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Strategies in jazz guitar improvisation

Norges musikkhøgskole
Norwegian Academy of Music

NMH-publikasjoner
2015:7

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Dissertation for the PhD degree
Norwegian Academy of Music, Oslo 2015
NMH-publikasjoner 2015:7

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ISSN 0333-3760
ISBN 978-82-7853-207-2
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Trykk: 07 Media, Oslo, 2015

Acknowledgement

I am indebted to several people who have provided both inspiration and assistance in my doctoral research. I am particularly grateful to Rolf Inge Godøy for being my main supervisor and for updating my understanding of relevant areas of cognitive psychology as they relate to improvisation. I am indebted to Chris Washburne for being my co-supervisor, for making the research in New York possible by accepting me as a visiting scholar at Columbia University and for providing invaluable help in my fieldwork and in the refinement of my theoretical approach.

Many thanks to my five interlocutors in New York City, namely Lage Lund, Jack Wilkins, Ben Monder, Rez Abbasi and Adam Rogers, for being so generous and for helping me by illuminating the secrets in jazz guitar improvisation. I am also thankful to associates, especially Fred Lerdahl and George Lewis at Columbia University, for sharing my interest in cognition and ethnographic research in jazz. Thanks to students in my classes over the years, and especially guitar students who have been a constant source of stimulation, expanding my own understanding of the subject.

Furthermore, I would like to express my gratitude to Kjell Arild Madsen for being my mentor in this project, Bjørn Alterhaug for reading my initial drafts, Jan Inge Sørbø for constructive comments on the thesis, and Paul Berliner for interesting conversations and suggesting New York City and Columbia University as a location for conducting this research. I want to

thank Richard Whitehead for detailed and competent proofreading and Hans P. Weisethaunet for being a knowledgeable and reflective opponent in my “trial public defense” on the thesis.

Finally, and most importantly, thanks to my wife Marit for continuous support and love all the way, and my children, Sondre, Haldor, Trygve and Karen Mathea for being generous with a sometimes absentminded father.

Abstract

What strategies are used in professional jazz guitar improvisation? This project finds that three main strategies are used by professional jazz guitarists; a basic coding strategy named chunking, an extended coding strategy based on context seen as schemas and an altered coding strategy based on skilled interaction in context, defined as templates. *Chunking* entails grouping small information units into *chunks*; these can then be combined into larger, hierarchically constructed systems and function as a mental "store" from which the performer retrieves material during improvisation. Chunk networks are triggered in the form of a *schema*, which is an abstract general mental representation of contextual knowledge. *Templates* are large flexible schemas frequently used by experts.

The practice-led research strategy has allowed questions, problems and challenges to be initiated and worked on in fieldwork. The aim has been to investigate how jazz guitarists recall, integrate, organize and develop their knowledge in improvisation. The inquiry includes participant observation, playing with and interviewing five professional jazz guitarists in New York City. By examining the fieldwork a *modal matrix* for analyzing structure, time and form in jazz guitar improvisation has been developed. The fieldwork studies have been supplemented by theoretical and contextual studies. The intention has been to bridge the gap between the roles as researcher and

performer, and in this process illuminate knowledge that might have an impact on different parameters in improvised music in general.

This research project finds that professional jazz guitarists' strategies are crucially dependent on context, style and type of interplay. Improvising is based on listening to what is happening in interplay and having flexible actions available to match the given input. Interplay defines the ways implicit (sub-conscious) and explicit (conscious) knowledge is used; the more familiar the context, the more use of implicit knowledge and intuition. The findings collapse the dichotomy constructed by the theories of top-down versus bottom-up expert skill, emphasizing that both approaches are needed dependent on time and place.

Norwegian summary

Kva slags strategiar er nytta i jazzgitarimprovisasjon? Funna i dette prosjektet viser at jazzgitaristar nyttar tre hovudstrategiar: Ei grunnleggjande koding kalla chunking eller gruppering, ei utvida koding basert på kontekst, kalla *skjema*, og ei intuitiv form for koding basert på høgt utvikla ferdigheiter i kontekst, definert som *malar* (*templates*). *Chunking* er gruppering av små informasjonseiningar til større hierarkiske einingar, *chunks*, som fungerer som eit mentalt lager som utøvaren hentar materiale frå gjennom improvisasjon. Nettverk av *chunks* vert utløyste i form av eit skjema, som er ein abstrakt generell representasjon av denne kunnskapen. Lang tids erfaring fører til gjenkjenning av mønster som skaper malar – samlingar av detaljar ved ein situasjonen eller eit problem. Når utøvarar samlar detaljar i templatar, trengst mindre analyse, og improvisasjonen kan byggja på meir intuitiv kunnskap.

Ein praksisleia forskingsstrategi har vorte nytta, der spørsmål, problem og utfordringar har vorte starta og arbeidd med i feltarbeid. Målet har vore å finna ut korleis jazzgitaristar kjenner igjen, integrerer, organiserer og utviklar kunnskap i improvisasjon. Arbeidet er gjort gjennom deltakande observasjon, samspel og intervju med fem profesjonelle jazzgitaristar i New York. Feltarbeidet er fylgt opp av teoretiske og kontekstuelle studiar. Ei *modal matrise* for å analysera struktur, tid og form i jazzgitarimprovisasjon er utvikla. Føremålet har vore å kombinera rolla som forskar og utøvar,

og i denne prosessen avdekka kunnskap som kan ha innverknad på ulike parameter i improvisert musikk generelt.

Dette forskingsprosjektet viser at profesjonelle jazzgitaristar sine strategiar er grunnleggjande avhengig av kontekst, stil og type samspel. Improvisasjon er basert på å lytte til kva som skjer i samspel og at ein har fleksible handlingar tilgjengelege som samsvarar med det som skjer i augneblinken. *Ekspertise* definerer korleis implisitt (ubevisst) og eksplisitt (bevisst) kunnskap er nytta; dess meir kjend situasjonen er, dess meir nyttar ein implisitt (intuitiv) kunnskap. Funna slår saman motsetnadene skapt mellom skjemabaserte teoriar som gjer bruk av langtidsminne (*top-down*) og sanseorienterte teoriar (*bottom-up*) som nyttar sensorisk register og korttidsminne for å forklare ekspertise. I denne avhandlinga vert det slått fast at båe vert nytta avhengig av tid og stad.

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1 Introduction

Many listeners and performers enjoy jazz guitar improvisation, but very few have described it beyond musical analysis of transcribed solos and verbal statements covered in interviews. In this project I have approached jazz guitar improvisation from a new perspective, linking interviews and *interplay* (interaction) as a *participant observer*, playing together with professional jazz guitarists in New York City, and conducting musical analysis based on chunking and schema theories.

The definition of *chunking* utilized in this project will be that proposed by George A. Miller (1956), with the term understood as an association process that explains how single items are hierarchically group into larger units. For example, defining a musical motive (a chunk of 3–4 items) into a higher-level chunk (a phrase consisting of several motives) renders the online processing more effective and enhances the limited processing capacity of short-term retention. *Schema* is the context of coding or chunking processes, and typically entails the general meaning of how we remember situations, here drawing on the definition provided by Frederick Bartlett (1932). Templates are retrieval structures used by experts to circumvent the limited processing capacity of short-term retention, incorporating long-term memory when dealing with decisions in real time (Guida, Gobet, Tardieu, & Nicolas, 2012).

The thesis is based on an approach called *functionalism*, claiming that functions of brain processes can be studied independent of questions regarding neurological implementation (James, Burkhardt, Bowers, & Skrupskelis, 1978; Snyder, 2000). The aim has been to investigate how professional jazz guitarists process and execute complex musical information with artistic insight and technical agility, and secondly to

develop ways of assisting jazz guitarists to meet such demands efficiently. The multitude of models for analysis developed in this project are created by integrating practice with theory, "showing doing" in a way that can enable "doing showing."

I approach jazz guitar improvisation from several angles: the theory chapters deal with prospects and limits of the underlying mechanisms that enable fluent improvising, whereas the fieldwork presents strategies for increasing effectiveness in practise[1] and spontaneity in performance. Reflecting further on what jazz guitar improvisation is—i.e. how it is acquired—and how it is used, my PhD inquiry raises the following research questions:

1.1 Research questions

What strategies are used in professional jazz guitar improvisation? What is implicit and explicit in these strategies?

When listening to good jazz guitar improvisation the guitarists perform at a level similar to a well-rehearsed performance, without preparing explicitly for the actual performance. How is this possible? I have found *strategies* to be a useful term for describing the processes that enable such high-level skills, as they contain both emotional and cognitive aspects. Strategies are used differently within different contexts, but they typically involve two major processes: *formulation* and *implementation*. Formulation implies analysis of a situation, while implementation defines the action plans needed (Sloboda, 2005). Recognizing that strategies can be innate, intuitive and highly personal, I believe that describing and analyzing them can reveal processes that can be transferred to other situations by others. The inquiry will focus on how harmonic, melodic and rhythmical structures are created by jazz guitarists, who are constrained by time and form.

Using the word "professional" implies a search for *the best practices* (Sloboda, 2005). Professional jazz guitarists inevitably spend much time and energy acquiring and refining their skills. Are there particular practise

1 The concept of practise (the verb form) with S refers to (goal-directed) instrumental rehearsing, while practice with C (the noun form) refers to instrumental rehearsing and performance, as well as cultural practices, i.e. practice-led research, cultural practices of jazz, performance practice, reflective practice, etc.

strategies that these guitarists employ to produce better performance or to achieve the same results more quickly when performing? How can we understand their strategies in terms of existing knowledge of cognition? By linking practical context to a cognitive framework using chunking and schema theory, this study is also a study of *expertise*, understanding skills as a consequence of general human capacity for extensive adaption to physical and social environments within a domain (Ericsson, 2009).

In the fieldwork, the interviews with the jazz guitarists will reveal their *explicit* (articulated) knowledge. The *implicit* (unarticulated) sub-conscious dimension will be illuminated by observations and analysis of their playing. Although it is possible to make a conceptual distinction between explicit and implicit knowledge, they are not separate and discrete in practise and performance. The interaction between these two modes of knowing—explicitly defining "what" and "why" and implicitly "knowing how"—is vital for the creation of new knowledge. While explicit knowledge can be codified and transferred via a manual or a method book emphasizing certain procedures, I believe that the intuitive, experience-based and implicit nature of a jazz guitarist's knowledge makes it more dependent on close interaction and observation in a relevant context.

1.2 A practice-led inquiry

This study aims at finding knowledge in practice through practice-led research, where knowledge is informed by the interrelated inquiries found in practice, practice context and theoretical studies (Gray & Malins, 2004; Haseman, 2006; Ulvund, 2013). Central in practice-led research is practice itself and the role of the researcher. Far from attempting an objective position, I frame the research questions using my personal background and experiences both as a guitarist and as a researcher. Accepting that the answers are something that the participants and I create together based on context and the aim of the research, including theoretical perspectives is fundamental in the project. In my study I stress this dialogical relationship by using the term *interlocutor* instead of informant (Denzin & Lincoln, 2005).

Being engaged as a practitioner does not mean being uncritical but rather aware of how personal background might enable contact beyond the traditional objective researcher position. In this project, the interlocutors

and my passion for jazz guitar improvisation enabled a focus on the phenomenon of jazz guitar by being linked to an embodied physical playing situation. Playing together helped the verbal conversation, and talking together helped the musical conversation. The empirical material should be seen as an integral part of the theory building, since many theoretical perspectives have been grounded in practice.

Improvisation happens in the moment and is a result of the cognitive constraints on the player, the complexity of the material and the context of the performance. Pilot studies were designed to find the blend of these constraints and define a possible bottleneck. As a part of the pilot studies, two concerts and two practice rehearsals were videotaped with me as a participant observer. This was done to cultivate observational skills of video recordings, to make implicit knowledge more explicit, and to cultivate interview skills by posing questions to fellow musicians.[2] These preliminary inquiries, including associated logs and interview guide sketches, were very useful in preparing for the fieldwork in New York City, where five professional jazz guitarists were recruited as interlocutors.

The jazz guitar lessons with the five jazz guitarists were important for bringing valuable and essential knowledge from the practice field and for fortifying the research projects' trustworthiness. Ethnomusicologist Paul Berliner reflects on a similar process in the following way:

> To keep comparable issues before me during this project, I resumed my former study as a jazz trumpeter and took periodic lessons with various artists. This allowed me to observe how different players evaluated my performance and the methods they adopted for correcting my mistakes and encouraging my progress. Using myself as a subject for the study—training myself according to the same techniques described by musicians—offered the kind of detail about musical development and creative process that can be virtually impossible to obtain from other methods. So, too, did reflection during my own performances on the experiential realm of jazz. Musical experiments in the practice room—for example, trying to invent and develop musical ideas—proved especially useful for testing different ideas about improvisation. (Berliner, 1994, pp. 9–10)

Immersing in a practice common for the practitioners in the field has been rewarding. Taking lessons made it possible to reflect in an *embodied* way, meaning cognition shaped by the human body in time and space (Merleau-Ponty, 1962). Questions were posed as a natural consequence of issues

2 Explicit and implicit memory can overlap, for example in jazz where explicit notation systems are used to encode part of what was previously oral knowledge.

related to what happened in the interplay, as well as to the questionnaire prepared ahead of the sessions. The guitarists reflected in both words and in demonstrating their words by playing "their answers" on the guitar. By involving other insiders as interlocutors, I obtained a wider range of perspectives that could verify or reject ideas concerning strategies in jazz guitar.

The fieldwork projects can be seen as a contribution to the emerging and rapidly growing field of *cognitive ethnomusicology* (Berkowitz, 2010), combining cognition and ethnomusicology, emphasizing how professionals talk and reflect on their practice and performance habits from a cognitive perspective. Gabriel Solis and Bruno Nettl describe such research as a dialectical activity between formal/symbolic constraints (musical material) and situational and embodied constraints and summarize it as;

> (1) whether something is properly improvisation, and how we can find out; (2) the relationship between some point of departure learned by an improviser and the product that is created in the course of performance; and (3) the methods of combining, juxtaposing, and otherwise arranging building blocks to create music. These are essentials. But we [. . .] believe it is important to follow another perspective: the study of improvisation in a variety of contexts. (Solis & Nettl, 2009, pp. xi–xii)

In this practice-led project, fieldwork combined with theory has been used to explore what improvisation means in a variety of contexts. Standard tunes have been used to define the relationship between product in practise and that which is created in performance. Chunks, schemas and templates have been important building blocks for understanding the music created in this process. I will elaborate on these issues later in the chapter.

1.3 Challenges

What are the psychological mechanisms that enable improvisers to create intricate musical phrases in the moment? In my view, understanding the cognitive foundations that allow for efficient learning and flexibility in performance is crucial. Too often, I have found the theoretical discussion as an entity not fully integrated into the practice component. For a long time, I hoped to get hold of a book that in a systematic way deals with the cognitive challenges related to jazz guitar improvisation, although I never found one. This research project and thesis is intended to be a contribution in this

respect. Reflecting on the position that practice studies have in science today, Erlend Hovland writes:

> Still, paradoxically as it may seem, the greatest threat to practice as a field of study is the lack of theory. To define and theorize practice is to create research potential. But since practice is inscribed in the concrete, in 'real-world-issues' there are good reasons to assume that different disciplines will have to develop differing theories and definitions, depending on the nature of the particular practice and the expectations held by those who pursue the research. (Hovland, 2013, p. 2)

Hovland suggests that it is reasonable to assume that different theoretical approaches can be applied to each practice. Choosing a cross-disciplinary approach linking musical processes to psychological processes has been challenging, because the questions and answers have to be addressed from several angles. Questions like "what is jazz guitar improvisation?" and "what are the parts and processes of which it is comprised?" deal with complicated aspects related to time, structure and form. As argued in the literature (Norgaard, 2011; Pressing, 1988 ; Sarath, 2010), traditional jazz methods approach questions like these by emphasizing music theory at the expense of structural and interactive concerns. Many of the "how to do it" methods are quite repetitious and stress the importance of learning new songs, new theory, copying solos, etc., but they ignore the importance of the corresponding psychological processes involved when playing and interacting with people.

I have found it useful to approach the study from two angles: a practise mode that focuses on how ideas and concepts are generated in practise, and a performance mode that asks how this knowledge is used in performance, focusing on anticipation and monitoring of own actions as well as interaction with others players. This distinction might sound artificial, since jazz musicians use important gigs, concerts, recordings, etc. to learn more about improvisation. And with such a perspective, everything can be thought of as practise, since performance itself is carefully monitored to provide cues for ways to further improvement. However, a distinction makes sense if one emphasizes the challenges related to being creative within the limited time constrains of real-time performance, versus the possibility of refining details without these time constrains.

In this inquiry, *practise* is defined as a focused and structured way to achieve results, targeting one aspect of a larger problem at a time, breaking down the greater problem into simpler, more manageable units. This resembles

the notion of *deliberate practice* coined by Anders K. Ericsson (1995), which involves hard and repetitious work to gain results. Working within restrictions, focusing on one aspect at a time is appropriate for practicing improvisation, but not for performing it. According to Hal Crook (1991) *performance* implies circumventing analytical thinking used in deliberate practise, to listening and intuition in context. This implies that after much concentrated practise the individual and targeted topics in deliberate practise may appear in improvisation by themselves, more naturally and intuitively. In jazz performance, deliberate practise is transformed into a more collective, situated and tentative activity relying on rules and roles in the context. As Paul Berliner states,

> [. . .] improvisation involves reworking pre-composed material and designs in relation to unanticipated ideas conceived, shaped, and transformed under the special conditions of performance, thereby adding unique features to every creation. (Berliner, 1994, p. 241)

This description recognizes that jazz improvisation is dependent on practise or preparation ahead of performance in form of pre-composed material (chunks) "conceived, shaped and transformed" by the particular context (schemas) of which it is created in performance. Illuminating how professional jazz guitarists create chunks in practise and integrate them in performance as part of overall improvisation strategies or plans have been important.

Improvisation implies discovering what we are looking for in the process of doing it. The *reflexive* accounts have helped me keep track of this transitory process. Reflecting subjectively and critically on jazz guitar from my perspective as a learner has been a tool for gaining greater imaginative variation and structural description. Implicit processes have been raised to consciousness by introspection and become more explicit. Using video as a tool for analysis has been especially rewarding, allowing for zooming back and forth on the video to capture the moment more fully.

Derek Bailey argues that it is impossible to learn improvisation from a (method) book, and that it cannot be taught from one source (Bailey, 1982, p. 7). He maintains that improvisation is a skill that is learned by "stumbling on the right method" through trial and error. This is important to mention; rarely can one expect a single method to cover all the complexities found within a field like jazz improvisation. Learning to improvise normally demands synthesizing information obtained from different sources by using

different methods. Bailey defines improvisation as a spontaneous activity performed in real time and by the constraints of one's own imagination. Strategies described in this thesis elucidate some of the complexity found within this field, focusing on both implicit and explicit knowledge and the nature of their interaction.

1.4 Inspiration

The functionalistic approach is inspired by American pragmatism represented by people like Charles Sanders Peirce, John Dewey and William James. This pragmatism entails a philosophical "learning by doing" approach where theory is extracted from practice and applied back to practice in a reflective way. Doing something then means making the implicit more explicit by reflecting on the matter at hand, linking cognition to situation, as seen in *situated cognition*, acknowledging that our strategies depend not only on what we are trying to find but also on our expectations and experience (Huron 2006). Merleau-Ponty states, "my body, in a familiar surrounding, finds its orientation and makes its way among objects without my needing to have them expressively in mind" (1962, p. 369). Intuition and exploration, trusting the body to make its own way, have been crucial in this project, recognizing that I might illuminate important aspects of a musical practice but at the same time that I might miss other important aspects of the situation.

Donald Schon is a follower of American pragmatism and argues that the best professionals typically know much more than they can explicitly define and that their implicit knowledge gathered from real-life experiences is crucial for their expertise. Following this approach, he has argued for an *experiential* education where the teacher and student are supposed to work together to solve a problem. In his book entitled *The Reflective Practitioner* (Schon, 1991) Schon refers to how purely technical knowledge is transformed when practitioners confront the particulars of the situation. In this inquiry I am the student/researcher seeking advice from professionals, who thus become teachers in this process. Together we use earlier encounters with similar situations as a background for understanding jazz guitar.

Along with Schon's reflections, I have found Jeff Pressing's more theoretical elaborations fascinating, especially his perspectives on cognitive constraints

in jazz-improvisation (Pressing, 1998). His notion of a *referent*, as a situation-specific creative channel for a more abstract schematic *knowledge base*, has been particularly interesting. This inspired the use of a single tune, *All the Things You Are*, as a reference for discussion and analysis. I associate referent with a tune and knowledge base with domain-specific knowledge containing different strategies.

What is retrieved from memory during improvisation is a crucial question. Pressing (1988) posits that memorized motor patterns form the basis for improvised actions. Through training, these motor patterns become more fluid and error free. Essential in this process is mastering the motor movements themselves as proposed by Schmidt and Lee (2005). Philip Johnson-Laird (2002) believes that such complex behavior is only possible if jazz musicians learn rules for combining movement patterns. His writings focus on the limited processing capacity of *working memory*, a system that actively keeps multiple pieces of information active, thus allowing the information to be manipulated. Laird sees working memory as the bottleneck in improvisation and believes that conscious processes and working memory are too slow to work within the constraints of real time in improvisation. This led me to the notion of a faster and more flexible working memory used in skilled behavior, called *long-term working memory*, as introduced by Anders Ericsson and Walter Kintsch (1995).

Studies on long-term working memory show that experts use their working memory differently from people that have no expert skills. Experts are not affected by interruption in the same way as non-experts when completing a task. Interference in working memory happens when new information competes with the old and ultimately overwrites it. It seems as if experts have a more effective way of handling the very limited workspace that can accommodate only a few items or events. They integrate their working memory with long-term memory in the form of pointers that immediately index the selected information. Ericsson and Kintsch (1995) refer to these pointers as *retrieval structures*, while the term *template is* used by Fernand Gobet and Herbert A. Simon (1996). I will use the notion of templates in this project as I find it more accurate. In Chapter 6 I will elaborate on harmonic templates facilitating advanced harmonic strategies in real time.

Much of the theoretical framework, including chunk, schema and template formation, is an essential part of expertise and encompasses skills, strategies and problem solving routines developed in domain-specific areas. Jazz guitar

improvisation as here studied is an example of such expertise, internalized through thousands of hours with practice. Ericsson (2006) suggests that experts' knowledge has to be studied in a *natural context* defined by the constraints of their expertise. In Chapter 3 I will elaborate on the methods used in a natural context.

The complex relationship of the human body's abilities to make real-time decisions has rarely been studied in jazz. The improviser is crucially dependent on the body in order to improvise within real-time constraints. In some ways, this can be comparable to processes of speech production and articulatory phonology in language (Berkowitz, 2010). However, improvisation in jazz is a more complicated process since it typically must be articulated (played) in tight temporal synchronicity with other performers, and not like speech where one normally speaks one at a time. Vijay Iyer (2002) has shown that *real-time decisions* in jazz often can be found in the range of 40 ms or less (1/25 of a second). Time is then of critical concern in jazz since the margin of error is very slight. I will elaborate on these issues in Chapter 5 and discuss how jazz musicians typically find ways to enable decision-making within such tight constraints.

Body and real-time constraints are essential, as well as limits on what we know. According to the interlocutors in this study, those guitarists whose thought process contains flaws or who face incomplete information often find greater difficulty in achieving success in performance, no matter how hard they study in their practice. On an expert level it is reasonable to assume that implicit *procedural* knowledge (know how to) rests solidly on more explicit *declarative* (know about) information. This thesis will pinpoint the connection between explicit and implicit knowledge, and define possible strategies employed by professionals in dealing with these levels of understanding.

Comparing introspective verbal reports of own actions with a video of the same action shows that the verbal reports in many cases are quite different from what is documented on the video. This effect has been demonstrated in observational and log studies by Roger Chaffin et al. (2010) in classical music, and by Helga Noice et al. (2008) in jazz music. My approach attempts to go beyond the limitations of interviews and self-reports, as I will compare what professional players say, with what they do, that is, what they play. Johnson-Laird writes about the explicit and implicit aspects of music cognition and psycholinguistics in this way:

> [musicians] can articulate only a limited answer, because the underlying mental processes are largely unconscious. If you ask yourself how you are able to speak a sequence of English sentences that make sense, then you will find that you are consciously aware only of the tip of the process. (P.N.Johnson-Laird, 2002, p. 417)

We are only aware of parts of our entire action, and expertise studies show that to become a proficient improviser (expert) and probably more aware of the entire action, one has to practise a lot over several years. According to Chaffin and Lemieux (2004, p. 20) "There is now a compelling body of evidence for the '10 year rule': a minimum of 10 years to become an expert in any field." They later add, "there are no clear exceptions to this 10-year rule in the field of music." Chaffin, who has studied jazz musicians, also probably includes jazz musicians in the category "no clear exceptions."

The idea of a minimum amount of hours to become an expert dates back to Simon and Chase's chess studies from 1973 suggesting at least 10 000 hours of practice, and is later supported by Sloboda (2005) in relation to musical expertise. However, defining what makes a jazz player an expert is not clear-cut, and attainment is not exclusively a question of quantity of practice, but also of quality. In the interviews, I will focus on individual engagement and knowledge of practice strategies that characterize my interlocutors.

The *modal matrix* found in the analysis part of the thesis is inspired by Paul Berliner's comparison of jazz improvisers in score format (1994, p. 522) and can be seen as an example of structuring knowledge. The matrix describes playing style and also defines how similar structures (harmonic, rhythmic and melodic) are used differently among the various guitarists. The modal improvisation matrix is developed to give "substance" to the theoretical framework and to provide a frame of interpretation for the musical transcriptions in the fieldwork. The matrix illuminates how harmonic complexity, sometimes blurred by being located in different keys, appears as more unified when being retraced to a single modality (key). Incorporating fretboard diagrams in Chapter 6 is another way I have moved beyond conventional musical analysis, by showing embodied realization of musical finger patterns.

In *Performance Studies* (1988) Richard Schechner focuses on multiple ways of "showing doing," combining qualitative and quantitative approaches in displaying doing. I have strived to underline and point to action by making models and figures simple, even though the analysis underpinning them

is not. The aim has been to present the material in a clear and consistent way. Developing models for jazz improvisation has revealed "blind spots" in the text and has been a good way of managing doubt and gaining greater precision in word usage. I hope the findings not only reveal "showing doing" but also enable "doing showing" by transforming the material to improvised actions.

1.5 Scope

Jazz improvisation can mean many different things depending on context, style and material. Free jazz contains challenges not found in be-bop and swing; modal jazz contains challenges not found in improvising over chord changes. In short, every style represents different challenges. This also means that analysis and theory building are constrained by context, style and material. By choosing mainly modern jazz guitar players as interlocutors in this study, I have delimited the scope of the inquiry. This means that I mainly speak of a certain way of thinking, exemplified by the interlocutors and reflected upon by my own pre-understanding. This being said, much of jazz guitar history is based on common knowledge shared in the jazz community, especially the relationship between what we improvise over, the tune or song form, and the material (musical ideas) we use to improvise with over tunes.

This thesis focuses on playing over standard tunes and must be read with these constraints in mind. In Chapter 6, when focusing on merged hierarchies and possibilities of using longer stretches of thought and creative imagination on a single chord, I depart from the standard chord-scale approach, showing how thinking becomes different but not necessarily easier when dealing with a single chord.

Reflecting introspectively, I play differently when improvising in freer contexts than in standard jazz, especially when playing in odd meters, like 7/8 and 9/8; the thinking becomes different. Still, I am the same improviser in both contexts, and part of my vocabulary is without a doubt present in both places. This touches a challenge in expertise studies, namely dealing with how flexible and *transferable* our knowledge is. What makes an improviser versatile? Is it frequent encounters with improvisation in different context, or is it a large knowledgebase that is gradually supplied

with new information more or less independent of situation, or maybe a combination? While cognitive psychology earlier aimed for universality of its concepts, contemporary psychology is much more aligned with emphasizing both views, depending on situation and type of learning (Snyder 2000, Sloboda 2005, Huron 2006). These issues are further discussed in the methods chapter aiming for a pragmatic perspective, and in theory chapters dealing with flexible knowledge structures being transformed in action.

Studying improvisation in a variety of contexts is important. Unfortunately in jazz "[. . .] the great majority of research has been conducted using keyboard instruments" (Thomson & Lehmann, 2004, p. 144). Obviously, it is not only keyboard players who improvise, and I believe every instrument has *idiomatic* or particular instrumental challenges that have to be dealt with. The guitar does not have the dynamic possibilities of wind instruments, nor does it have the range of the piano. But it has an intimacy in sound that makes it versatile and a preferred instrument in many contexts. Bends, slides, slurs, and vibrato make for variation in single tone playing. Percussive body strikes, finger picking or plectrum strumming make for variation in the way harmonies can be played. When guitarist add amplification and effect processing it becomes an instrument with many possibilities. It is within these constraints that jazz guitarists should find their "own voice" by making the "guitar talk" or "the horn sing." Those aspects that are essential in making "an own voice" in jazz guitar improvisation will be thoroughly discussed in Chapter 7, highlighting the guitarists' own perspectives.

When playing together musicians interact and use their instruments and bodies in slightly different ways, depending on context. These challenges are not properly addressed when playing over a pre-recorded backing track in a studio, as many of the keyboard studies unfortunately do. Vijay Iyer (2002, p. 389) says " [. . .] the fundamental building blocks of cognitive processes are control schemata for motor patterns that arise from perceptual interaction with the body`s environment." For Iyer, this perceptual interaction is closely linked to what happens in interplay, it is crucial on a professional level, and it therefore constitutes a focus for this inquiry.

Acknowledging that a feature common to all improvisation is that decisions are made within the real-time restrictions of performance itself, this research project will focus on strategies that facilitate improvising in real time. From a psychological perspective, these strategies fall into two broad

categories—strategies based on psychological and physical constraints (limitations of body, individual reaction time and extent of knowledge) and strategies based on socio-cultural constraints (culture, defined style, context of playing). This is of course not a definite split, since socio-cultural constraints, coming from the outside, after a while will be assimilated and felt as more internal psychological constraints.

The most obvious schema constraint in this project is the song form of *All the Things You Are*. This tune facilitates the production of musical material by providing a melodic, harmonic and rhythmic frame for variation. Using standard tunes enables a mutual understanding concerning style, chord changes and other parameters. In short, it increases efficiency in interplay (two jazz guitarists improvising together) and direction of interview by linking jazz guitar expertise to something shared, a repertoire based on a cultural agreement of notation and interpretation.

Several other research strategies have been considered as potentially relevant, like grounded theory and action research, both of which have much in common with the chosen practice-led strategy. However, compared to grounded theory, which traditionally avoids preconceived theories and aims for discovering theory through data analysis, practice-led is constantly combining theory and practice for the best of both disciplines. Compared to action research, practice-led focuses on description more than prescription, and on tacit knowledge more than explicit knowledge. This has made practice-led research the most relevant for this research project.

1.6 Personal and professional context

My pre-understanding and qualifications as an insider are based on performing as a jazz guitarist for over 30 years, and teaching for over 25 years at high school, college and university levels. I was one of the first five students graduating from the first university level conservatory jazz program in Norway ("Jazzlinja" in Trondheim). Furthermore, my master's thesis *Jazz Improvisation as Information Processing*, dealing with cognitive constrains in real-time processing, has been useful as a background study (Solstad, 1991). This study is then informed from both an *emic* position (from within the phenomena of chunked actions and listening representations)

and an *etic* position (observing other musicians and reflecting on their process as a researcher), terms coined by linguist Kenneth Pike (1954).

By asking questions and engaging in interplay with these guitarists my understandings, both as a musician and interpreter of their actions, have been informed. Sometimes I have found it difficult to be specific enough when using words. Using the guitar and playing to exemplify it has made this process easier and more to the point.

In pilot projects and fieldwork, I have used my experience as a musician to get closer to the core of what jazz guitar improvisation is. The explicit incorporation of identity and experience in one's research has gained wide theoretical and philosophical support during the last few decades (Gray & Malins, 2004). The extent of practice- or experience-related research has been rapidly growing, as evidenced in Norman K. Denzin's and Yvonna S. Lincoln's large collection of qualitative research (Denzin & Lincoln, 2005). This practice-led project is a contribution of this tradition, balancing ethnography, phenomenology and reflective (practitioner) approaches in a holistic enquiry.

To recapitulate; in this practice-led research project, inspired by ethnography I rely on fieldwork and extensive data collection involving prolonged time in the field. As a participant observer I describe the practice itself from within as embodied, playing with my interlocutors who are professional jazz guitarists, using my knowledge as a jazz guitarist to understand their expertise. Inspired by phenomenology, I am not giving a thick (extensive) description of the culture involved, but of how the actions of my interlocutors and my position as a learner together help me to understand strategies in jazz guitar improvisation. Using introspective reflections concerning my own practice and trying to understand this embodied practice I am a reflective practitioner. Inspired by the performative research paradigm, video is used as a tool for gathering information and to process understanding, acknowledging the visual and auditive aspects of jazz guitar improvisation, and as documentation in addition to written text.

1.7 Thesis overview

Chapter 1 defines the study's background and objectives, while Chapter 2 situates the project in a larger research context, focusing on research relevant to this study. The methodological approach and methods used for illuminating strategies in jazz guitar are described in Chapter 3. Moving on, Chapter 4 deals specifically with structure, Chapter 5 with aspects of time, and Chapter 6 with form related to playing over the standard tune *All the Things You Are*. In Chapter 7 the performers' reflections related to playing are categorized and analyzed, describing their strategies in practise and performance. The main categories in this practice-led research describe harmonic, rhythmic and melodic overview, parts, joins and maintenance. The musical analysis in Chapter 8 is based on my own transcriptions of the interlocutors' solos over *All the Things You Are*, and introduces a modal matrix for analyzing jazz improvisation. Based on musical transcriptions and interviews, along with answers to the overall research question, the findings in Chapter 9 outline the characteristics of each guitarist playing style, as well as the study's limitations.

2 Studies and theories of jazz improvisation

This chapter provides a discussion of relevant research in jazz improvisation. The aim of this review is to situate the project, round up relevant data, discuss rival interpretations and define why strategies in jazz guitar improvisation are needed.

2.1 Improvisational practices in jazz

David Hargreaves noted in 1991 that despite new theoretical approaches to jazz improvisation, there is almost no empirical data on how jazz musicians practice. "Despite these theoretical developments, virtually no empirical data has been collected from practicing jazz improvisers" (Hargreaves, 1991, p. 47). In terms of improvisational practice, Daniel Fischlin summarizes the situation as marked by a "general lack of theoretical attention paid to improvisational practices in jazz" (Fischlin, 2004, p. 19). By illuminating practise and performance strategies used by professional jazz guitar players, the present study attempts to meet both the "lack of theoretical attention" and absence of "empirical data."

Guro Gravem Johansen's 2013 PhD study *Å øve på improvisasjon* (*To practice improvisation*) examines musical practising habits among students in higher jazz education in Norway and Sweden. She uses 13 qualitative, semi-structured interviews as her empirical base, triangulated with a follow-up case study with three of the students. The study pinpoints the value of explorational practise (experimenting with both musical forms and

instruments) in addition to deliberate (goal-directed) practise to develop a personal identity as an improviser. Her study is similar to mine in that she also stresses interplay as a means to define individual sound.

As far as I have found, there is little research specifically related to strategies used by professional jazz performers. However, jazz pianist Tord Gustavsen's writings on *The dialectical Eroticism of Improvisation* (Gustavsen, 2010) has many parallels to my approach. In this work he discusses the tensions between controlling the music and giving in to the music, as seen from a jazz pianist perspective. He discusses *musical objects*, which in many ways resemble the notion of chunks and how the improviser deals with music as sound experienced in time. It is a theoretical study but with interesting reflections based on long-time experience in the field of jazz. Gustavsen's focus on dialogical tensions found in jazz, and the discussion of how the improviser must make improvisational decisions between intuition and analysis, are particularly interesting for my project.

2.2 Introspective phenomenological accounts

An important work for this study has been David Sudnow's introspective study entitled *The ways of the Hand* (Sudnow, 2001). Here he reflects on learning to play jazz on the piano, with the most essential learning being that the success of improvising depends on trusting the hands to go their own ways, without interfering with conscious thought. Specifically, Sudnow learns to improvise jazz via the piano by imitating the larger body movements of his piano hero, Jimmy Rowles. The key is found in doing the actions. Sudnow makes certain mental representations along the way, and between these images he sings along with his improvisations. This relates to how Paul Berliner speaks of the ability of linking mental images to an inner singing as the *singing mind*, and to how he defines it as a typical representation of the mental processes in most great improvisers (Berliner, 1994, pp. 180-181). Improvisers speak about singing ideas through the instrument; the instrument is then viewed as an extension of the body and the imagined sound one hears with the inner ear.

Reflecting in practice is essential for Sudnow; the body learns through actions, and first-hand knowledge is something quite different than reflecting on it in a theoretically abstract way. Although Sudnow's detailed

reflections are interesting, they are not based on being a professional performer and hence do not necessarily match the way professional performers reflect, which is the topic of this study. Nevertheless, the introspective knowledge gathered from Sudnow's accounts has been inspirational and a main reason for the researcher's choice to partake in the fieldwork as a participant observer.

2.3 Ethnographic studies

In performance, images or mental representations are constantly confronted with input from the environment. Paul Berliner uses the term *negotiation* to describe what happens between what one brings into the performance situation, in the form of sound or images, and the transformation of these images into real music in the meeting with musical input from the environment. Berliner's book *Thinking in Jazz* (1994) and Ingrid Monson's study *Saying Something* (1996) are both important ethnographic contributions to the field of jazz, engaged in how jazz musicians communicate through interplay. Monson's study is written in a way that articulates identity, politics and race to a larger extent than Berliner's study. My approach will be closer to Berliner's approach.

Both studies rely on musician-orientated approaches that reflect on jazz musicians' thoughts. Monson presents a musical and cultural analysis of fourteen prominent New York City jazz performers, focusing on interaction in the rhythm section and the inherent tension between the individual and the collective. Many of the musicians interviewed in Berliner's study and in Monson's study play in the neo-bop tradition and use standard tunes as a musical reference. The present study will also use standard tunes as a reference. As with Berliner, I will have a position as learner and interviewer using semi-structured interviews, but interviews are done sitting with an instrument and not a pen, implying that the playing itself defines the direction of the verbal conversation.

Berliner's examples of alternative notation are useful (Berliner, 1994, pp. 531 - 532), even though he does not use it for more than short examples. His main documentation is in traditional musical notation. Idiomatic (instrument specific) practice can sometimes be difficult to represent in standard musical notation. In this research I use audio files, graphs, colors

and matrixes to add another dimension to traditional transcription of solos and interplay.

In Monson's case it is sometimes hard to contextualize her descriptions of musical interplay, since she does not involve herself in doing video or audio recordings in a particular field context. Neither Berliner nor Monson conducted follow-up interviews, where the interviewees would be subjected to face-to-face discussions afterwards in order to go more in-depth on particular issues. The musical analyses in Berliner's and Monson's studies are based on recordings done much earlier than the actual analysis. In my own research project, I have found it fruitful to be a part of the fieldwork, record the entire session, including both interview and interplay, and then analyze it afterwards. This was also done because I could not analyze the communication between us as I was actively engaged in interplay and dialogue in the session itself. Analyzing a practice, here the musical materials, and then going back to the practice in a follow-up fieldwork, here back to the interlocutors, are essential parts of practice-led study.

The most fascinating part of Berliner's research is, in my opinion, the places where he reflects upon his thinking as a trumpet player and the effects of what happens when he engages in practice. This makes the text more alive, more vibrant than the rest of the material. It is no longer only a reference to what the great musicians do in improvising, but also something that allows us to do by engaging in the practice ourselves, in other words a more embodied way of reflecting on the insider role. His reflections were important for choosing a practice-led research approach in this project.

Including the musician's perspective in the research process is important. Yet it is also important to know the limitations related to interviewing musicians. Memories are fragile and stories can change depending on the interview situation and context. It would be inappropriate to ignore what musicians say about their own craft, but it is also unwise to always take what they say for granted. Interviews, despite the information they provide, can sometimes be of limited value due to the possibility of inaccuracy and distortion. Peter Reinholdsson's PhD study, *Making Music Together* (1998), which examines musical interplay or interaction, makes interviews more trustworthy by having audio recordings of the performed music, enabling him to match the actions with words. Reinholdsson collects different perspectives from players within a group setting focusing on how musical information is being adjusted based on mutual relationships in a group

context. He is thus using field-recorded materials, music sessions and recorded interviews as a basis for analysis.

Reinholdsson is an insider in this study, but he is not performing. The insider/outsider discussion is important in his thesis, where he reflects on the dilemmas between self and body, subjectivity and objectivity using the concepts of emic (insider) and etic (outsider) as a departure for the discussion. As an insider, I use the interview and observation aspects of Reinholdsson's study, but my departure point will be as a practitioner engaging in the action. I will reflect from inside-out, much like Paul Berliner is doing in his introspective accounts of taking lessons with his interlocutors, or as Sudnow does in his introspective phenomenological approach. By being engaged as a performer and by combining this experience with an analysis of video recordings, I hope to get closer to what is at issue in jazz guitar improvisation.

A potential danger of insider interviews and participant observation is the tendency to be very subjective, forgetting a professional distance or detachment to the study, as in making the well-known un-known and the un-known well-known. Another drawback of such studies, including Sudnow's introspective study, is a reliance on one subjective view. It is only the learner's perspective that is foregrounded, and as a reader one might be faced with a perspective that seems artificial. Combining perspectives from interviews and musical analysis, I hope to have avoided this drawback and strengthened the trustworthiness of the research project.

2.4 Observational studies using video

Roger Chaffin's studies of musicians reflecting as they learn new pieces are very informative. Most of these studies are, however, connected to learning a piece in the classical tradition. One of the findings in Chaffin's research is the striking difference between what musicians say they do and what they actually do. It seems as if the body makes its own choices beyond the conscious mind. In several of these observational studies psychologist Chaffin (2010) has worked together with cellist Tania Lisboa, who demonstrates how practise routines are influenced by expressive thoughts that are ineffable and hard to articulate, and which shape her music-making directly, without the intervention of words. Lisboa reflects by using a written

diary, and what she writes about her practise versus what she observes afterwards on a video of the same action is quite different in many cases. This shows that memory is something that is hard to use as an exact tool for analysis, and it also stresses the importance of getting beyond words in order to illuminate performers actions.

Martin Norgaard's PhD thesis *Descriptions of Improvisational Thinking by Artist-Level Jazz Musicians* (2008) identifies decision-making processes underlying jazz improvisation and consistency in verbal reports using video as a tool. Seven proficient improvisers are recorded improvising over a blues progression using audio computer software. Then an approximate notation of the audio recording is presented via midi analyses. While the improviser is listening to his solo, together with the midi-based simplified notation of their own jazz improvisation, they are encouraged to give comments. Their comments are then written into the musical transcription at the place where they occurred while listening. Norgaard's use of decision-making mechanisms and my emphasis on strategies have many parallels, and both use video to capture the entire procedure. However, Norgaard's project doesn't incorporate negotiation in interplay; the seven musicians in his study only interact with a click from a metronome.

Aaron Berkowitz combines several methods when using an interdisciplinary approach in his research on improvisation (Berkowitz, 2010). His work points to cognitive constraints in search for the improvising mind, which is also my approach by focusing on strategies in jazz guitar. Berkowitz is both a neurologist and musician and ties the discussion to both neurobiological perspectives and musical analysis. Like Berliner, he compares improvisation with language acquisition, and especially spontaneous speech. Linking interviews up to musical analysis and asking what sort of knowledge is required for fluent improvisation, how it is learned and how it used in performance, makes his focus similar to mine.

2.5 Jazz analysis

In order to find categories of musical interaction, Paul Rinzler (1988) analyzed a studio-recorded group performance of *Along Came Betty*, as recorded by the Phil Woods Quartet in 1979. By focusing on five types of interaction in jazz—call and response passages, fills, accenting the ends of

formal units (cadences), common motive, and peak responding—he defines important aspects of making music together. Documenting this interaction, Rinzler offers no transcriptions, no contact with the musicians involved, no video, and no follow-up, thus making it hard to contextualize his reflections on musical interaction.

The most interesting part of this study is the phenomenological description of the musical events and interactions based on what he hears on the recording. Rinzler defines three strategies and levels in improvisation: first a cliché level with no creative impulses that characterize the lowest level of improvisation, then an intermediate cut-paste level based on having much improvisational knowledge but where ideas are not blended in the interplay context. Finally, there is the highest interactive level where ideas are blended and transformed according to what happens in the particular interplay in a particular moment. Rinzler's descriptions have been important for defining levels of improvisational expertise in this project.

2.6 Generative models in jazz improvisation

Whether one improvises on rules or improvises based on learned examples has been a huge topic in generative theories of improvisation. In these theories, one is also concerned about the origin of novelty, what enables improvisation, how much is preconceived and how much emerges as it goes along. Jeff Pressing (1988), Philip Johnson-Laird (1991; 2002) and Eric Clarke (1988) have made important contributions in this respect by making models of how the mind works, linking jazz to expertise. The problem with these models is that they are often too rigid to capture all the nuances in jazz improvisation; jazz musicians get much of their impulses from interplay situations that are unique every time. A more detailed description of these generative theories will be given in the theory chapters.

The same critique could be applied to researchers like David Hargreaves, Conrad Cork and Tina Setton's laboratory experiments (Hargreaves et al. 1991), including pre-recorded backing tracks in jazz. Playing on backing tracks is artificial for many jazz improvisers, since it does not contain any chance to influence dynamic interplay with the pre-recorded track. What I found interesting in the Hargreaves et al. study related to conceptual frameworks was the conduction of interviews with improvisers discussing

their strategies just after they had played. They found that expert players approached each improvisation with an overall strategy or action plan, but at the same time they were flexible about changing their strategy in response to the whim of the moment. In general, they were relaxed about their performances, occasionally using *licks* (pre-learned musical patterns) as part of their overall strategy. Linking strategies to improvisation and interviewing the performers in the setting is similar to my fieldwork, although the use of backing tracks is quite remote from musical negotiation with living human beings.

Musical negotiation and phrasing length has been analyzed by Andreas C. Lehmann and Stephan Goldhahn (2009) in relation to professional jazz improvisation, framing the question as "when do performers have time to think during performance?" Their research focused on written transcriptions of famous solos, which will be discussed in more depth in Chapter 5 dealing with time constraints. Interesting for this study was their focus on musical phrasing in the formal cadences of the music, the two last bars of a formal section, and the concept of using a score to compare the different phrasing lengths in these cadences.

Ole Kühl defines melodic and phrase structures as developed from gestures, and that it is the body that is the generator of meaning or schemas in this setting (Kühl, 2007). This is very close to Vijay Iyer's (2002, p. 389) reflections on the body and the gesture as a key to understanding musical meaning, structured by the body situated in its environment. Kühl (2007, p. 3) calls this embodied action a sign cascade. David Borgo and Ryoko Goguen focus on the transitional moments of this moments as chunks or phase spaces. They call these phenomenological units of experience *qualia* and see them as hierarchical according to the way they appear or transform in the moment (Borgo & Goguen, 2005, p. 4). They believe improvisation should be analyzed by chunking the musical surface into a sequence of discrete events, and defining the hierarchical meaning in these chunks. Sub-chunks of meaning might then appear in these phases for each individual musician and direct different transitions between these chunks. For example, playing over a Dm7 chord for a sustained period of time might evoke different images of continuation for different musicians within the setting.

From a neurological perspective there seems to be signs of phase spaces in how musicians' brains interact through synchronized goal-directed actions (Lindenberger, Shu-Chen L., Gruber W., & Muller, 2009). The

tendency to synchronize through collective dynamics is vital in jazz, and the ability to entrain subtle movements and behaviors with others in time is a vital part of improvised behavior. Inspired by action studies and communication, Benjamin Schögler's research addresses how two players in jazz improvisation coordinate their subjective perception of time in order to create a single musical narrative (Schögler, 1999). His main findings were that improvisation and tension building in this context is anticipatory and very much schema based. Musicians switch between goal directedness and periods of inactivity while performing duets. Goal directedness is more prominent when ideas are acknowledged by both players, enabling further development and interaction. My study resembles Schögler's study, by using duo playing based on standard tunes as a framework for research.

Stenström uses perception, decision and action as his foundation for a model on improvisation (Stenström, 2009). He employs Pressing's concept of *feedforward* to explain the internal representation of the coming actions of the co-players. The transitions between these stages are based on *closed-loop actions*, which include ongoing feedback and the amount of attention and memory capacity the improviser can handle. Stenström calls domain-specific knowledge *extended memory* and defines this long-term memory structure as an ever-present resource that guides the improvisational direction. Describing domain-specific knowledge, I have found it fruitful to include altered memory as a part of long-term memory. I describe basic, extended and altered memory structures in relation to time, structure and form—i.e. basic harmony (chord tones), extended harmony (top tones) and altered harmony (tension notes).

2.7 My approach

Illuminated by the perspectives presented, I define my research project as a phenomenological study. It is intersubjective and context bound, inspired by Sudnow, and ethnographic by using approaches developed from Berliner and Monson. Furthermore, it is cognitive by stressing expertise and the subjective way of using skills as described by Berkowitz, Pressing, Johnson-Laird and Clarke. Levels of musical interplay are developed from Rinzler, Pressing and Reinholdsson. The chunk and schemas theories are foremost

inspired by studies of chess but also by the theories of Pressing, Godøy, Clarke and Johnson-Laird.

In the theory chapters I will explain expertise first as a general phenomenon with references to the most studied field in expertise, namely chess, and then I will connect this knowledge to jazz improvisation and finally to the specifics of jazz guitar improvisation in the fieldwork. First, however, I will define a methodology that is useful for answering the research questions.

3 Methods

What methods can best illuminate how much jazz guitar improvisation is preconceived and how much emerges as it progresses? Moreover, how is it possible to investigate strategies in jazz guitar and access the knowledge that accrues from doing this, when the activity often cannot be expressed in words and consciously identified? In this chapter I discuss the methodologies and methods used for dealing with questions like these, being engaged in a practice-led inquiry.

3.1 A practice-led inquiry

A practice-led inquiry involves a hands-on as well as minds-on approach for understanding the phenomena in question (Gray & Malins, 2004, Haseman 2006, Smith & Dean 2009). In this project the research questions have been challenged by reflecting in-action, in this case improvising with professional jazz guitarists, and reflecting on-action, discussing this playing practice in words with the jazz guitarists. Three main concerns have pervaded the methodological approach:

1. Using practice as a method and not only as an object for study.
2. Acknowledging that jazz guitar improvisation is inter-subjective, context bound and subjective.
3. Using different approaches to frame, analyze and reflect upon this practice.

Reflecting on methods in a larger philosophical context, and the practical applications of the different methods, I found it helpful to distinguish between two main parts in this chapter:

1. *Methodologies* as discourse about methods on a meta-level, dealing with paradigms, approaches and strategies.
2. *Methods for generating data*, which deals with the empirical material and the ways methods have been used in pilot study and fieldworks.

3.1 Methodologies

3.1.1 Research paradigms

Denzin and Lincoln (2005) define research *paradigms* as a basic set of beliefs that guide our actions as researchers. Within this understanding, paradigms are human constructions; no one can fully comprehend all the variables found in reasoning. The positive in acknowledging this is the respect for diversity; the negative may be that all knowledge becomes relative. Reflecting critically on methodical approaches from such a relativistic or post-modern perspective, John Law states that "we need new philosophies, new disciplines of research. We need to understand that our methods are always more or less unruly assemblages" (Law, 2004, p. 11). Reflecting such a perspective, there has in the last decades been a growing debate among researchers on whether traditional ways of conducting research, represented by quantitative (number orientated) or qualitative (word oriented) methods, are the most functional for the arts (Smith & Dean, 2009).

David Morgan (2007) claims that by calling a research paradigm an "approach" or a method "quantitative" or "qualitative" is overly reductionist and easily leads to undue generalization about the research process. He agrees that scientific principles like *deduction* (moving from theory to data, emphasizing a quantitative approach) or *induction* (gaining an understanding of the meanings humans attach to different events via a qualitative approach) are important. They are, however, too simple to capture real world processes. Morgan writes:

> Try to imagine acting in the real world for as long as 5 minutes while operating in a strictly theory driven, deductive mode or a data-driven, inductive mode – I certainly would not want to be on the same road as anyone who had such a fatally limited approach to driving a vehicle. (Morgan, 2007, p.71)

As a jazz guitarist I also switch between different modes when improvising, sometimes using theoretical ideas with exact deliberation, and sometimes relying on intuitive flow provided by others in the particular context. The main point is the same as with Morgan's example of driving; one has to be alert and use the approach most practical in the situation. As researchers we move back and forth between positions. Findings can be classified as quantitative or qualitative, but in the research process paradigms nest within each other, using approaches related to the need of the situation. Below I will describe the ways paradigms are nested within this practice-led inquiry.

Quantitative and qualitative research

According to John W. Creswell and Plano Clark (2007), quantitative research often starts with a problem statement, moving on to hypothesis, through the instrumentation, before discussing data collection, population and finally data analysis. Deductive scientific principles are frequently used, moving from theory to data, explaining causal relationships between variables in the form of numbers. Testing *hypotheses* as proposed explanations for further investigation involves measuring and quantifying phenomena, counting them in frequency, distribution, cause and effect. Structured protocols define the premise or condition on which a logical argument is based and the ways in which a hypothesis can be proved (Haseman 2006). Such research often aims for an objective perspective, collecting (large) samples of sufficient size in order to generalize conclusions.

In this project I use a quantitative approach when doing *content analysis* of musical material, establishing categories and systematic links between inside (consonance) and outside (dissonant) structures in the guitarists' solos. This also includes counting the number of instances when those structures are used, in addition to counting the number of up-beat versus downbeat placement in phrasing, classifying the length of phrasing in short, medium and long phrases, favored pitches, range of solo, etc. However, the aim is not to formulate general laws but to define richness and the

unique approach of each individual guitarist, thus making the research aim qualitative.

Denzin and Lincoln write, "Qualitative research is a situated activity that locates the observer in the world. It consists of a set of interpretative, material practices that make the world visible" (Denzin & Lincoln, 2005, p. 3). A *situated activity* is constrained by context, meaning that the researcher needs to be aware of and relate to the context in which the knowledge is situated. As such, situated cognition, constrained by possibilities given within a situation, shares many principles with anthropology (Lave & Wenger, 1991), ecological psychology (Huron, 2006) and embodied cognition (Iyer, 2002) stressing identity formation through interactions with others.

Within a constructivist perspective, situated cognition is described as individual subjective experiences in an environment. In a more social-constructivist approach the individual perspective is replaced with a focus on group and communities of practice (Lave & Wenger, 1991) where areas of expertise are transformed by individuals and groups in a process of assimilation. Reflecting such a perspective Lage Lund states in my fieldwork, "Even though it is technically my solo, they're as much a part of it as I am." Within a qualitative approach, constructivists and socio-constructivists would probably propose different perspectives to explain such a phenomenon, but I believe this is more a sliding scale that emphasizes different points of the same practice. Lund is an individual who reflects from his own perspective as a jazz guitarist, but at the same time acknowledges that the other players in the band influence his decisions.

Toward a more pragmatic research

Parts of social cultural knowledge is implicit, and a major task using a practice-led approach is choosing methods that make implicit dimensions explicit for the reader. Faced with a choice between approaches such as deduction, objectivity and generality in quantitative research, or induction, subjectivity and context in a qualitative approach, has made researchers turn to a middle ground alternative. David L. Morgan (2007) defines this middle ground alternative as a third paradigm and calls it *pragmatic research*, inspired by American pragmatism. The seemingly deterministic ways of positivism and the interpretivism found in qualitative approaches are in pragmatic research balanced by a focus on actual behavior, or *lines of action* (William James and George Herbert Mead); the belief that supports

such actions, or *warranted assertions* (John Dewey); and the consequences that are likely to follow from different types of action, or *workability* (James and Dewey).

Haseman (2006, p. 103) defines research inspired by the pragmatic approach as *performative,* originating from John L. Austin's speech act theory, insisting on action-based approaches to designing, conducting and reporting research. I will use the notion performative as I find this concept more in line with the entire process of practice-led research, focusing on *doing-showing* (Schechner, 2006, p. 28) as an important part of the research process itself. Haseman describes practice-led research as a research strategy within performative research; this will also be my approach.

Performative research

Performative research is aligned with many of the values characterizing qualitative research, like a relativist ontology in the form of multiple constructed realities, interpretive epistemologies where the knower and the known interact, shape and interpret each other (Haseman, 2006, p.104). This becomes very clear in the process of practice. Practice as a method, and not purely as an object of study, changes the way research is conducted.

In a traditional quantitative or qualitative design the research question is often fronted in the beginning of the process, with defined aims and objectives. This might also be the case in a practice-led inquiry, but when playing the guitar I have often found that the coordinated and synchronous activity that attempts to construct and maintain a shared conception of a given problem has its own direction. Playing either solves what was actually the initial problem, or the problem quite frequently appears in another shape. This makes the research messier; I have to negotiate two forces at the same time, the intellectual dealing with subjective meaning or objective truth, and the reality that I observe from my embodied practice. Using such an *abductive* reasoning that moves back between induction and deduction, converting observations from playing into relevant theories and then assessing those theories through action, is typical for pragmatic research (Morgan, 2007).

Moving back and forth between various points of reference, stressing *intersubjectivity* (communication and shared meaning) in a practical context is essential in improvisation. Real-life situations move the research away

from the more abstract claims of truth and toward the representational – the thing observed (Schechner, 2006). As an improviser I accept the real world, including the musicians I play with and the constraints within that situation, at the same time as I accept that all of us who improvise together have different subjective interpretations of that real world.

The amount of knowledge transferable to other situations will depend on the factors affected by the transfer (similarity, kind of learning and how it is learned). In a pragmatic approach the dualism between situated qualitative research and generalized and universal quantitative research is solved by a focus on this *transferability* (Morgan, 2007). According to a pragmatic view, qualitative and quantitative researchers need to cooperate and ask themselves when a narrow or broad context is needed and when a narrow or broad skill is needed; this involves facing the problem from different angles. Lisa D. Pearce states, "In reality, it is unlikely that a study in one specific setting has no applicability beyond that setting, nor can one study be generalized to every possible historical or cultural setting" (Pearce, 2012, p. 833).

Multi-method led by practice

Even though it is possible to say that a paradigm is quantitative (number orientated), qualitative (words orientated) or performative (action orientated) in its research outcomes, it is very rare that all the methods used in a research project are purely within one paradigm. According to Denzin and Lincoln (2005), many researchers apply *mixed-methods* approaches, depending on the topic at hand. This means that surveys, questionnaires and experimental (quantitative) design can still fall under a qualitative or performative paradigm. While a mixed-method strategy combines different methods (procedures) belonging to several paradigms, the *multi-method* approach is sequential, using a method at a time belonging to a certain paradigm. Multi-method research is an umbrella term that includes mixed-method research (Pearce, 2012).

I use a mixed-method approach that is at its core a qualitatively study, (interview, subjective perspectives, constructed within specific contexts which have specific situational affordances) and I combine these with quantitative data/methods added to supplement and improve the qualitative study, using content analysis of a modal matrix to quantify the frequency of different parameters within the matrix. The performative dimension of my

qualitative multi-method approach is that the inquiry is initiated and led by practice, promoting an experiential understanding as well as a formal explanation.

I combine enquiry found in the traditional PhDs (metrics, statistics, etc.) that stress outcomes that include benefits for the discipline, industry, public good, etc. with outcomes that deal with self-development, personal discovery and learning, as found in professional practice investigated in a naturalistic, reflective inquiry. Using abduction, intersubjectivity and transferability in the research process, and mixing different methods, also has an impact on the research outcome.

Documentation

As a researcher in this project, I improvise together with my interlocutors, and I reflect in order to translate the musical experience to another language, a language to give words to the musical experience. In this process I experience music both from the inside as a performer and outside as a researcher. By giving the music a new language in words, the (auditive) language of music is no longer immediately present, and I reflect on and relate to it as something that was. This transformation process is done with the sole purpose of making improvisation and communication between musicians more understandable for others. What is lost in this process?

Not everything can be conveyed using language; using words to describe the music will never be the same as listening to the described music. Language itself might be a constraint in making phenomena more understandable for others. Language becomes the only channel of understanding between the readers of the text and me; language itself may present another gap between the phenomena as experienced and as told. Musical experiences can be to ineffable to be exactly matched by words. Such distance may occur in many parts of the process—between the guitarists' improvisation in the live situation and the descriptive observations, between the descriptive observations I see, to how I interpret what I see in their actions, and/or to what I define in my text related to what others read in my text. These are challenges that have been important for my choice of methodology, by documenting the process with video, notation and words, and in this way bringing the reader closer to the lived experience of jazz guitar improvisation.

The problem of *representation* (Denzin & Lincoln, 2005) and the frustration that research outputs and claims must be documented in the form of words or numbers and not through the forms of their own art practice, as music, dance, moving images, etc., have led several researchers to insist on using presentational symbols in the language of their discipline to document at least parts of their research outcomes. *Presentational symbols* is a form of symbolism described by Susanne Langer (1957) as integral forms of expression and understanding that manifest themselves usually simultaneously—in images, music, dance, multi-media, live performances, etc. Langer contrasts this presentational symbolic language with the practice of linear *discursive* symbols (quantitative, numbers) and qualitative (words) approaches.

According to Haseman (2006, p. 103) symbolic data, i.e. music, as sound does not need any discursive symbols (words, numbers) to convey meaning; music works performatively and expresses itself. It is the listeners that use words to attach a specific quality to the music. Ingrid Monson writes,

> While I don't particularly like the fact that language has suggested itself as the general model of relationality, the metaphors of discourse and writing seem to be here to stay. We need to remember that they are metaphors placing language at the center of the universe and may or may not be fully applicable to non-linguistic phenomena such as music. (Monson, 1996, p. 209)

Many of the musical phenomena heard in a jazz performance, such as tone color, dynamics, rhythmic coordination and intensity, are not easy to describe in words or to notate using traditional musical notation. But they are definitely a part of the expressive language that we identify as music and that make us react. My way of investigating the non-linguistic phenomena of music needed to be connected to performing it, and the interlocutors and my own participation has been the natural hub for the work to circle around. I have been engaged in an interpretative discovery process that can be called dialogic, asking purposeful questions: trusting my own intuition in the exploration of the field, documenting it with video from fieldworks engaging in creating music with other musicians, doing the actions.

Recognizing the multimodality of human behavior and to address non-linguistic phenomena, several researchers engage in interdisciplinary work to find the essence of how humans act or perform. Performance studies are established as a discipline at several universities, often replacing what were

earlier called music, theatre and dance studies (Elkins, 2009). Denzin and Lincoln applaud this performative turn in research. By looking at research in an embodied way, as perceptually guided action, exploring the environments with body and senses, researchers can learn to correlate multisensory input with own bodily experience. Reflecting from the inside out has, according to Denzin and Lincoln, "[. . .] reshaped entirely the debates around 'appropriate' scientific discourse, the technical and rhetorical conventions of scientific writing and the meaning of research itself" (2003, p. 7).

Below I present a table with a combination of perspectives found in Morgan (2007) and Haseman's (2006) conceptualizations of pragmatic and performative research and its role in the larger research community. Important to notice, Table 3.1 shows the major paradigms in a simplified way.

Paradigms	Quantitative research	Performative research	Qualitative research
Approaches	Deduction Objectivity Generality	Abduction Intersubjectivity Transferability	Induction Subjectivity Context
Methods	Scientific method	Multi-method led by practice	Multi-method
Representation	Numbers, graphs, formulas	Material forms of practice; includes music, dance, still and moving images, live action	Words

Table 3.1 Paradigms, approaches, methods and representation. The table shows contents found within the different paradigms. Placing the performative in the middle defines its pragmatic position as something between the dichotomies of quantitative and qualitative research. Simply stated, quantitative research registers that something happens, performative research shows how it happens, and qualitative research explains why it happens.

3.2 Research strategies

To identify performative research as a third research paradigm, one has to identify the type of skills, assumptions, and practices the researcher employs when moving from paradigm to the empirical world (Denzin & Lincoln, 2005). A research strategy is a procedure for analyzing data. Choice of research strategy depends upon the questions asked, and the questions or

challenges depend on the specific context, what is available in the context, and what is possible to do in the setting.

To answer the research questions—What strategies are used in professional jazz guitar improvisation? What is implicit and explicit in these strategies?—I needed to conduct research which aligns with a performative paradigm. As already discussed a practice-led approach within a performative paradigm is initiated in practice; it is carried out through practice and employs methods familiar to the practitioners in the field. Deciding on strategies like naturalistic observation, being engaged as a participant observer necessitated interlocutors who were active both as professional jazz guitar players and as teachers, since I was going to approach them as a learner taking lessons.

Inspired by Paul Berliner and Ingrid Monson`s fieldwork in New York City I was eager to immerse myself in a living musical culture, approaching the interlocutors from different angles: how they communicated with the audience, how their playing style was influenced by context, observing them in different band constellations and performing situations. To obtain this I needed to stay for a longer period in a professional jazz environment, and this involved moving to New York City for a year to find the best context and interlocutors for the fieldwork. I became immersed in a society of practitioners in the evening and was engaged academically as a visiting scholar at Columbia University during the day. This move represents the ethnographic aspects of the study and methodology.

3.2.1 Ethnography

Ethnography research is designed to explore various cultural phenomena and the system of meanings in the lives of a cultural group according to Creswell and Clark (2007). In *ethnomusicology* the importance of the body and the study of the practice itself have long been suggested as a way to find meaning. Alan P. Merriam's (1964) model of understanding music at three levels reflects this view: as musical sound itself, as behavior in relation to music and as concepts used in music. Musical research is considered a situated activity that locates the observer together with the observed in a natural setting. It consists of a set of interpretive, material practices that make the research visible. Interpretation of phenomena happens in and depends on the context in which it is undertaken (Blacking, 1973). At the core

of this thinking is the idea that perception is an active process where the body, the mind and the environment are in constant interaction.

From an ethnographic and musician's point of view, a strong link to practice is normally preferred, experiencing the totality of musicianship in direct meetings with the musicians and the music being performed. Berliner's ethnographic approach reflects this view: "It is still largely the case, as it was when I began this work, that if one wants to learn the intricacies of jazz improvisation, one must learn them directly from musicians" (Berliner, 1994, p. 5).

Reflecting Berliner's perspective, one has to be aware of how people improvise in the real world, including how improvisers bring together event and context in unexpected yet entirely logical ways. New situations are created based on immediacy of human interaction, between musician and audience, between the players who generate the action, and the interaction between the musical material and each individual way of interpreting this material. Learning these skills directly from musicians includes being prepared to engage in the setting where all this knowledge actually operates.

In his essay collection on critical practices in jazz, editor and writer Ajay Heble (2000) suggests that researchers must actively engage with this musician-based knowledge. Creating meeting points outside the institutions in order to reflect on the knowledge helps both academia and the artists, according to Heble. He writes, "the separation between high theoretical discourse and 'low' entertainment highlights a political stratification built not only on racial and professional lines of exclusion but also on less visible inability to imagine the common circumstances they share" (2000, p. 17).

As a visiting scholar and musician I sometimes found it hard to define my exact role in approaching the musicians. Denzin and Lincoln (2005) use the term "jazz musician," and Howard Becker (1998) uses the term "bricoleur" to describe the performative researcher, deploying whatever strategies, methods and types of empirical materials are at hand. I was both a jazz musician and bricoleur in this fieldwork in New York City, improvising solutions to many of the practical challenges that occurred in the process. If I needed new approaches or techniques, I had to invent them according to situation at hand. There seemed to be no models, since as far as I know nobody before me has done this type of fieldwork with professional jazz

guitarists. The role as participant observer, however, is a well-known aspect of ethnographic work.

Participant observer

Defining a subjective departure point for research not only as an observer of the actions of others but as a participant doing the actions oneself, has resulted in new ways of looking at research. Choosing a role as a participant observer is an important performative aspect of my research design. I gain knowledge by using my jazz guitar skills in interaction with my interlocutors. Richard Schechner is one of the leading figures in the performance studies originating in the US in the 1960s, and he defined four core strategies in being an observer within such a context:

> 1. Behavior as the 'object of study.' 2. A focus on the relationship between studying and doing performance. 3. Studying parts of own culture or aspects of own behavior. 4. No approach or position is 'neutral' in performance studies. (Schechner, 2006, pp. 1–2)

He stresses the challenge to become as aware as possible of one's own stance. It is a shift from something that "is" to something that "allows us to do." The notion of a lead sheet as something more than a piece of musical notation is a good example of a performative turn; the signs on the paper allows one to act and react musically. In my own playing when looking at the chord symbols I imagine the harmonies both as sound and action. When I look at the melody, my mouth engages in silent humming. When imagining the guitar fret board, my fingers engage in movements corresponding to the actual hand movements. My feet are moving as a part of making a definition of time. Most fascinating of all is the body-mind's ability to integrate all these multisensory subjective experiences into a natural whole in fractions of a second during improvisation.

Focusing on individual experience, including oneself in the study and breaking down the traditional I versus them relationship in ethnographic research is also described as *insider* or *auto ethnography* (Denzin & Lincoln, 2005). The insider ethnographer recognizes the field as collaboration between researcher and participant; by focusing on these meetings over time it enables an "us" instead of "I versus them." Using words like *interlocutor* instead of informant about the guitarists' role in the current study stresses the importance of this dialogical relationship.

In this study, the aim has been to use all the experience from all the participants in the study, including myself, to "grasp the very nature of the thing" (Van Manen, 1990, p. 177). Using information from different perspectives greatly helps a project's trustworthiness or credibility. In this project this will be reflected by highlighting phases of process, change and stability by transcribing the essentials of what my interlocutors say and do as documented by videotapes. Video allows for detailed analysis of behavior and reduces reliance on a fragile personal memory. Subjective observation reports from only one person can be problematic because only one perspective is foregrounded, and in worst case only reflects narcissism. Video can help to clarify the meaning of the observer's point of view and the points of view of those observed.

Subjective experience is central in phenomenology, and because it respects diversity in opinions and emphasizes subjective discovery more than an objective truth, this is a chosen research approach in this project.

3.2.2 Phenomenology

Inspired by the philosophical school of phenomenology, the focus of this inquiry is searching for subjective knowledge as a learner. In brief, phenomenology as a philosophical movement or school began around the turn of the twentieth century with the works of the philosopher Edmund Husserl, though it is based on ideas presented much earlier, most notably with Immanuel Kant's (1724–1804) distinction between objects as interpreted by human beings (phenomena) and objects as things in themselves (noumena) that people cannot directly experience. Franz Brentano's (1838–1917) ideas about *intentionality*—the relationship between mental acts and the external world and especially as related to consciousness of time—are important in this research project. Husserl's ideas were developed in a hermeneutic direction by his student Martin Heidegger in Germany, and in an embodied and existential direction by, among others, Maurice Merleau-Ponty in France.

Lived experience

The notion of lived experience in phenomenology is not about explaining a general structure of how the world is, as detached from people's individual experiences. The intent is to explore directly the pre-reflective dimensions

of human existence. Hans-Georg Gadamer states, "what is experienced is always what one has experienced oneself" (1975, p. 55). He relates this to an experience with a lasting impression and meaning based on being completely present in the situation. It is a direct description of our experience as it is. Gadamer wrote: "The ultimate unit of consciousness is not named 'sensation' . . . but experience. The unit of experience represents the true unit of what is given" (1975, p. 59).

As a teacher and performing jazz guitarist, my own methods for understanding jazz guitar improvisation have not been linear and straightforward. I have gathered information from different sources and by various methods, depending on how and where I was in my own understanding of jazz guitar. Being engaged as a jazz guitar player, doing actions in a professional and semi-professional community has been a critical standard to which my methods have been regarded as successful or not. The reflection would have been different without the personal experience of being present in these jazz guitar situations.

Lived experience is a combination of what we see and a way of remembering what we see based on memory, image and meaning, according to Creswell (2007, p. 236). This also means that lived experience is subjective and can never be grasped in an immediate objective manifestation. We frame situations with a beginning, middle and an end in time, focusing on the *essence* that makes each experience different from other experiences, including perceptions, actions, thoughts, sense of time, memory and attention. All of these will be important in this study.

Taking lessons from a professional jazz guitarist points to something outside itself; it is being conscious or intentional about something; it has a quality, sometimes referred to as *aboutness*. It is about jazz guitar, improvisation, finger patterns, playing together, conversing together. It is also about more remote things like taking the subway to the guitarists' home, getting delayed and being affected by the delay. From a phenomenological point of view, all these single aspects converge in the now and should be addressed if they are important for the experience.

"Thinking Body"

A phenomenological approach to subjective consciousness is not restricted to the realm of the mental as traditionally understood; instead, the

phenomenological notion of embodied experience offers an alternative to mind-body dualism. According to Merleau-Ponty (1962) we *are* our bodies and not only our thoughts; we perceive with our whole body and reflections are a result of something embodied. The body operates on its own, making connections and purposeful actions not conscious to the mind. Jeannerod (2006) among others claims that the body prepares for action about 300–400 milliseconds before we become conscious of it.

Computer technology allows for increasingly more precise measurement of body movement, yielding concepts like the thinking body. The question then becomes, what is a thinking body? How can we study something that the mind is not conscious of? How do we get hold of the *tacit* or more precisely unarticulated dimension? In research this has resulted in a myriad of research strategies, embodied cognition, the performative turn, research on practice, practice-led research, and studio research. In Chapter 5 I will return to embodiment and consciousness of time in improvisation.

Phenomenology embraces not only the achievements and correlates of constituting subjectivity, but also those of intersubjectivity, that is, of the "we" rather than only the "I." A phenomenological study allows for examining the individual in a context and how others influence her or him. This suits my project, focusing on how to construct individual meaning as an improviser in musical meetings with other improvisers. Aiming to illuminate the professional jazz guitarists' knowledge and ideas in interviews and interplay, I sometimes had to put aside my own understanding. For example, I had to put aside concepts that I was familiar with as a researcher and use other words to communicate meaning with my interlocutors, for example using musician-based concepts like patterns or groupings instead of a psychological term like chunking. I did not set my knowledge of psychology aside, which involves *bracketing*, as based on Husserl's concept *epoch*e. I just redefined my conceptual language on certain issues to establish a common ground for understanding.

Transparency

By outlining my experiential knowledge ahead of the fieldwork I defined my pre-understanding and how to conduct the fieldwork design. Defining background and abilities both as a practitioner and researcher are, according to Pierre Bourdieu, not meant to stimulate to narcissism and

make oneself interesting but rather make one's position transparent (Bourdieu, 1977).

As a researcher, explicitly defining one's experiential knowledge helps the reader to understand arguments as reasonable, reliable and probable. Peter Reason uses the term *critical subjectivity* to define this process: " . . . a quality of awareness in which we do not suppress our primary experience; nor do we allow ourselves to be swept away and overwhelmed by it; rather we raise it to consciousness and use it as part of the inquiry process" (1988, p. 12). The prospect of studying one's own practice can be challenging. Making a position transparent includes a potential for destroying the spell or intuitive aspects of own performance. In this project I found the process of carefully managing the dual roles as performer and researcher rewarding. Approaching professional guitarists and having their opinion about my playing and then afterwards introspectively reflecting on their comments has given me insights which would have been impossible without this participant observer activity.

The *reflective practitioner* is an approach closely associated with an embodied approach, dealing with reflections-in-action and reflections-on-action. As with ethnography and phenomenology this approach focus on illuminating the implicit or tacit dimension of human behavior, explaining how reflections can be used in a systematic inquiry.

3.2.3 The reflective practitioner

The reflective practitioner sees instability and conflicts of values as natural ingredients in many situations. Every individual is unique and every situation can be solved in many different ways. Donald Schon, who introduced the reflective practitioner as a concept in 1974, is especially concerned about our "know-how" in action and how we think when we act (Schön, 1983). How do we communicate with the situation? This involves a continual discussion related to the know-how we had before we entered the situation.

A good example of such a practice is Paul Berliner's accounts of how he as an ethnomusicologist becomes involved in *doing* the actions prescribed by his interlocutors, moving beyond the role of interpreter of other actions to experience the action himself as a doer; he becomes a reflective practitioner.

Berliner states that taking lessons allowed him to observe how different players evaluated his performance and the ways in which they helped and encouraged his progress as a trumpeter (Berliner, 1994).

Asking questions to the interlocutors, I sometimes found the guitarists hesitating when being confronted with a challenging question. It seemed as if the implications of my questions made them reflect through an inner dialogue imagining a situation, and then try to think about how they were going to act. This sometimes resulted in overt self-talk, and I found them talking even more as the situation grew more difficult. The words coming from their mouths were more tentative and consisting of pauses, for example I asked Lage Lund about how he imagined patterns on the instrument:

> Stein: How much do you visualize? Lage: Uhmm . . . I don't . . . I don't know . . . I think it's sort of automatic . . . I don't really see shapes too much anymore . . . like . . . I mean . . . I know a bunch of different shapes (playing them on the guitar) but I think what I'm trying to do . . . is to say that if you have F minor . . . instead of saying like . . . okay . . . F minor is that [plays a minor shape on the bottom strings] or F minor is this [playing the same shape on another set of strings an octave higher].

On the video he is first looking at me, but when he starts to talk his eyes move toward the guitar neck as he continues to use his mouth to formulate the problem. It seems like he imagines how the sound should be when he is talking. Then he touches the instrument as to make the words more concrete by listening to the sound of what he tries to formulate in words. Finally, he uses a chord shape to define accurately what the pattern can look like in different registers of the guitar. It is like he responds to his own talk, by visualizing patterns and then applying them on the fret board. He sees it and hears it, and in this way he is able to facilitate a connection to the problem at hand.

I find this forward and backward connection to be a challenge in my own practice. As I approach a problem on the instrument, I have to do the movements of the intended actions at the same time as I think. The body movements and the ongoing reflection cannot do without the other. I am testing my way forward in different ways, speaking in the situation and hopefully in this conversation the situation "speaks back." Schon refers to knowing in action as "online anticipation and adjustment" and defines situations like this as a "continuous detection and correction of error."

> Usually reflecting on knowing-in-action goes together with reflection on the stuff in hand. There is some puzzling, or troubling, or interesting phenomenon with which the individual is trying to deal. As he tries to make sense of it, he also reflects on the understandings, which have been implicit in his action, understandings which he surfaces, criticizes, restructures and embodies in further action. It is this entire process of reflection-in-action which is central to the "art" by which practitioners sometimes deal well with situations of uncertainty, instability, uniqueness, and value conflict. (Schön, 1983, p. 50)

Reflections can be seen as careful consideration of personal actions, including the ability to review, analyze, and evaluate situations during or after events. An important part of improvisation is the ability to have several possible solutions at hand when confronted with musical stimuli. Schon calls this a *double vision* which involves "the capacity to keep alive, in the midst of action, a multiplicity of views of the situation" (1983, p. 281). This is a key feature involved in template formation and skilled behavior which I will elaborate on theoretically in Chapter 4. Double vision is possible because we have developed a feeling for a situation and assimilated the requirements needed (repertoire, collection of images and examples) for action.

In my project the concept of reflecting-on-action enabled me to spend time exploring why we played as we did. It enabled me to develop sets of questions and ideas about what was happening after we had played, devoting much time to only one aspect at a time, with complete attention to fully understanding, exploring and improving that area alone. While reflecting-on-action is linked to practise, reflecting-in-action is linked to performance, for example improvising using intuition without a specific restriction or objective when playing under severe time constraints.

Schon thinks that professionals rely much more on their tacit knowledge in performance than on explicitly defined formulas derived from practise. Schon refers to the famous story of the centipede paralyzed by the attempt to explain how he moves as one among several stories that make us understand that the action component is a fragile one when combined with thinking in action. As improvisers we rely on our intuitive, implicit knowledge as a bank of competency "knowing-in-action," exploring a phenomenon and trying a solution in the same act. The reflective practitioner acknowledges the dialectic process between individual and collective experience in this exploration process, realizing own ideas, and at the same time acknowledges others' experience of the same situation.

My perspective

Having described some of the characteristics of ethnography, phenomenology and the reflective practitioner, I will now define the use of each of them in this project. As mentioned earlier, interpretation of phenomena happens in and depends on the various contexts in which it is undertaken (Blacking, 1973). Hanging out in jazz clubs, listening to the musicians in a public sphere where interactions can be observed has been part of my fieldwork. Through immersion in the setting, I have strived to gain a closer look and to incorporate additional perspectives of my interlocutors. This has included meeting the musicians over a year in clubs, taking lessons, documenting the lessons via video recordings, discussing shared beliefs and aspects of behavior. This is all typical ethnographic research.

However, my approach goes in a phenomenological direction when it focuses on created reality, the domain of private constructions and interpretations where behaviors and actions are only a starting point to explore personal experiences and meanings (Bresler, 1995). A cultural study of jazz guitarists living in New York is not my research focus; it is what they allow me to do when we interact. As such, this is a phenomenological and performative approach, situating myself in a complex setting and reflecting on how it makes me act.

The reflective practitioner is an approach that I use when asking myself, What am I doing? What can I do to achieve my goal? The reflective practitioner is recursive and reflexive; as a researcher in this project I have repeatedly examined and re-examined how changes in my actions have changed situations. I have found myself planning, taking action, observing and reflecting to make sense of what is happening in my research. As a reflective practitioner I may be seen as a hybrid between an ethnographer and a phenomenologist. I am a part of a cultural practice in jazz guitar playing and try to understand this practice, at the same time as I am inquiring into my own subjective beliefs about the implications of this cultural practice.

My mixed-methods approach is shown by combining ethnographic material collection approaches within site (semi-structured interview, field notes, participant observer, video filming) with phenomenological approaches (subjective experiences and actions independent of cultural interpretation)

to allow for maximum focus on jazz improvisation as a phenomenon. Transcribed interviews, transcribed music, field notes and video annotation are mixed with content analysis and theory to supply the practice-led approach cross-site. All together this makes a rather complicated conceptual framework, but so too is reality. Identifying the different approaches in a multi-method makes Law's definition of the postmodern world true when he states that "We need to understand that our methods are always more or less unruly assemblages" (Law, 2004, p. 11). In Table 3.2 I have shown some of these "unruly assemblages" found within this practice-led project.

	Practice-led strategy		
Approaches	**Ethnography**	**Phenomenology**	**The reflective practitioner**
	Participant observer Situated Real world Natural inquiry Culture Group processes Etic-emic Insider ethnography Thick descriptions	Lived experience Intentionality Embodiment Transparency Context free Individual processes We Shared experience Essence	Know-how Tacit dimension Reflection-on-action Reflection-in-action Double vision
Similarities	Descriptions, open-ended interviews (reflections), reflective-logs, subjective reflections, oriented toward implicit (tacit) knowledge.		

Table 3.2 Practice-led strategies. Showing some of the influences in practice-led research. The suitability of each approach depends on time and context.

The research design

Choosing a research design is essential in making the transition from paradigms and strategies to a real-life context addressing how I as a researcher and practitioner will formulate and implement a practice-led research design. As Denzin and Lincoln state,

> A research design describes a flexible set of guidelines that connect theoretical paradigms, first, to strategies of inquiry and, second, to methods for collecting empirical material. A research design situates researchers in the empirical world and connects them to specific sites, people, groups, institutions, and bodies of relevant interpretative material, including documents and archives. A research design also specifies how the investigator will address the two critical issues of representation and legitimation (Denzin & Lincoln, 2005, p. 14).

Below I define some of the aspects that make my research design consistent with a practice-led approach, stressing subjectivity, involvement and a pragmatic approach.

1. Choosing a practice-led design and a participant observer strategy, I have focused on the reality that is created together with the interlocutors instead of having a presumed objective perspective.
2. I have used myself in many phases of the inquiry, including data collection and analysis.
3. I have relied on abductive approaches in fieldwork, switching between inductive and deductive approaches, depending on the situation at hand and the phenomena to be explained.

3.3 Methods for generating empirical material

Documentation of practice-led research strategies, emphasize the ongoing reflection between practice, theory and research context. Data collection happens as a co-effort between participants and the researcher, and may include many types of data that are open for interpretation (Gray & Malins, 2004). In this project data refer to audio-visual recordings of practice, interviews, transcriptions and reflective logs.

The methods for collecting data have been through practice, pilot- and fieldwork. Collecting begins by determining my knowledge of the material ahead of the pilot- and fieldwork, and then engaging in pilot- and fieldwork to know more about the topic at hand. The research processes are illuminated by interviews, observations, and reflections including video annotations and musical transcriptions of what is found. All the participants in the pilot and field studies agreed to participate in the project and signed a written agreement, which included information about the study's aim and objectives. All bibliographical information has been approved by the guitarists. Before conducting the studies, all information had been approved by NSD, the Norwegian Social Science Data Services (Norsk Samfunnsvitenskaplig Datateneste).

The study contains four main components: two pilot studies and two fieldworks.

1. Pilot study 1: practising alone and performing alone in a solo concert.
2. Pilot study 2: rehearsal with a quartet and performing the same repertoire as in pilot study 1 but with the quartet.
3. Fieldwork 1: taking jazz guitar lessons with professional jazz guitarists in New York to learn more about strategies in jazz guitar improvisation.
4. Fieldwork 2: doing a follow-up fieldwork with the same guitarists with specific questions related to analysis of interviews and music done in fieldwork 1.

3.3.1 Pilot studies

Pilot study 1

I started this project by reflecting on what sort of knowledge is contained in jazz guitar improvisation and on what happens with this knowledge, in several steps from practising alone to performing with others. The first step of the pilot study was with a set of introspective reflections illuminating jazz guitar competency. Here I focused on individual knowledge contained in playing over standard tunes progressions, highlighting typical chord-patterns and the related scales and chord tones derived from the chord progression. In this first step I was focusing on explicit (verbalized) knowledge, explaining my way of thinking, as conducting an instruction video on jazz guitar.

In the next step I did a whole concert with only guitar and reflected ahead – during and after the solo concert – in the form of a reflective log. I conducted a (church) concert in the fall of 2009 with a program of eleven original compositions, including some of the chord progressions highlighted in the instruction video. The preparations also contained musical preparation like making simplifications of the melodic material in the form of stemless notes with mono-rhythm, identifying the pitches and simplifications of the chord progression in the form of road maps, pinpointing the most common chord connections, etc.

Pilot study 2

As a third step the solo material with original compositions was rehearsed and performed with a jazz quartet. The aim was to see how the material transformed during the process of rehearsal and concert with a quartet. I had, on several prior occasions, performed with the pianist, Erlend Slettevoll, and the bassist, Audun Ellingsen, but the drummer, Erik Nylander, was a new acquaintance. The players are all professional jazz players with extended experience both nationally and internationally. The rehearsal ahead of our concert was videotaped, along with the concert and interview following right after the concert. The interview focused on reflections over what happened in rehearsal and in the concert, highlighting musical communication and the subjective perspective of each player.

Using stimulated recall, the players observed the concert video the next day and made annotations on a timeline to pinpoint what they found interesting; no clues were given. The stimulated (video) recall session illuminated a more nuanced and positive perspective than the one given immediately after the concert the day before, possibly indicating a less self-critical attitude when energy and time had elapsed after the concert.

The pilot studies allowed me to pose questions in an interview setting and reflect experientially, and to have peers' perspectives on practise and performance. However, even though I had gained valuable information, my topic was to investigate professional jazz guitar. I needed interlocutors who could communicate this information in an informal way, while still being in a setting that was natural. Taking lessons from professional jazz guitarist who could afford different perspectives on these issues and be on a very advanced level was my aim. As such, I found New York to be a good choice. Moving to New York for a year and being engaged as a participant observer by taking lessons with professional jazz guitar players underscores the study's ethnographic approach. Table 3.3 shows the phases of these studies.

Pilot studies in 2009

Instruction video	Solo rehearsal/ concert	Quartet rehearsal/ concert	Interview	Stimulated recall	Semi-structured interview
Explicit knowledge on some standard tune progressions	a) Using some of the harmonic content from instruction video in modern and original compositions; b) Reflecting ahead/under and after concert; c) Video stimulated recall	Using solo concert material in quartet	Immediately after concert	Next day, watching video of concert	Conducting semi-structured interview based on notations done when watching video

Table 3.3 Phases of pilot studies. Showing the phases of pilot studies illuminating aspects of transformance when material is practised, performed and reflected upon in different settings.

The interviews in the pilot studies were conducted at an early stage of this PhD project, and were not specifically directed toward strategies in jazz guitar and the related, more specific research questions. As they do not provide relevant findings for this thesis, they will not be further discussed.

3.3.2 Fieldworks

The participants

Five professional jazz guitarists participated in the project. All of the guitarists are internationally known performers with extensive experience in both teaching and performing. Presented in the order of how I approached them in fieldwork, the guitarists were Lage Lund, Jack Wilkins, Ben Monder, Rez Abbasi and Adam Rogers. The guitarist selection was not random; it was based on a reflective choice on who may be the best informants and interlocutors for the research project, and also on availability and willingness to participate in a project involving video recording of guitar sessions with them as interlocutors. The subject matter of the interviews was about strategies in jazz guitar improvisation and required a level of openness from the interlocutors, who were not granted anonymity. All the guitarists who were asked to participate in the project

said yes. They signed a written agreement to allow their names to be used in the project as long as it was not commercially exploited and so long as the material was not used on YouTube, Facebook, etc. No additional musicians were invited to participate.

I conducted *progressive recruitment* of interlocutors (Denzin & Lincoln, 2005), which in this project meant contact was established with each guitarist after having finished my interviews with the former guitarist. One of the selection criteria was that the guitarists should be versatile in different styles in jazz and that they should have experience as teachers, since I was going to approach them as a learner. I used a typical or *representative* selection of guitarists, with much *variation* within the group. The guitarists are in some ways typical, unique and critical for pinpointing strategies in jazz guitar improvisation. Had I chosen a group with maximum variation, I would have generated other and more diverse data perhaps, but this study pinpoints guitarists who play in many different contexts and are versatile but still good representatives of standard jazz. Choosing New York as a location for this fieldwork gave me opportunity to select among what I consider some of the best jazz guitar players in the world.

Two of the interlocutors are not Native Americans; Rez Abbasi was born in Karachi, Pakistan, and Lage Lund was born in Skien, Norway. Even though they have lived for many years in New York, their sound and style is colored by their origins. Abbasi has an Eastern sound in his approach that I feel close to, having performed Turkish music myself for several years with a Turkish/Norwegian group called "Saz Semai" and having played their traditional string instruments like Oud and Saz. Lund has a Nordic sound in his style that blends uniquely with traditional jazz guitar performers like Grant Green and Jim Hall, where Hall is one of my favorite players.

I heard Jack Wilkins for the first time on his 1977 solo album *Merge*, where Michael and Andy Brecker, Phil Markowitz, Eddie Gómez, Jack DeJohnette and Al Foster also participated. I even tried, although without succeeding, to take lessons from him in 1999 when he was teaching at the Manhattan School of Music. I did not know too much about Adam Rogers and Ben Monder, but I became interested in their playing via recommendations given by Pat Metheny, who is another favorite player of mine. The two most

distinct features in their playing that caught my attention was the variety of chord voicing from Monder and the flowing single string lines from Rogers.[3]

Even though I decided in agreement with my advisors that five guitarists should suffice, we were flexible on recruiting more guitarists if these guitarists did not properly illuminate the research questions. More interlocutors were not needed, as all the interlocutors informed the inquiry from their own unique perspectives adding substantial information to the research questions.

I approached the guitarists after seeing them playing in concerts, and after being informed on the aim of the inquiry, all of them agreed to participate. Observing them in concert situations made me aware of their playing style in a live context, how they communicated and how they played in different contexts. In addition, observing them on YouTube videos allowed me to gather other types of information like how they explained aspects of their playing in workshops, etc. Inquiries into their background and what they had been saying in earlier interviews were done to prepare my own questionnaires. This observation process was done as an independent observer, and it prepared me for posing questions and taking lessons as a participant observer.

At first sight, explaining concepts and interacting with a researcher was for my interlocutors probably not that different from giving a normal lesson with a student. I attended the lessons as a learner paying for the lessons, as other students would do. I asked questions on how to improvise fluently on the guitar, we arranged the setting as a standard guitar setting, etc. However, the fact that I informed about my inquiry as a PhD project and that the session was videotaped obviously could bias for positive reporting. The guitarists might want to be seen as reflective and constructive individuals, and perhaps they might leave out some of the negative aspects related to being a professional jazz guitar player. While this *reactivity* effect (Denzin & Lincoln, 2005) is not easy to avoid, the study primarily focuses on practice itself and not so much on cultural issues, like for instance competition on the music scene, the like and dislike of musical styles, racial issues, etc. Issues like these were not fronted nor in question in the project, even though we talked more informally about these issues outside the recorded sessions.

3 For more information on the guitarists, see Appendix 12.

As discussed earlier in this chapter, the aim of a practice-led inquiry does not strive for an objective position as a researcher, but rather using all experiences to create more knowledge about the topic. Meeting the musicians, engaging in interplay and reflective discussions has been essential for the project's findings. Listening, I believe, is a prime tool for becoming a good musician. Engaging in this activity as well as by playing with the interlocutors gave directions to the practice-led research, by stimulating questions, reflections and analyses of the embodied musical practice. This might be aligned to joining jam sessions; we play, we interact, and having played together, we know more of what we can talk about.

The interviews are not meant to illuminate some kind of objective truth about practice and cognition but to illuminate the guitarists' own reflexive, and sometimes tacit, thoughts. Language is one channel for mediating this information, stressing what is significant in the situation. The guitarists' conception of the researcher's role could easily lead to adjustments or passiveness in order to find out or fit the standard of language and knowledge they believed I had. These kind of situations can result in an artificial situation, where both etic and emic positions are alienated, according to Reinholdsson (1998). I tried to avoid this by sometimes presenting myself as less knowledgeable, as a way to activate the guitarists' explicit perspectives. Even though I knew the insider language, using metaphors like "laid-back," "grooving," etc., I partly withdrew from using this kind of jargon, since they could consider the information contained in such language as redundant and implicit. I avoided complicated cognitive terms (like chunking) if they were not absolutely necessary for the meaning. I used techniques for validation, like probes, follow-ups to ensure that I had understood the meaning of what was expressed.

Setting and apparatus

All the guitarists were video recorded and interviewed in a setting of their choice. I approached them in their studios or private homes where they normally gave their lessons. The sessions with Wilkins, Abbasi and Monder were conducted in their homes in Manhattan, whereas the sessions with Lund and Monder were recorded in their homes in Brooklyn. The exception to this was the first fieldwork with Lund, where we had the session in my apartment in Brooklyn.

We used guitar amplifiers on most occasions, except for the first fieldwork with Lund, where we both played unplugged with our hollow body jazz guitars. In the first fieldwork with Monder I played unplugged and Monder had his semi-acoustic guitar amplified. All sessions were played with a clean sound, and no distortion or effects processing were used.

A hard disc video recorder was used for video documentation. The brand was Zoom Q3 Handy Disc Recorder, with a special built-in microphone for the sound. The practicality of the device's small size and the very good quality of the audio system supported this choice. Preparing the video recording, the only thing I asked for was sometimes minor changes in the interior to have a more neutral background for the video recording of the sessions. A little table stand was used for the recordings. The aim was to frame the whole torso and guitars of both guitarists on the video, illuminating the gestures of both the interlocutor and me during interplay.

When first watching the videos I looked for elements of chunking, but exactly in what ways was still not clear. I made excerpts of the sessions, and after looking repeatedly at the videos, I decided to focus on the guitar improvisations and keep excerpts of the interlocutors' verbalizations that directly referred to the solos being played. Related to chunking, I decided to focus on harmonic content at the phrasing level, how the harmonic content is used and how it is combined with rhythm and melody at the phrase level. Having collected over 15 hours of video material from pilot and field studies, I chose to concentrate on one standard tune in the field material, *All the Things You Are*. This enabled me to illuminate the relationship between each guitarist's knowledge and the way they used their expertise over this specific tune.

Before the follow-up fieldwork in the summer of 2013, I watched the videos and looked through the interview transcripts from the fieldwork from 2010–11 several times. Meeting the same professional jazz guitarists as I took lessons with and videotaped in 2010 and 2011 was exciting. All the guitarists were positive to a new follow-up session and were keen to elaborate on issues discussed in the first fieldwork. The follow-up sessions were more focused than the sessions in the first fieldwork, since the guitarists already knew the project, and the practice-led strategy had allowed the development of the research questions and thus a clearer study focus.[4]

4 An example of the questionnaire for the follow-up fieldwork is provided in Appendix 10.

For the second fieldwork, excerpts of videos with solo transcriptions and analysis were carefully prepared for the guitarists to watch and reflect upon. This time, I brought a second video camera with me, a Nikon high-resolution camera that enabled a detailed study of my interlocutors' micro movements, focusing on the hand movements. The Nikon camera was primarily used for the playing sessions. The Zoom camera was placed further away to capture the interplay and verbal dialogue (interviews) as in the first fieldwork.

Watching the video after the sessions allowed me to observe with a view from the outside and thus on another level than when being part of the sessions. I could zoom in and out, back and forth, and "freeze the frame" as often as needed to understand and analyze the sessions. Using video, I also had an observation tool for investigating unarticulated knowledge and seeing how and what knowledge was communicated.

Observing both as an insider in the moment and as an outsider in the subsequent video analysis was challenging. The video helped me to recall events but didn't have the immediacy as when we played together in the session. Compared to qualitative observation relying only on a diary or log, I found that the video more fully captured the experience—i.e. the video excerpts and annotations linked to the excerpts made me more aware of the number of strategies that were applied in certain positions on the guitar. This means I could analyze the actions of the musicians' hands when playing a solution or attempting to answers the questions verbalized in the interview.

Interview

I conducted semi-structured interviews and had prepared many questions as backup if the conversation was going in a direction that involved elaboration on certain issues. In the interview session my skill on the guitar was experienced as more important than the order of the questions. When the opening questions were set, the playing often directed the topic at hand. My intuition and experience as an instrumental teacher for many years guided me in defining action firsthand (playing) before reflecting verbally (interviewing). However, the topic (strategies in jazz guitar) was always in the back of my mind during the sessions.

We used standard tunes as a basis for the semi-structured interview. Lead sheets, which include simple musical notation of song form, were never

used in the sessions. We could discuss a harmonic issue, and then a standard tune that incorporated this harmonic feature could be mentioned by one of us. We then played it and elaborated further upon this tune according to whatever happened in the interplay. For the most part, we had a common reference to the song's key. When we were in doubt we just decided on a key and played our version. On a few occasions in all these sessions we had to stop to define a common chord structure for the song.

The interviews were influenced by the personality of the players. The more introvert players needed more time in the situation to answer my questions. Using the guidelines of responsive interviewing (Gray & Malins, 2004), I sometimes needed to make follow-up questions, like "what do you mean" or "can you demonstrate your point of view?" With the more extrovert players, I needed to remind myself of the topic at hand so the discussion didn't go in too many directions. All the interviews were conducted without breaks and as one session, except for two sessions in the follow-up fieldwork.

Before doing the follow-up fieldwork, the semi-structured interviews were analyzed and categorized under the two main labels: practise and performance. Under the practise label I categorized the interviews according to how experts normally approach a task using domain-specific knowledge or expertise. According to Chaffin et al. (2002) experts normally start by getting an overview of the music, then focusing on the separate parts, then on how the separate parts are going to be connected or joined to each other, and finally how memory and practise enable a fresh and performance-ready repertoire. In the analysis, I structured all the earlier interviews under these categories and wrote follow-up questions if I found I needed more information on the topic at hand. The performance part of the interview focused on structure and real-time constraints, musical analysis, and comments for further improvements on playing.

3.3.3 Analyzing the interviews

I began analyzing the interviews by watching the video several times and then transcribing the main content. Concerning the level of details in the transcription of verbal interviews, Rubin writes: "We put into the transcript only the level of detail we are likely to analyze, and include any information that might influence the interpretation, such as laughter or gestures of emphasis or puzzlement" (Rubin & Rubin, 2005, p. 204). In this project,

pauses, repeated individual words, short digressions and utterances such as "ahh" "hmm" were not included if they did not affect the meaning.

The interviews were transcribed using text and video transcription software Nvivo 9. Before the transcription process started, each interview was exported from the Q3 Zoom handy-held video recorder, also used in the live settings and imported to a Mac computer. The digital file was then converted to a Quick Time video format. The analysis and coding of the interview content was done in Nvivo, which allows the user to view and listen to the video file while writing in a separate window. It also allows the user to insert time codes into the transcribed text. Nvivo automatically recognizes a particular code based on verbal content and then assigns this code to various passages in different interviews, where each passage can be accessed and compared afterwards. In addition, the program can generate different quantitative measures related to the coded text. This includes giving the exact number of times interlocutors use certain words or combinations of words. All these features helped me to define the categories that were useful for this research project.

After the text was transcribed and imported into Nvivo, the main analysis commenced. In the beginning I found some categories that I could assign as the first codes, for example technique. When I read my transcriptions, I asked myself what the main content of the sentence or paragraph was. This was then given a short code and assigned to the quotation. In cases where the quotation had several ideas or unclear ideas, several codes were then assigned to the same text. For instance, when we talked about tension in the performance of music, my interlocutor Roger Adams stated:

> I try to not think too much about those things. Working on my technique is to be able to connect to music and the emotional side of it in a very profound way. If I had known ahead that I always should play great, I would have stopped long ago. You never know quite how it will turn out, sometimes it is frustrating, sometimes the most rewarding thing in the world. That's what's beautiful about it, it's elusive and it's mysterious. In my mind I clear out different things before going to the gig, so that I am ready to perform.

The paragraph expresses several ideas. The first sentence is about thinking in music. The second sentence contains the word technique and emotion. The next sentences contain adjectives like frustrating, rewarding, elusive and mysterious to describe the playing process. The final sentence is prescriptive: "I clear out different things before going to the gig, so that I am

ready to perform." The first categories developed from the coding included technique, relaxation, strategy and playing. In this case I assigned the code "relaxation" as the main code for the quote based on the context (we were discussing tensions in the performance of music), reading the paragraph while focusing on the first and last sentence in the paragraph. The opening statement was "I try to not think too much about those things." The closing statement was "In my mind I clear out different things before going to the gig, so that I am ready to perform."

Data were coded independent of existing theories of improvisation. The first categories were based on verbal data gathered directly from the guitarists interviewed. Later I linked these categories to findings in the theory chapters focusing on structure (Chapter 4), time (Chapter 5) and form (Chapter 6). The categories were linked to theory by asking how a certain category, for example technique, was used in the setting. It was, for instance, linked to time (Chapter 5) if the technique was about phrasing in time, being consistent in rhythm.

In addition to coding interviews, I also wrote an analytical log during the coding process. In it, I reflected upon the selected categories and their immediate relevance to the topic I was working on. During the qualitative analysis of Fieldwork 1, I assigned 27 initial codes dealing with different aspects of strategies in jazz guitar improvisation. The original Nvivo outline of my categories was 46 pages with lots of overlap in the material. I then made a synopsis of the main content on each category, and I linked the content to structure, time and form. When I was looking for certain issues related to theory, I could easily back-up the perspectives with a quote from the interlocutors. However, I decided to be sparse in using perspectives from my interlocutors in connection with the theory chapters and instead have a coherent presentation of their perspectives in a separate chapter.

The codes were compared with codes from larger segments of the interviews, and finally with the music transcriptions. Harry E. Price describes this process as a "collapsing of codes" (Price, 2006). In the final stages of data analysis, the summaries of the most salient aspects of each interview were linked with the *modal matrix*—a model I developed for analyzing the interlocutors' solos. Under each category in practise and performance I had follow-up questions from the analysis of fieldwork 1, including comments from the guitarists on the analysis and findings.

3.3.4 Analyzing the music

In order to have a clear focus I decided to delimit the amount of transcribed material to the first chorus of each improvisation. Analyzing bodily movements and sound together on the video gave an additional type of knowledge that supplemented the interview data presented in Chapter 7. The video captures the dynamic musical process, a multisensory type of knowledge where timing and interaction are seen in a natural context. Bodily movements and facial gestures give information about how the situation is experienced and synchronized movements and verbal dialogue capture our interaction. Our mutual understanding is based on an oral tradition where we operate within the confines of the given tradition, using music and vocabulary common for the practitioners in the field. Ethnomusicologist Gerard Béhague states that

> The distinctions between written and oral traditions of music have been overstated. Behind all notational systems rests a dynamic oral tradition of performance, subject to change in time and space. This is true of all (written or oral) musical traditions, including Western art music. This oral tradition of performance represents one of the most essential sources for the study of cultural values, communication and meaning. (Béhague, 1984, p. 7)

It has been important to study the videos connected to these transcriptions, because they capture the detailed body language and the micro timings that are so essential in "a dynamic oral tradition." Knowledge transmission within such a tradition is based on negotiation, choosing certain strategies in favor of others to fit the given context. Gestures are interpreted and influence future actions. The musical transcriptions illuminate some of the choices made on these particular occasions when we improvised together.

Transcription process: analyzing the audio recording

I used the computer software Transcribe! for transcribing the solos. The software allows one to loop, define the tempo and key, zoom in on the picture, and watch the video while transcribing. The most interesting feature of Transcribe! is the possibility of making measures and beats by pressing different keys as the music is being played. Pressing B as the music is played creates beats in the audio file, and pressing M makes measures. In addition to bars and measures, I made annotations in the audio file. This made it possible to have three dimensions at the same time, hearing the music, watching the video and reading the annotations. Using annotations on the

Figure 3.1 Transcription! - Excerpt of Rez Abbasi's solo. The audio file is displayed in the lower left corner. A7, A8, and A9 indicate measures 7, 8 and 9 in the A section of the piece. The annotation (Indian-inspired glissando) above the timeline is played between the 11th and 14th second of Abbasi's solo. In the upper left corner, tempo shows 70% of normal tempo. On the right is the video that corresponds to the audio track.

video with a timeline made it possible to locate the exact place and time when something interesting happened. I also labeled the different choruses as A, B, and C to define the number of choruses. I used only the A part of the entire transcription, which means the first 36 bars.

Looking closer at the features in Transcribe!, to the left of the picture (Figure 3.1), three bars are marked, bar 7 to 9. The analysis focuses on an Indian-inspired glissando performed between the 11th and 14th second of Rez Abbasi's solo. On the top left, the tempo indicates 70% of live-recorded tempo. On the right side, I can watch the video marking in 70% tempo, and watch the video segment or chunk in different sizes depending on the need of the analysis.

Transposing process: creating the 'modal matrix'

Having finished the audio score of all the solos, including annotations on the timeline, I used the Sibelius musical notation software to document it as musical notation. The challenging aspect with the notation program was to

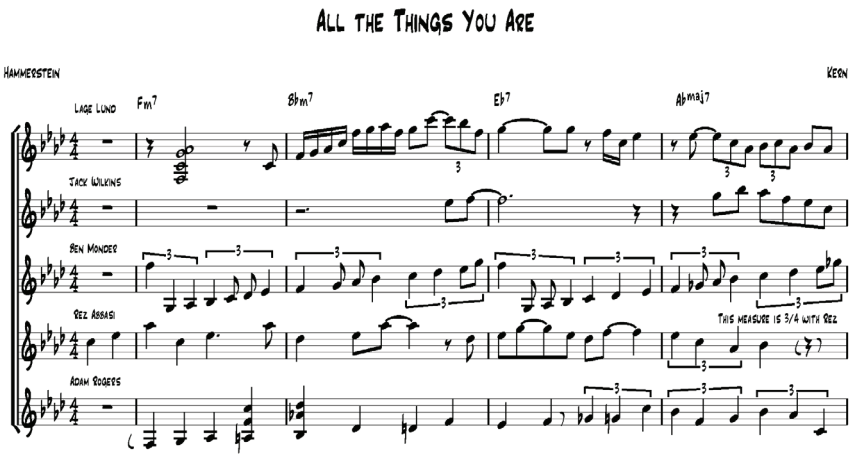


Figure 3.2 Modal matrix of the first four bars of the interlocutors' solos on *All the Things You Are.* The parentheses are in Adam Rogers's solo indicating a comping idea until the third measure where he begins a single string solo. The fourth bar was played as a ¾ bar with Rez Abbasi (not on purpose, but it sounds natural in the context).

notate it as accurately as possible without overloading it with details. I got a midi version of the notes first, but I could not obtain much information out of the midi-converted notes, and I decided to do all the transcribing myself. When all the solos were transcribed, I placed them all in one score for comparison. Even though the live tempos of the solos were somewhat different, I aligned the different versions by choosing a tempo for playing the score based on average tempo.

I defined the score as a matrix (see Figure 3.2) underlining the way it could be used for generating a substantial amount of re-combinations —for example, jumping between motives or phrases used by the guitarists. It is also possible to use it in a more challenging way to generate more surprising musical results, for example shifting between ideas used by the different guitarists on every measure, using one measure of Monder's solo, one measure from Lund's solo, etc.

Structure

In the modal matrix, I go from many keys to only one key. The rationale behind this is that patterns and licks (chunks) are learned in one key before the idea is played in other keys. By transposing and reducing all the keys in *All the Things You Are*, I could more easily:

- Compare phrases in a more coherent way, having all the phrases in one key or modality,
- Define possible idiomatic phrasing, i.e. linking ideas to tonalities and framing questions like "Do guitarists play different ideas in different guitar keys?," as represented by the neutral and sharp keys sections of the song (C, G, E sections of the matrix),
- Define tension notes in the harmonic structure. These tension notes are also given a quantitative representation, seen as tension graphs in the findings chapter.

A red color (see figure 3.3) defines the *tension notes* that are the notes outside the given tonality in the matrix. In this matrix the five notes of the G flat pentatonic scale (G♭, A♭, B♭, D♭ and E♭) represent the tension notes or outside scheme, with the exception of the transition or modulation areas in

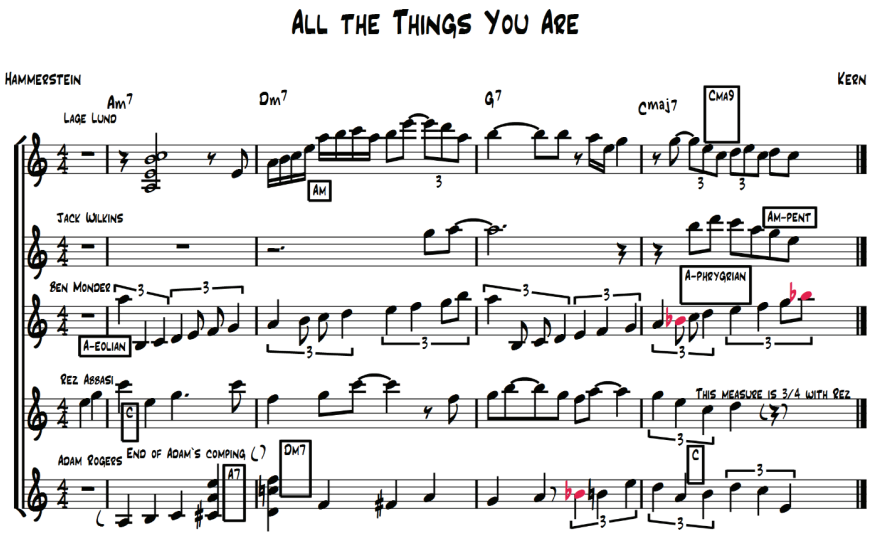


Figure 3.3 Modal matrix in C. Harmonic chunks in boxes are labeled from scale structures to triads, the red color defines a tension note. The red B♭ note is a tension note because it is outside the C major tonality of the first four bars.

bars 24 and 36 and the diminished area found in bar 32. Harmonic chunks and templates were boxed and labeled, ranging from scale structure (seven notes) to triads (three note structures).

Time

To get the essence of the interlocutors' playing style, I found it useful to include all the solos in one matrix. When I transposed the solos, I defined the tension notes in relation to the basic lead sheet representation. In the interplay, I was comping differently on each occasion. Sometimes my voicing changed due to what happened in the other guitarist's solo; at other times I played new voicing to add a new harmonic dimension to the music. In the cases where I used substitute chords, the other guitarist's solo line could match my harmonies but not the standard harmonies. When I transposed my comping and analyzed the relationship between tension notes and my comping, I needed to frame the questions:

- How much do the guitarists improvise on the lead sheet changes, defined ahead of actual interplay?
- How much do the guitarists improvise and react spontaneously on harmonies provided in the moment?

In the analysis, the focus will be on tension (red) note areas. For instance, in figure 3.4 the A♭ in the comp might trigger the corresponding A♭ in the solo. The standard changes are Dm7, and my comping is a D minor seventh flat five chord.

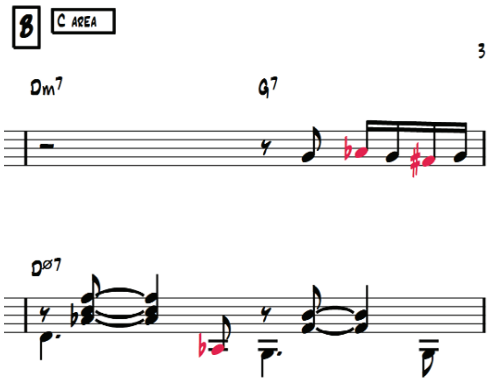


Figure 3.4 Interplay figure, showing a Dm$^{7\flat5}$ chord on standard Dm^{7}. The soloist is playing ♭5 in his line (see measure 6 page three in the modal matrix).

In the early analysis I found that the guitarists shape their solo by continually responding to the ideas of both their own improvised solos as well as input from me. There are many convergences between us in choosing to implement a substitution at a particular moment, but incongruity is just as common. In order

to not over-interpret harmonic convergences, I decided to let the standard lead-sheet changes be the basis for an inside scheme and everything outside the standard scheme as outside scheme or tension notes. Analyzing the form, particularly interesting interplay situations are pinpointed.

It has been important to show the accompaniment in relation to the improvised solos, since professional jazz guitarists also are professional listeners and are able to interact based on their listening experience. In classical music, it would be strange to treat a violin solo in isolation from its accompaniment or considering the violin concerto only against chord changes or roman-numeral analysis. However, this is not so strange when the analysis is based on long experience in the field, and some of the interactive processes identified in such analyses are taken for granted because of this. This project recognizes the importance of interaction, but the focus is on uncovering the improvisational strategies that musicians themselves use, supplied by research in cognition on why these strategies may work.

Reflexivity have been important to balance my emic and etic perspectives, they have provided possible explanations that could justify my own concerns, and to become aware of my 'blind spots' in interpreting the data. Using reflecting-on-action and reflecting-in-action has enabled me to capture a more complete picture of the research process. In order to balance the perspectives further, several reflexive techniques have been adopted for the research process including a reflective log and noticing-in and noticing-on practice.

Reflective log

A *reflective log* has served as an ongoing commentary on both practice and reflection in this project. A reflective log is not just a diary of what one has done, but a critical assessment of how one has progressed, asking questions like "have I developed new skills, how could I improve the process of research and writing or how did I deal with challenges in the process?" Using a reflective log is a tool inspired from the field notes used in anthropology (Merriam, 1964). John Mason states, "noticing can be sharpened, can be developed and refined, as part of personal professional development, even disciplined to form the basis for recognized research" (2002, p. 38). Mason refers to noticing IN research (in practice) and noticing AS research (on practice), and considers both to be valuable in the research

process. This also enables the researcher to look for ways of linking the various collected material.

After each session, I summarized the main content and my reflections related to the sessions. I found these free narratives or written reflective reports to be very useful when analyzing the practice. I compared these writings to what actually happened as seen in the video recordings of the sessions. Retrospectively, I consider these free notes to be quite valuable, because I can retrace the research process and what I found interesting at a specific point in time.

Managing data

The analysis of jazz guitar strategies is derived from three interrelated activities in this project; reflections in practice, reflections on practice, and reflections on theory as related to chosen theoretical frameworks. According to Marit Ulvund the reflections in practice depend on the time and space in which they happen, and choices are made using knowledge both "in" and "on" action (Ulvund, 2013). Revealing the unarticulated or tacit knowledge has been a challenging process. The problem of representation (Denzin & Lincoln, 2005)—capturing lived experiences with words and numbers—is still present in my project even though I have used video and introspective reflections to capture the essence of the present. Transferring the creative, embodied work to a written text and highlighting the musical result in a modal matrix has been my pragmatic way to meet these challenges.

As a reflective practitioner in a practice-led inquiry, I use myself in different ways; by asking questions, finding methods suitable for the questions, elaborating methods to perform the research and finally deciding on how this may influence further practice. Such an open position might challenge the transferability (external validity) of the project. I have attempted to distinctly incorporate the voices of the participants, for instance by including many quotes in the interview analysis and a detailed musical analysis of their solos.

Being aware of the limitations of the researcher's perspectives, I know that this text is created in a social context. It is an asymmetrical relation between researcher and the interlocutors, and this can be a treat to the credibility (internal validity) of the project. Video reactivity and bias has been discussed, and *maturation* where individuals change over time, even

from fatigue, might have been present. By having sessions for not more than on the average one hour, this effect might have been reduced.

My implicit knowledge about jazz guitar and what it is supposed to be might have been so deeply grounded and hidden that I deceived myself when explaining phenomena in the field. I might have reified the process by which a theory, lesson or skill is enacted, embodied or realized, instead of illuminating critical and possible challenging aspects within my pluralistic approach. Using a practice-led strategy, and seeking legitimation and involvement of critical peers, has informed the inquiry's parameters. Potentially challenging aspects of my methods have been discussed and criticized, and this has hopefully been constructively directed.

Using an intersubjective approach, working in the interdisciplinary field of music and cognition, balancing many aspects and perspectives at the same time, has been a challenge. Caroline Gray and Julian Malins describe the challenge of a practitioner-researcher with a multi-method approach in arts in this way:

> In the role of the 'practitioner-researcher', subjectivity, involvement, reflexivity is acknowledged; the interaction of the researcher with the research material is recognized. Knowledge is negotiated – inter-subjective, context bound, and is a result of a personal construction. . . . So a characteristic of 'artistic' methodology is a pluralist approach using a multi-method technique, tailored to the individual project. (Gray & Malins, 2004, p. 21)

The pluralistic performative research strategy described above is sometimes referring to performative social science in general, sometimes denoting presentational versus discursive approaches, and at other times referring to "art as research" even though art research does not mean the same thing as performative and does not necessarily have any performative elements integrated into its research. With all these possible interpretations of what a practice-led strategy might involve, I will summarize my methodological approach by the following points:

1. Natural setting—engage in interview and interplay;
2. Emergent procedures—questions are partly developed from what happens in interplay;
3. Dialogical structure—interview and interplay where combinations of simple interactions can lead to surprising emergent phenomena;

4 Negotiated outcomes—based on critical assessment of what happens in action when two guitarists react and act upon one another;
5 Process over product—focus on music-making involving special criteria for trustworthiness (playing together), devised in terms of the nature and context of the project;
6 Embodied elements—defining musical meaning and unarticulated (tacit) knowledge within the constraints of improvisation, structured by the body situated in its environment (situated cognition);
7 Performance based interpretation—Collaboration and emergence, unpredictability in timing of others based on context, where action and situation can be developed in many different ways, often initiated by the individual but carried out collectively.

Concluding this chapter, this research project is situated in a qualitative and performative research paradigm using a practice-led approach. Phenomena related to jazz guitar improvisation are performed and experienced in an embodied way and analysed as a reflective practitioner. The methods, involving interviews and interplay, stress the co-effort created between the interlocutors and the researcher/musician as relevant for and discussed in ethnography, phenomenology and reflective practice. Furthermore, the elaboration of the reflective inquiry crucially depends on the inquiry both in theory and practice.

The next three chapters will provide theory involved in jazz guitar expertise, focusing on structure, time and form as vital components. Chapter 4 deals with structures shaped by chunking, schema and template formation, while Chapter 5 deals with time constraints, and Chapter 6 deals with the harmonic form of *All the Things You Are*.

4 Chunking, schemas and templates

The overall focus of this chapter is jazz guitar expertise, and in this expertise I have found chunking, schemas and templates to be important concepts. These concepts explain essential psychological mechanisms that underpin the ability to improvise, including the ability to quickly recognize and generate patterns based on profound knowledge of musical style. Chunking will be described as basic coding, schemas as extended coding, and templates as altered coding. The inquiry will also look at how experts combine these strategies depending on context.

4.1 Chunking: basic coding

Music is rarely heard as an unbroken continuum; it is usually grouped into smaller units like phrases consisting of melodic, harmonic and rhythmical units (Snyder, 2000, p. 231). It is this grouping mechanism that enhances our ability to remember sequences. The cognitive foundation for these events has received much attention in traditional Western music theory (Lerdahl & Jackendoff, 1983), in ethno-musicology (Solis & Nettl, 2009) and in music cognition (Sloboda, 1985; Snyder, 2000).

Fred Lerdahl and Ray Jackendoff (1983) use the term *parsing* for this process and relate it to compositional grammar. John Sloboda (1985) and Bob Snyder (2000) employ the term *segmentation* and *chunking* for the same process and relate it to memory processes in music cognition. Rolf Inge Godøy defines chunking in music not only as a parsing of something, but also as a transformation or re-coding of something into a larger unit (Godøy, 2008,

p. 117)—i.e. parsing a phrase into smaller motives or taking motives from different phrases and combining them into a new phrase. The resultant units are called *chunks*. In ethno-musicology Gabriel Solis and Bruno Nettl (2009) use the term *building blocks* for the resultant chunks, while Pressing (1988) uses the notion *event* in his writings on improvisation. In my project I will use the notion chunking for the grouping process and chunk for the resultant product.

The concept of chunking was first introduced in a Dutch thesis by Adrian De Groot in 1946 as a way of understanding problem solving in chess. This thesis was later revised and translated into English in several editions and has gained much attention in the field of expertise (2008). George A. Miller (1956) defined it as a grouping principle in perception and memory and related it to capacity limits of short-term retention. I will elaborate on this later in the chapter.

When small informational units are grouped into larger informational units, they become chunks. Creating these chunks involves a re-coding of information and functions as a way to increase the amount of information that we can deal with, by linking the external environment to internal cognitive processes (Snyder, 2000). According to Alessandro Guida et al. (2012) chunking can be divided into two broad areas, each reflecting how and when chunking is assumed to happen.

1. *Chunk creation*: *How* chunking happens can be seen as a deliberate and goal-oriented process. This involves binding different units in working memory into a chunk that does not yet exist in long-term memory. Especially relevant for this thesis is how organization is based on associative learning of semantic and perceptual properties that facilitate retrieval in jazz improvisation.
2. *Chunk retrieval*: *When* chunking happens is considered a more automatic and continuous process related to perception. Perceptual chunking occurs when we, for example, automatically group letters into words and sentences, and single tones into motives and phrases. Chunk retrieval involves the perception of a chunk in working memory that already exists in long-term memory.

Guida et al. (2012) maintain that chunk creation mainly happens when individuals do not have a strong knowledge of the information they are

processing, for example when learning a new skill, and they also believe it takes place when experts are learning new skills involving new information. According to such a view it follows that as the number of chunks increases, there is a gradual shift toward chunk retrieval, since more chunks are automatically available in long-term memory.

A chunk is stored in long-term memory as one unit and recalled within the limits of short-term memory one at a time. According to Fernand Gobet and his associates (2001), "a chunk is a collection of elements having strong associations with one another, but weak associations with elements within other chunks" (Fernand Gobet, 2001, p. 236). A visual pattern like this: ------ //////// ====== will then be perceived as three separate chunks, having strong associations or binding within the group but not with the other chunks. Bob Snyder refers to associations as the glue that hold chunks like these together (Snyder, 2000, p. 54). The perceptual features of chunking will be further discussed in Chapter 6 in relation to visual pattern recognition in jazz guitar improvisation.

A chunk can be defined as a single action with a defined start and end, sitting down (chunk 1) then standing up (chunk 2). A movement contains several action units chained together in a continuous movement, for instance when coordinated continuous movements between the torso and hands result in music. This process is called *coarticulation* and describes the rapidity in which overlapping sequences are processed simultaneously and influence each other (Sternberg & Mio, 2009). Coarticulation is very much influenced by context and expertise, which means that chunks can be anticipated and processed together with ongoing action chunks in the moment. This is also quite evident in improvisation, where the fingers are playing a musical phrase while the mind is anticipating the next tones to be performed. Coarticulation is then also a gradual alteration of movements happening in the moment; the movement is linked to what has happened before or to what will happen after. Sternberg and Mio describe the process this way:

> How are we able to perceive fifty phonemes per second if, paradoxically, we only can perceive less than one phoneme per second of nonspeech sounds? One answer to this question lies in the fact that speech sounds show coarticulation. Coarticulation occurs when phonemes or other units are produced in a way that overlaps them in time. One or more phonemes begin while other phonemes still are being produced. (2009, p. 251)

Coarticulation is then based on practice and the ability to chunk information in meaningful ways so often that we can make the identification process faster. In speech this can happen when the mouth is anticipating mouth position before the sound comes, like forming a *u* before saying *t* in the word tune, or by having anticipated a hand position before doing a single action. I will return to these aspects of coarticulation when speaking of motor control.

In music, coarticulation happens on two time levels, as shown by Godøy et al. (2010, p. 692): a *sub-chunk level* that includes steady pitch and timbral features (0–0.5 seconds), and a *chunk level* typically around three seconds including musical motives and motives combined to form higher level chunks like musical phrases. In jazz music the sub-chunk level is often referred to as rhythmic and melodic feeling, for example phrasing behind the beat, on the beat, or after the beat. The beat's placement and the micro sensitivity to adjusting the beat is essential in jazz on this "sensory" or "immediate level" according to Vijay Iyer (2002, p. 395).

The various shorter musical units, like 3–4 note chunks, at the chunk level are often referred to as licks, ideas, figures or motives. Somewhat longer musical statements, seen as higher-level chunks, are referred to as melodic patterns or phrases. Prominent items in chunks can be used to cue other chunks, and these features can become hallmarks of different styles. Creating chunks in this *supra-chunk level* is based on long-term memory structures, including style-specific understanding. This supra-chunk level includes concatenations of several chunks including sections and entire tunes according to Godøy (2010). Likewise, chunks created in the sub-chunk and chunk time scale can be referred to as echoic and short-term memory structures (Iyer, 2002, p. 395).

4.1.1 Chunking capacity

Improvisation deals with severe time constraints. Chunking is a way of dealing with these time constraints by grouping chunks into event clusters or higher-order chunks. Chunking relies by necessity on experience; in order to chunk knowledge, you already have to know something that can be associated with the new knowledge to make it more meaningful and useful. For example, when an improviser plays chord tones over a chord progression, it implies knowledge of chord tones associated with the chord

progression. Processing hierarchical information like this, knowing the progression, the single chord, and the single tones that define the chords, places heavy demand on short-term memory. The problem is then how to unveil and measure this knowledge, ultimately inquiring into how many items can be held in memory at the same time. Miller's (1956) key contribution to this problem was to define short-term memory capacity as an average number of 7(±2) items that can be held in short-term memory without rehearsal. Miller estimated that the number of items that constitute a single chunk is the same as short-term memory capacity (7 ±2), which leads us to refer to "the magical number seven."

Later research has suggested that the magical number 7 is a good estimate of working memory, explaining short-term memory with a process of practice, for example when one tries to keep a chord in mind by articulating it silently, or visualizing the individual chord or chord tones in order to play them. To clarify the content of short-term memory, Alan Baddeley and Graham Hitch introduced working memory as a process component in short-term retention (Baddeley, 1974).

Baddeley suggested that the capacity for short-term retention depends on the complexity of content rehearsed in working memory. Complicated words take more time to articulate than shorter words, words are more complicated than letters, and letters are more complicated than digits. Visual fixations are more complicated when the notes are outside the staff system, etc. Fewer items will be located within the span of short-term retention ranging from 4 to 30 seconds but normally within 4 to 6 seconds (Hallam, Cross, & Thaut, 2009). Based on this and other research, several authors have suggested a lower capacity limit for short-term memory, i.e. Nelson Cowan suggesting the magical number 4 instead of 7 (Cowan, 2005).

David Huron sees the actual size of short-term retention as a product of statistics more than a finite number (Huron, 2006). This means that a person who has been exposed to certain patterns frequently will be able to identify and articulate well-known patterns easier and faster. This is very much in line with the previously mentioned coarticulation point of view. For example, familiar sounds or meaningful patterns are processed much faster for a jazz guitarist since they contain meaningful information based on frequent encounters.

For improvisers, the notion of a working memory is important because it, among other things, can help explain the controlled processes that sometimes happen in the improvisational present. An example of when such a process might be active is when one has to raise or lower single tones related to tonality. The improviser has to know "where am I" (I. e. A♭ major) in order to adjust single tones to the new key, "where am I going" (I.e. C major). These are controlled processes and absorb resources from working memory, just as retaining something there does.

In short, the theory presented so far seems to indicate a process-based working memory with a capacity of 7(±2) with rehearsal, and 4 or less without rehearsal in short-term memory. Chunking explains how hierarchical compression occurs; by forming associations between individual chunks of 3–4 items into larger units, a huge increase in short-term retention is enabled. In music this can be a group of 3–4 note motives chunked into a phrase, which would be a higher-level chunk. The phrases can be chunked to sections, sections to whole melodies, etc., but the size of each chunk has to be within the capacity of short-term retention. Schemas are the contextual frame for this hierarchical coding and explain how chunking relies on context.

4.2 Schemas: extended coding

A schema represents a dynamic and abstract framework in the mind that structures experience and is structured by experience and knowledge. Bob Snyder states "schemas are large patterns of generalized associations in memory that determine how whole situations are processed" (Snyder, 2000, p. 56). It identifies the who, what, where, when and how of a situation. It defines the setting where chunks can be used and the structural patterns that underlie these chunks. In the case of the nervous system, it can be seen as a neuronal encoded structured version of the world (neuronal groupings in the brain) that could potentially guide behavior (Roediger, Dudai, & Fitzpatrick, 2007). From an evolutionary point of view, David Huron states that the primary reason for schemas and memory in general is not recall but anticipation and expectation and is as such crucial for survival (Huron, 2006).

Schema expectations serve at least three functions according to Huron: motivation, preparation and representation: Motivation to find something in

the tune that one recognizes, a way to prepare this recognition by chunking items so one can easily identify it, and finally a form to represent it. Related to music, schemas enable us to like/dislike what is heard (or never heard before) based on stylistic knowledge. The extent to which this capacity to form schema expectations is governed by general cognitive functions or specialized musical functions is still unclear (Huron, 2006).

In jazz improvisation, schemas are essential since they enable anticipation in real time based on certain expectations. If one improvises over a tune, the tune itself represents a schema that is gradually built up by chunking. As previously mentioned, Pressing calls these tune-based schemas a referent (Pressing, 1988). According to Pressing, the tune or schema guides the improvisation in the form of chord progression and melody to be improvised over. The tune offers a structure that can be analyzed in practise and that reduces real-time decisions in performance. Knowing the harmonic schema, patterns and licks can be prepared in advance and as such make it easier to execute them during improvisation. The harmonic and metric frame is shared in real time with the other players; the style and way of approaching the tune is based on mutual understanding. In short, the schema provides the underlying or overarching structural disposition for the improvisation.

For an experienced improviser, schema expectations are created based on frequent encounters with a situation. It enables anticipation. Imagining the chord progression with the "inner ear" before playing it produces simulated feedback. The lead sheet is only a surface script for this action, giving only a very simple outline of the tune with melody and chords. However, in the hand of an experienced or expert improviser this lead sheet represents rich possibilities of elaboration far beyond the simple lead sheet notation.

Since even the specialized aspects of music comprehension are tied to more general cognitive functions, according to Hallam et al. (2009), studying general cognitive abilities should then be relevant for how cognition in music works. Chess studies represent one of the most examined fields in the area of cognition and expertise. Fernand Gobet and Herbert Simon underline the fact that chess expertise is general expertise: "[We] should like to remark again that the characterization of chess memory . . . is not special to other expertise, but . . . is generalizable to other domains of expert performance" (2000, p. 680). In the following I will define this expertise and then link it to musical improvisation.

4.3 Expertise

Ever since the seminal research of De Groot, expertise in chess has been an important source of knowledge in fields such as selective search, pattern recognition and expertise according to Gobet and Simon (2000, p. 652). Chess research, which employs players who have spent thousands of hours practicing their skills (experts), can be compared to an experienced jazz guitarist who use strategies to find patterns in musical material both as an abstract flexible entity, meaning not precise movement details, and as clearly defined patterns on the fretboard. In jazz improvisation, Paul Berliner refers to Larry Gray's way of seeing sequential pattern:

> Gray likens such improvised movement to the chess player's calculation of alternative moves on a chess board: two squares forward and one to the side carries the knight to the same place as one square to the side and two forward. Creating unique harmonic routes between the pivotal chords of a composition is effective as long as you're moving in a logical, sequential manner so that the listener can hear a progression. (1994, p. 224)

Chase and Simon (1973) proposed that chess experts have a vast database of chunks, containing approximately 50 000 chunks to move in logical ways on the chessboard. These masters have developed retrieval structures based on mnemonics to encode information rapidly into long-term memory. This means that masters can also simultaneously recall several boards (games) immediately. Gobet and Simon (1996) believe that the large database that experts have allows them recognize random positions of two and three pieces more often where random pieces (two or three units) can be seen as a part of a larger chunk.

Observation studies show that expert chess players have much clearer images of the board than novices; this also means that they make fewer mistakes. I believe this is also the case with professional jazz guitarists when identifying shapes on the guitar fretboard. Discrimination and familiarization are central components of this clear image. Making each chunk distinct facilitates associations to other chunks.

Allan Paivio and Wally Lambert (1981) have demonstrated that a visual code is mnemonically stronger than a verbal code in accessing a clear image. If tasks are presented in a multi-modal way, schemas will be memorized and retrieved more efficiently, especially in a natural context. Their *dual coding theory* proposes a separate language and a nonverbal imagery system called logogens (words) and imagens (picture). The empirical evidence is based

on the beneficial effects of concreteness and the possibility of forming a vivid image related to the topic at hand. Memory and the potential for action increase by a ratio of 2:1 when we have a clear mental representation in mind, according to Paivio and Lambert (1981). Related to jazz improvisation, this effect can be seen when we have a defined (visual) image of a specific chord and a conceptual (language) understanding of the same chord.

4.4 Templates: expert coding

According to Gobet and Simon (1996) interfering tasks have almost no effect on working memory performance with chess experts, contrary to the belief in chunking theory proposed by Chase and Simon (1973). How is this possible? They suggest that information is not stored in working memory as initially proposed and that experts instead transfer information rapidly and efficiently from long-term memory where interference has no effect. Both theories (Ericsson and Kintsch and Gobet and Simon) suggest that this is only possible if knowledge structures are built.

Chess experts combine long-term memory immediately with working memory in ongoing operations. This is also later confirmed by neurological research that shows firing of neurons in both working memory and episodic long-term memory areas among experts, but not among novices (Guida et al., 2012). Ericsson and Kintsch (1995) proposed the notion of a long-term working memory to account for the skilled use of working memory operations like this.

According to Gobet and Simon, "'templates' are schemas implicitly learned in the process of acquiring substantive knowledge, which also contains slots that can be used for rapid augmentation" (2000, p. 655). They are stored as flexible knowledge structures in long-term memory and are open to change when retrieved by working memory. Chess pieces with numerous relations are more easily recognized and hence chunked according to Gobet and Simon (2000, p. 655). Gobet and Simon have demonstrated how templates are open for alterations within the time limit of 250 ms in chess. In music this seems to reflect improvisational skills on the highest level; within fractions of a second pre-learned phrases are picked, but the contours or other parameters are altered according to what is going on in the interplay.

Short-term memory is typically limited to around three chunks, according to Gobet and Simon (2000). This implies that short-term memory must be integrated with long-term memory in order to work efficiently. Chunks of jazz harmony are contained in long-term memory, and the role of short-term memory is to keep pointers (chunks) to this information. A domain-specialized chunk, which can be filled rapidly in each application within the limits of short-term memory, also explains why interference does not necessarily happen in short-term memory; the slot (place for variation) is also a storage place for comparison. This can be seen when one processes information in the moment and selects different possible executions of the function at the same time. For instance, I know it is a tonic function, but I add the VIm^7 and the IIIm^7 to make it more varied.

In music we most probably will find these templates in cadences as closures at harmonic, melodic and rhythmic levels. According to Huron (2006, p. 157) cadences are the most predictable places in music. This is also where chunks and schemas will reinforce each other especially well. Having practiced chord progressions of typical cadences in isolation, like many jazz musicians do, it seems reasonable to expect a more chunked phrasing in the cadence. With practice and expertise chunks get interconnected in larger and more complex networks (schemas); they become templates (flexible retrieval structures) that occur often in a master's playing.

4.4.1 Mnemonics

Template coding involves a core, which is the non-variable part of the template, and slots, which constitute the variable part. Using the template to its fullest involves the use of elaborated memory structures often referred to as mnemonics. Ericsson and Kintsch (1995, p. 221) describe them as "knowledge-based associations relating units of encoded information to each other along with patterns and schemas establishing an integrated memory representation."

A mnemonic technique could be to use the *method of loci*—(method of location) in understanding jazz harmony, for example defining three familiar locations (seen as the slots in the schema) and name them the tonic, sub-dominant and dominant (rooms). According to jazz educator Jerry Coker (1964), all harmonic complexity found in tonal jazz is a variation of the harmonic tonic, sub-dominant and dominant functions. These variations can

be seen as slots in the I-IV-V schemas of jazz improvisers. These harmonies are accessed in long-term memory through discrimination, by testing out different aspects of functional harmony in relation to the basic tonic, sub-dominant and dominant functions—i.e. defining the tonic sub-mediant (VIm^7) and the mediant ($IIIm^7$) chord in the tonic (I) location, the IIm^7 in the sub-dominant (IV) location, and the $VIIm^{7\flat5}$ in the (V) dominant location.

Color might be used to add a visual dimension to these tonal categories (I-IV-V). The color gives immediate information about each chord and function in a way that would be very hard or impossible without this color discrimination. In music pedagogy, it would be seen as a mnemonic device to assist in memorization. Hilgard and Bower (1981) concluded that audio-visual instruction, combined with mnemonic devices and imagery of musical materials, can enable students to maximize the amount of information to be learned in the least amount of time. Traditionally color-coded representation has been associated with learning traditions for children, color-coded keys, etc., but is also used in jazz. As Paul Berliner states,

> Students conceptualize the successive sound clusters of harmonic forms as mapped out in particular positions on instruments, and as visual images of abstract designs whose colors and tints may represent different shadings of harmonic tension. These kinetic and visual conceptualizations serve as mnemonics for harmony for musicians at whatever level of knowledge. (Berliner, 1994, p. 72)

With the advent and widespread use of color copiers and color markers found in musical notation software like Finale or Sibelius, more avenues for color publications have become available. In this project colors will be used to discriminate consonance and dissonance, dissonant chunks will be marked with a red color in my modal matrix model, and consonance with no color. I will elaborate on this in the analysis in Chapter 8.

4.4.2 Formulas

Turn-arounds, turn-backs, as well as II-V-I and II-V progressions are all good examples of formulas in jazz. Formulas are flexible recurring patterns that are frequently encountered. Improvisers have spent a long time in elaborating different patterns that can be used over these formulas. These formulas are different "pathways" or variations based on the tonal cadence I-IV-V. The most basic level in the formula is the bass line and the corresponding harmonic progression. The second level is the

melodic formula, standard phrases and melodies used over these standard progressions. Jerry Coker was probably the first to demonstrate the similarity between different standards, in his book *Improvising Jazz* (Coker, 1964). His work has been followed up by many other jazz educators when showing how tunes can be chunked into categories according to harmonic formulas (Baker, Gillespie, Unsworth, & Diehl, 1997); (Coker, Knapp, & Vincent, 1997, Elliot 2008; Cork, 1990).

Formulas might also be found in different *recombination* techniques (Berkowitz, 2010). Traditionally these were associated with interludes in 18th century classical music where the performer learned ornamentation techniques that provided a number of musical choices for a given musical style, like a waltz or a minuet. Aaron L. Berkowitz says that in this improvisatory practice the performer learned to write variations and remember several versions that demanded the instant access to these musical-motor patterns when needed. An important part of this improvisatory practice was "combining and recombining musical elements to form new musical entities" (Berkowitz, 2010, p. 56).

Having internalized a number of chunks in advance the performer's craft was to show how the chunks could be combined in a stylistically idiomatic fashion. The art of selection was called *ars combinatoria* and reflects a way of improvising that wasn't necessarily linear, by forming ideas based on combinatorial principles. Aaron Berkowitz talks explicitly about the chunking part of this process:

> . . . short passages taught in isolation create an initial set of improvisational elements. Recombining these passages exponentially increases the improviser's potential storehouse of possibilities. For example, if the student improviser learns ten Capo-coda pairs, he or she has ten musical "chunks" to play when improvising. If any capo can take any coda in place of its original concluding coda, suddenly there are one hundred possible options (ten possible codas for each of the ten capos). Thus, learning by way of recombination provides for an extremely large reserve of possible paths through the knowledge base of elemental components. This is crucial in spontaneous performance, where the need for instantaneous creation of musical flow is essential . . . (Berkowitz, 2010, p. 69)

Using melodic chunks from different tunes and applying them to another tune is one way of showing how recombination works in jazz; this is called musical *quoting*. Berliner points out "one essential 'secret' is that performers can potentially introduce a particular phrase in their solos wherever its complimentary chords occur" (1994, p. 173). The five first bars of *All the*

Things You Are might just as well be the beginning of another standard tune, *Fly me to the Moon*, since they share the same harmonic progression. A chunk consisting of five chords can then be used on several places using different melodies. Many books on jazz patterns are based on this principle, outlining the most common formulas in jazz progressions and then linking these to patterns that can be played on the specific chord progression. These pattern books represent style and musical choices within a culture. When improvising, jazz musicians also use their expertise in ways that reflect the preferences of earlier performers, contemporary performers, peers, audience and critics. Tradition and environment are important, but are there certain structures that are universal and not constrained by socio-cultural aspects?

4.4.3 Hierarchy

According to Jackendoff and Lerdahl, there are musical structures that are universal for all humans, including a hierarchical listening grammar that groups a musical surface into discrete events, for example seen in phrasing, beat division and metrical structure (Lerdahl & Jackendoff, 1983). Due to chunking, many memory structures are arranged in multileveled memory structures within a hierarchy (Snyder, 2000). A hierarchy can be seen as a number of single units being combined into fewer units on a higher level. Alternatively, the hierarchy may be described as an inverted tree structure, with the root at the top and the leaves at the bottom. Jackendoff and Lerdahl's ideas are clearly inspired by linguistic theories, foremost represented by Noam Chomsky's theories of surface and deep levels in syntactic language structure (Chomsky, 1957). The language comparison to music is also used in brain research: "Like language, music is a human universal in which perceptually discrete elements are organized into hierarchically structured sequences according to syntactic principles" (Patel, 2003, p. 674).

A hierarchy can be shown as a chain of associations where simple associations can be grouped hierarchically into longer associations further up in the hierarchy. The schema is the structural patterns that underlie both the harmony and melody chained together. A hierarchy chain might look like this:

The tone and motive are normally processed at the sub-chunk level, the template, phrase and formula at the chunk level and section and entire form at the supra-chunk level. Music that is organized hierarchically through chunking, including several closure or boundary levels (motive, phrase, section, etc.) is likely to be retained in memory "with maximum effect" according to Snyder (2000, p. 66). I will elaborate on this in the next chapter on temporal awareness.

Figure 4.1 Hierarchy chain chunked in different levels. At expert level the entire chain from tone to entire form is often chunked as one single chunk. The improviser has pointers (chunks) in short-term memory that rapidly can elaborate on a specific level when needed by combining working memory and long-term memory

Lerdahl and Jackendoff describe how chunking is quite dependent on schematic expectations in music. We group distinctive transitions, regularity in musical structure, symmetry, beat and several other features of the music immediately to create patterns in the music. Their theory on cognitive constraints on classical tonal music (Lerdahl & Jackendoff, 1983) has been updated several times as a result of ongoing critique. Some of the critique against Lerdahl and Jackendoff's generative theory relates to their extensive use of large-scale musical structures within tonal classical music to demonstrate their principles.

Many of their musical examples use the inverted tree structure to show the connection between surface and deep structure. The hierarchy's basic level is normally found in the middle, on the phrase level, between very abstract schema based representation and a very detailed chunk level. Such models suppose that the cognition of music consists of larger and larger levels of hierarchical organization similar to linguistic models. These structures are assumed to be universal despite little or no effort to test it out on music other than Western tonal music. The theory assumes that there are some deep levels of structural meaning in the music itself that can be mirrored in the listeners mind, like consonance and dissonance, similarity, continuity, etc.

4.5 Action-based chunking

While quite far-reaching in the case of Western tonal music, linguistics-inspired musical theory does not fit well with the vast majority of other genres of music, according to Iyer (2002, p. 388). Iyer relates improvisation to situated cognition where the mind reflects the body situated in a context. Iyer is critical to the linguistic metaphor and the logical chunking of tree structures to reveal greater and greater levels of hierarchical organization. The mind's fundamental building blocks are control schemata for motor patterns. He defines an ecological music perception and gives examples of how active engagement in music and dance differs significantly from cognition in an abstract, de-situated setting. He shows how microscopic sensitivity to musical timing is essential (on the order of a few milliseconds) to entrainment, chunking and identity in improvisation.

Entrainment means that we engage in situations that give us the ability to interact socially. When we hear dance music we want to dance, when we hear rhythms our feet start tapping. Humans know how to start and end together when they clap, even to synchronize the patterns according to the rhythm. Iyer (2002) suggests that we react to the groove by moving in a pattern suggested by the groove, and not according to some sort of hierarchical abstract thought, based on what has traditionally been referred to as higher levels in the hierarchy.

Iyer writes: "For musical performers, the difference between musical and human motion collapses to some degree; the rhythmic motions of the performer and the musical object overlap" (Iyer, 2002, p. 395). The quote implies that a body in action creates musical ideas while moving, and that the music also affects the movements. Based on this Iyer suggests *heterarchical* interconnectivity (combining conscious and unconscious processes) between body and mind instead of the traditional hierarchical representation of motor control.

Pressing saw musical improvisation as a result of combined top/down processing and bottom/up processing and shared these thoughts. Decision-making can, in other words, be transferred between different levels depending on the needs of the particular situation. Pressing used the notion *coalition* for this process (Pressing, 1988 p. 136). Coalition implies that improvisational choices are very much based on which activities are physically executable at the time a given choice is made. Coalition implies

both heterarchical activation (horizontal activation) and hierarchical activation (top/down) depending on situation, according to Pressing. Similar observations have been done by Sudnow (2001) in his introspective study of learning to play the jazz piano, by Godøy (2008) in the notion of goal-postures, and by Ed Sarath (2010) on actuality, possibility, and probability in improvised jazz.

In the same way as we hear melodic ideas with a start and end, a body in movement will normally finish a motor movement once started: it is very hard to stop in the middle of an action. The movements are according to such a view chunked (preprogrammed) and highly effective when not being disturbed. This makes it possible to think of musical actions as formed by gestalts or chunks, triggered by the setting's schema. By forming categories or similar examples of appropriate responses to a situation, action are improved and the appropriate response to a situation can be done without considering each new situation in all its detail. Such schemas have evolved from natural selection of survival instincts and are referred to as neural-Darwinism by Gerald M. Edelman (1987) and David Huron (2006).

Godøy has proposed a triangular model of cross-modality at work in chunking and the formation of schemas. This means that when we hear something, we form an auditory and visual image in our mind, and even imagine how the action of the sound is carried out (Godøy, 1997). This resembles the multi-sensory qualities of an *auditory scene analysis* (Bregman, 1994), where we as humans are dependent on all senses to survive. We hear a sound, imagine it as a threat or not, situate the sound in space by forming a vivid image, and then imagine how we should react.

We do not even need to hear the music in a physical sense to imagine the music in a lead sheet. By forming an image of the music, we embody the signs; we not only read the notes, we also hear them as music and imagine the related actions forming micro movements in our body when doing the activity, according to Godøy (1997). This is also confirmed by recent research on motor movement. As Margaret Wilson and Gunther Knoblich state, "[. . .] not only do pianists generate motor imagery in response to hearing familiar pieces, but this motor imagery actually anticipates and precedes the unfolding melodic event" (2005, p. 467).

Forming a vivid image of the music then naturally also involves forming schemas of groove and beat, where assimilation in an oral tradition is

crucial and not so easy to represent on paper. This is often intuitive and unarticulated knowledge gathered by immersing in a living culture (Berliner, 1994). How much of this oral tradition is based on schemas seen as musical rules, and how much is based on chunks seen as musical patterns? In the following I will first describe rule-based improvisation and then pattern-based improvisation.

4.5.1 Rules

According to Johnson-Laird (1991) decision making has to be linked to rules to be effective in jazz improvisation. Rules are important because the brain can't make conscious decisions about everything happening at the same time. For Johnson-Laird it is enough to know the basic rule of a major tonality if you want to improvise over chords that belong to that major tonality, as long as you define some additional rules accompanying the main rule. Johnson-Laird (2002) argues that two main constraints are responsible for shaping the improvisation in tonal jazz. The first one is the underlying chord progression and procedures related to scales, chord-tones and passing notes. The second deals with generating the selected tones in prototypical jazz rhythms. According to such a perspective,

1. a) The scale should be played mostly in a stepwise way occasionally with interspersed tension notes (tones outside the scale).
   b) Interval leaps (huge) should be played mostly with tones belonging to the scale and especially chord tones.
2. Apply in a rhythmic manner found in the jazz style played.

This means that the rule concerning details in the chord structure is abandoned for an alternate rule: know the basic major scale with the two above additional rules for elaboration. Johnson-Laird's theory is based on a core, the tonality, but it also accepts tonal and rhythmic variations of the principle, and is therefore highly flexible. Just like schema theory it offers structural generalizations of how things normally work. In this case one does not have to think about individual choices on each chord because the different chords share the same scale (tonality).

Johnson-Laird (2002) also defines expectations as a central component of jazz improvisation; we have a set of rules in our vocabulary as improvisers, where we generate patterns based on habits, thus resulting in schema

expectations every time a similar situation occurs. This means that we tend to use some favorite phrases over and over again, based on their prominent place in the hierarchy. It is not only the phrases, but also everything connected to the situation using these phrases. Chunks as part of motor schemas indicate a multisensory and learned approach to improvisation; we have experienced it before, learned the setting, and are prepared to use the schemas again when needed.

Johnson-Laird defines this as a function independent of working memory. The time constraints do not allow the time-consuming process of comparing earlier phrases with incoming phrases. By relating jazz to rules, the improviser according to Laird does not need to check temporary results; he states, "instead of a list of fragments of rhythms, motifs, and so on, the algorithms described make use of rules" (2002, p. 440). Looking at the tune used in this project, *All the Things You Are*, the highest node in the hierarchy is a rule saying that playing the A♭-major scale sounds fine over the first five bars of the tune. There is no need to recode this information, whatever happens in the improvisation. The improviser has been involved in chunking at an earlier stage, forming a vivid representation of the tone's entire form in a series of recodings on several levels in the hierarchy, from a small harmonic unity to a larger part and finally to the entire tune. According to Huron (2006, p. 128) this is also the way the brain works; simplicity is preferred to complexity. We generalize about how things work, and as long as it is functional and can be coordinated or bound within sensory events, we prefer the simpler solutions.

Sudnow seems to agree with Johnson-Laird. He learns to trust his skills in real time by understanding a principle and following the principle until it is internalized, making stimuli-response chaining almost redundant on this principle—i.e. understanding a substitute principle on a II-V progression, and linking practical execution of many different melodic patterns on to this principle until it is internalized. Sudnow's detailed description of skill acquisition in jazz piano suggests, according to Hubert L. Dreyfus (2001), that the common way of describing skill acquisition in cognitive theory all the way from Socrates to Descartes to Husserl and Piaget has the phenomenon upside down. This does not mean that learning from specific cases to abstract principles (bottom-up learning) is wrong, but it shows, as in Sudnow's case, that learning can be done both ways.

Critics of rule-based improvisation claim that the improviser does not rely on rules, but more on embodied patterns that are triggered by a schema that contains a cognitive image of sound and a corresponding motor realization. Pressing (1988) is a proponent of such a perspective and thinks that due to severe time constraints the improviser needs pre-learned structures, especially on tunes with fast tempos.

4.5.2 Patterns

Being in the moment, bound within a sensory event, experiencing a chunked sequence, is, according to Carol Krumhansl and Ed Kessler, established within three chords and a few seconds. This is also the case with rhythm and meter (Krumhansl & Kessler, 1982). This means that a typical II-V-I progression is enough to establish a firm foundation of tonality. An entire II-V-I progression is normally treated as a single harmonic chunk or pattern to improvise over by an experienced improviser. Other typical patterns in jazz are based on recurring progressions like the previously mentioned formulas—turnaround (I, VI, II, V), turn back (IIIm, VI, IIm, V) and back door (I, IVm, ♭VII) progressions—which are variations of the tonal cadence (I, IV, V, I) found in Western music, according to Coker (1997). The most common progression in jazz, the II-V-I cadence, compromises approximately 75 percent of all chords used in standard jazz tunes (Coker, 1964, p. 75).

Recurring patterns in harmonic structure allows the improviser to execute pre-learned patterns, licks or ideas frequently. The language analogy is obvious: one learns patterns of speech and uses these patterns more or less without thinking in spontaneous conversation based on familiar topics. It is obvious that one cannot keep the details of grammar open all the time in working memory. If one has to define whether one is using a verb or substantive when speaking, the working memory capacity would soon break down due to overload. One has to simplify, and according to such a view, this basically means improvising patterns in the amount of time defined by the setting.

Instead of asking whether jazz guitarists use patterns or rules in improvisation, this project focuses on how they combine patterns with rules according to various strategies. My approach is based on findings that suggest that improvisers use both rules and patterns depending on context. For example, the two most frequently cited strategies for improvising, as

described by professional jazz musicians in Martin Norgaard's PhD study, were "like having a bunch of Legos and how the Legos can fit together" and "weaving through the changes" (2011, p. 119). The first one indicates patterns based on using well-learned ideas from memory, and the second chooses notes based on a harmonic priority seen as rules for improvising over changes or a chord progression.

But this raises another question: how are discrete movements combined to create novel, improvised behavior that uniquely fits a given situation? What information is stored in the brain that enables such complex behavior? Based on the information so far it seem as if there are at least three approaches to these questions, where Pressing and Iyer suggest that we store musical patterns in the brain that are triggered by the musical setting, Johnson-Laird suggest procedures based on musical rules in tonal jazz, and Norgaard suggests that both strategies are used.

To more closely explore how improvisational material is created, I first will examine relevant research on motor behavior and how movements can be integrated with an auditory image. I then discuss some of these findings related to neuro cognitive processes in musical improvisation.

4.5.3 Motor schemas

Richard Schmidt and Tim Lee (2005) argue that instead of learning specifically programmed movements, people learn generalized motor programs or schemas by comparing various parameters of a movement and the corresponding outcomes. They propose two memory schemas—the recall schema and the recognition schema—and believe that a schema stores four components of the motor act:

1. The initial conditions of the movement. In the case of music, the placement of fingers on the instrument, which prepares the body for action.
2. The response specifications, which means information about the task to be executed, such as speed and force.
3. The sensory consequences of the response. In the case of music, how it is felt during performance, i.e. finger movements, images and sound of a phrase.

4 The response outcome compared to the intended outcome. This involves evaluating external feedback compared to internal expectations and knowledge of result. For example, did the phrase turn out as expected?

The above processes are vital in decision-making and for synchronizing movements initiated by the musculoskeletal system. To be effective for the improviser most of these processes need to be internalized beyond conscious control. The very limited processing capacity of working memory is compensated for by a host of unconscious motor control processes that most of the time interacts with it below the level of awareness. Because we have, by definition, no access to these subliminal events, it is easy to underestimate their importance. Yet these motor schemas very much shape jazz improvisation by defining constraints in physical execution. In jazz improvisation the level of motor control is associated with levels of improvisational expertise.

4.5.4 Levels of improvisation

The development from novice to expert, according to Richard Schmidt (1975), goes through three schema stages, which are nearly identical with improvisational stages suggested by jazz educators Paul Rinzler (1989,2008) and David Baker (1988).

Schmidt refers to level one as the *cognitive phase*, involving a declarative "what to do" orientation and is often quite rigid in execution. He suggests that this phase has the most dramatic gains in the learning process. Level two is called the *associative phase*, and the challenges are now the different contexts. Related to improvisation, the improviser has much more knowledge but still uses it in a stereotypical way. The intermediate improviser has problems in repeating the licks in another key, and on another standard tune because he has not developed strong or flexible schemas for this type of playing. The third level Schmidt refers to is the *autonomous phase*; everything is thoroughly digested and used sensitively and in a coherent way. Related to improvisation, this means listening deeply, linking part of phrases together in entirely new ways based on what is happening in the moment. Expert performance at the third level involves deep coding, or elaboration of the information that we like and are used to thinking about, and therefore have superior recall for. Going through these

three stages in learning jazz improvisation is well described by jazz pianist Walter Bishop Jr.:

> It all goes from imitation to assimilation to innovation. You move from the imitations stage to the assimilation stage when you take little bits of things from different people and weld them into an identifiable style – creating your own style. Once you've created your own sound and you have a good sense of the history of the music, then you think of where the music hasn't gone and where it can go – and that's innovation. (Walter Bishop Jr. in Berliner, 1994, p. 120)

Going from *imitation*, getting involved and copying solos and behavior of musical idols, to *assimilating* this knowledge with your own ideas and *innovation*, finally creating original contributions, are important processes in jazz improvisation. I believe Bishop's statement also can be seen as a critique of some of the trends in jazz pedagogy. Beginners are unfortunately sometimes starting with a visual approach, assimilating jazz theory at the expanse of imitating models heard on records or in concerts. According to Bishop beginners need models for improvising within a style, and theory can rarely substitute for a real inspirational listening experience where dynamics, articulation and sound are important parts. Assimilation is then a natural next step, refining and developing the best ideas imitated, singing and playing them over and over again in all ranges until they are internalized. When ideas are internalized, the mind can focus on innovation, bridging ideas that were formerly apart.

Automaticity may result from frequently generating chunks from memory or through reorganization of schemas to create rules that facilitate rapid production. Both processes probably occur with the end result being the same; practise leads to automaticity in retrieving memorized material. For jazz musicians this also happen through *transposition* strategies, which implies learning the song form in different keys, generating redundant patterns on formulas, learning rules based chord and scale theory, or creating variations by recombining smaller elements to form new entities. Automaticity can be seen as a shift from controlled processes relying on short-term memory to automatic sequences in long-term memory (Pressing, 1988).

On an expert level, jazz pianist Fred Hersch refers to this automaticity as, "it's like you've got this third ear that oversees the whole business—the craft part—and that tells you what to do when you solo" (Berliner, 1994, p. 207). According to Hersch, the third ear's various concerns include blending

bodily movements and emotional energy with the logic of musical ideas and keeping them in balance. When improvisers reach peaks in their solos, they must be able to think in action and eventually ask where they can culminate this peak in performance. Being both intuitive and analytic in performance is then a delicate balance; the third ear is like a central executive checking the different parameters of the performance in this process, i.e. breathing patterns, bodily movements, development of ideas, coherency, etc.

According to Andrew Goldman's study on advanced jazz pianists, motor movements and flexibility work best in familiar keys when improvising. When these advanced jazz pianists played over a play-along track of well-known "Rhythm Changes," Goldman observes:

> Jazz pianists employ different strategies depending on the context in which they are improvising. In the familiar key with the familiar motor context, the participants had auditory imagery linked with motor plans. They were able to play according to their auditory imagery. In the absence of familiar motor patterns in the unfamiliar key, improvisers used their explicit knowledge of chord tones and scales to improvise. (Goldman, 2012, p. 367)

They could hear the music in the unfamiliar keys as well but they did not have the motor program available to execute those auditory images and were not able to play them. Within the unfamiliar keys they relied on declarative knowledge, deliberately choosing tones that fit within the tonality. In the familiar keys they relied on procedural (how) motor programs stored as patterns based on procedural (rule based) knowledge, according to Goldman. Familiar keys allow for flexibility by giving more tags for the memory during performance. But how are these images controlled, and how is dexterity and fluency possible?

4.6 Motor control

Motor control organizes coordinated movements and skilled actions. Most models for explaining motor control envision a refinement of information processing from a distant goal "play the imagined phrase," to a more detailed motor plan "move horizontally on the first string," to even more detailed production rules. John R. Anderson uses the concept of proceduralization and composition to describe the gradual process toward automaticity in action (Anderson, 1996). According to Anderson's view the multi-step process of forming production rules reach automaticity and final destination

when there is no need for consciously calculating the intermediate steps. In many ways this concept resembles the notion of a chunked action where a chain of actions are reduced to a few or a single sequence as training progresses. This linear and hierarchical process is also referred to as *motor program approach* (Gibet, 2010, p. 218).

Nicolai Bernstein (1996) set the basic principles for the modern study of motor control. He describes the plateaus, delays and occasional regressions that occur when learning complex motor skills. The plateau is Bernstein's way of describing learning of skilled movements as a process where the skill is suddenly manageable because all the constituent elements are assembled. In other words the process does not proceed in a gradual smooth way. Attempting to speed up the motor skill level might very well lead to delays and occasional regressions because the body needs time to get used to the new motor schema.

Like Schmidt, Bernstein proposed the need of all movements to be adaptive and flexible and therefore likely to be schema based. We rarely repeat exactly the same thought and same movement, only similar ones. This is also a key component of jazz improvisation, since the skill requires spontaneous movements triggered and directed from aural sources, where at least some part of the movement will be novel. Whatever is being played, a chunk in the improvisers mind should be readily available at the right point in time, reflecting both the sound and motor execution. In order to achieve distal outcomes, for example to play an instrument in order to produce sound, Bernstein suggests five core ideas related to action.

- *Chaining*: In this concept, borrowed from Sherrington (1906) but used somewhat differently, he suggests that after numerous repetitions of a movement, the motor cortex will sooner or later develop dynamically stable movement patterns. Bernstein sees actions as movement sequences tied together in chains, where different movements replace each other depending on the need of the situation, leading one to a solution to the problem. If you miss a link in such a chain, or mix the chain's order, you will most likely fail to solve the problem (Bernstein 1996, p. 146).
- *Adaptive variability*: Improvising in a standing position or in a sitting position demands slight alterations of the technique, but the schema involved makes the basic operations work under different conditions. Adaptive variability is very much related to

high-level improvisation in the form of flexible motor execution, i.e. playing the same phrase with different fingerings. As previously discussed, Iyer believes that this adaptive variability also changes the direction of the phrase itself (Iyer, 2002, p. 395).

- *Recursion*: This is the ability to run back single chunks in motor schemas. Motor schemas are based on the ability to replicate certain elements of the action and generate new ones in action. Schon (1983) refers to this as "thinking in action." In improvisation this monitoring is crucial for shaping the solo's direction, since it enables alternative routes in the moment of playing.
- *Action trajectories*: One of the core ideas in Bernstein's theory is that only target actions (goal of actions) matter, with trajectories of different limbs being flexible and interchangeable, although they normally take the shortest/straightest route to the desired goal.
- *Stabilization*: According to Bernstein (1996, p. 198), stabilization is the last phase of skill elaboration. Stabilization is a critical concept for explaining automaticity in actions, and a desired outcome is achieved within a cascade of intermediate steps that converge in a decision. The implicit action and the time-consuming activity of chaining the action is a slow and elaborate process, normally involving thousands of hours for experts. Once realized, however, it can be triggered in a fraction of a second.

The main point in Bernstein's functionalistic theory, which stresses the pragmatic perspectives of body coordination, is that the body is able to produce a novel series of movement (correctly, quickly and rationally) unlike those previously rehearsed when a new situation appears. Bernstein's focus on *dexterity*, the ability to find a motor solution for any external situation, including adequately solving any emerging motor problem, are often merged into a three-component information-processing model for explaining motor skills (Solstad, 1991). These three stages can be seen as input (sense organs), processing and decision making (central nervous system), and motor output (muscle system). The most important point of difference between fixed performance and improvised performance is probably the output part where sensed sounds are set into cognitive representations and defined as music, which constructs and triggers the next action sequence. Movement control by the central nervous system is complex, and it is only

in the last decade that neurocognitive research has shed light on musical improvisation.

4.6.1 Neurocognitive aspects of improvisation

Asking jazz musicians what they think during improvisation is normally answered as, "I just play." But this does not mean absence of thinking. Studying motor control and visually guided finger movements, Grafton (1992) et al. have shown that the neural activity in some cases in fact increased when one would expect it to decrease in action which includes automaticity. This is strange, since automaticity is normally achieved when there is no need for thinking during action. As automaticity occurs there is less need for chunk creation, since the chunks are already available in long-term memory. Guida et al. (2012) claims that the numbers of chunks that can be held in working memory do not vary with expertise, but the size of the chunks will become larger, and then the number of chunks needed to represent this information decrease. According to Guida et al. we will find a decrease in neural activation in the prefrontal and parietal areas. However, this is only the first stage in advanced skills; templates will increase neural activation, since these templates also can link to plans, moves, and strategic and tactical concepts. Guida et al. suggest that functional reorganization of the brain is a characteristic of all types of expertise:

> Finally we would like to add that we believe that the sequence going from a decrease of brain activation to a functional reorganization involving LTM areas is the road to expertise that all individuals take when increasing their knowledge towards excellence in a domain. Even if inter-individual differences exist, the sequence is general. (Guida et al., 2012, p. 239)

I have come across two studies on the neurobiology of musical improvisation that aim to locate the neural activation during improvisation, and both of these studies overlap in several places. Charles Limb and Allen Braun (2008) examined what centers in the brain were activated while a jazz pianist was improvising. They used functional magnetic resonance imaging, fMRI scanning, to detect changes in blood oxygenation and flow. At the same time, Aaron Berkowitz and Daniel Ansari (2008) also used fMRI scanning to conduct a similar study to see how classical-trained musicians improvise. Both studies combined observation and execution tasks among the same participants, and included fixed playing (no improvisation) before an improvisational task was given.

Both studies showed activation in several regions of the brain while the musicians improvised (Limb and Braun saw changes in neural activity in over forty regions), thus suggesting distributed processing in motor tasks. In both cases the researchers found most blood activation in the medial prefrontal cortex that is associated with self-expression, higher-level goals and intentions. They found deactivation in the lateral orbital prefrontal cortex and dorsolateral prefrontal cortex, which is associated with regions involving self-monitoring, which includes planned action and correction. Limb and Braun discovered activation in visual areas and language areas, even though their eyes were closed when improvising. These two studies of brain imaging thus correlate well with artists' experiences of improvisation. Being creative is shown by higher blood levels in the medial prefrontal cortex. Being an observer to one's own process is shown by a deactivation of self-monitoring and is shown by a decrease in blood flow levels to the brain's lateral orbital prefrontal cortex and dorsolateral prefrontal cortex regions.

4.6.2 Possible negative effects of schemas and chunking

Schemas allow economical recall, but this ability has its price. We remember the gist, and fill in the details, very often systematically misremembering. Neurologist Henry Head described the model we have of our body as extremely resistant to what it sees as discordant information (Head & Rivers, 1920). An implication of Head's research is that the brain is able to construct a reality independent of the accuracy of sensory information. Sometimes we see what we want to see, or hear what we want to hear, and not what we actually see or hear.

Fredric Bartlett (Bartlett, 1932) demonstrated that memory is both selective and recreated. What we remember is not necessarily the facts, but our recreation of the facts to fit our existing schemas. This is not a passive process, and it is very much based on our values, emotions and ideas ahead of the actual situation. We see our memories in a different light as time proceeds and in fact every time we remember them. In a neurocognitive perspective Gerald Edelman and Giulio Tononi note, " . . . every act of perception is, to some degree, an act of creation, and every act of memory is, to some degree, an act of imagination. Biological memory is thus creative and not strictly replicative" (2000, p. 101).

Schemas can musically lead to stereotype playing. Paradoxically in jazz, this means that the thorough preparation done in practise, working out patterns in all keys, learning typical chord substitutes, having all scales under command, might affect spontaneity. "It is one of the great ironies associated with improvisation; as soon as artists complete the rigorous practice required to place a vocabulary pattern into their larger store, they must guard against its habituated and uninspired use" (Berliner, 1994, p. 206). This happens because the schemas are released faster than imagination. It can become a stimuli-response type of action, where the player only plays pre-learned phrases almost without thinking and without being completely present in the situation.

In sight-reading, Sloboda has demonstrated a similar phenomenon known as the *proofreader's error* (Sloboda, 1985). The well-established schemas for how the music should sound makes the expert sight-reader look ahead in the score in such large chunks that he does not detect the errors placed in the music. The performer plays part of the music based on stereotypes and not on what he or she is looking at. Actually, amateurs are better in detecting these errors than experts because they process smaller chunks, on the size of 2 to 3 notes ahead, while professional often make visual chunks of 7 notes ahead according to Sloboda.

Improvisers, and to a certain extent sight-readers, are working without preparing explicitly for the performance. They need to adapt to the changing environments and develop strategies to cope with the situation, for example by changing dynamics and tempo. Identifying patterns without checking the details includes inference, anticipation and guessing. It has been demonstrated that readers are more likely to misperceive letters occurring in the middle of a word than at the beginning or the end of the same word (Sloboda, 2005, p. 15). In the same way, Sloboda has shown that identifying notes that are accidently altered in a musical score is most difficult to spot when they are located in the middle of right-hand phrases for pianists.

Reflecting on this process from an improvising perspective, I quite often imagine phrases ahead with a defined beginning (including exact visualization on the fretboard) but leave it to harmonic and rhythmic impulses from the other players to shape the actual form of the phrase. My movements are then being shaped by both stylistic conventions and embodied cognition. As long as my schemas are confirmed, interacting does not pose any problem. However, I find that my ability to recognize and infer

patterns based on stylistic knowledge of form also makes me more sensitive and distracted by irrelevant information.

Sloboda has suggested that professional sight-readers change their perceptual span by interpreting the musical structure first and then changing their perception according to the situation at hand (Sloboda, 2005). In improvisation this is known as *targeting,* an ability to imagine where the beginning and end of phrase should be and how it will sound in relation to the underlying harmonic structure. Talking about targeting in improvisation, my interlocutor Rez Abbasi says, "[. . .] I use targeting in my phrasing; I try to look ahead of where my phrases are going to end." Targeting is, according to Abbasi, something that characterizes great artists. Reflecting about the famous saxophonist John Coltrane, he says "he also has this capacity of targeting the phrasing; he knows instinctively where to go, and you can feel it in his music."

Knowing instinctively where to go was in Coltrane's case based on transcendence, the ability to move beyond the confines of accumulated practise. At the other end of the scale, targeting can also describe improvisation without sensitivity to context. Phrases are performed and heard as clichés without any connection to what is happening in the rest of the band.

If the current schema acts as a filter for information, then only those aspects that we can comprehend or are able to act upon will be attended to. Simply stated, one cannot play the alternative if one has no idea of an alternative way of playing a specific phrase. On the other side, learning many examples and approaches to the same phrase ensures a rich and detailed schema.

Having formed a listening template for a specific tune, the aural information can trigger motor schemas in the same way as visual patterns can trigger hand movements. If music sounds strange, the brain can adjusts the information to fit existing schemas. The creative part of memory transforms and rationalizes parts of the information to make it more coherent. In this way schemas become adjusted and rationalized narratives, which allow us to think of our past as a continuous and coherent string of events. This happens because the brain is embodied and reacting continually to a complex world, according to Edelman and Tononi (2000).

4.7 Improvisation, chunking and schemas

The improvising context is very much defined by schemas; the main challenge with a schema is the broad definition of what a schema is. It is semantic memory and based on episodic memory; it is subjective and creates expectations. A schema is knowledge at all levels, from ideologies to the meaning of a particular musical phrase at all levels of abstraction. According to Rumelhart, all of our generic knowledge is embedded in schemas (Rumelhart & Bly, 1999). In addition to scope and flexibility, schemas have been applied across multi-disciplinary areas that could also be interpreted as a weakness or inconsistency of the theory. This makes it hard to precisely define what constitutes a schema and how it changes dynamically based on a variety of impulses.

On the other hand, the outcome of novel behavior seems to be generalizable to a certain extent, indicating an underlying similarity or function. Schemas and chunks provide these underlying constraints and at the same time offer flexibility to an improvisational setting. Schema theory assumes that we need structure to make sense of experience, and experience to make sense of structure, and proposes that individuals break down information into generalizable chunks that are stored in long-term memory for later recall. A schema is the network of chunks, the associations that connect separate chunks to time and place.

In a real context there seems to be a dialectical tension between the experience of improvised performance and the knowledge and strategies used in that process. In this chapter, I have described different ways of looking at how chunking and schemas are interconnected. Schemas facilitate chunking by offering a familiar context, while chunking enables schema formation by defining hierarchies within the schema. For the improviser the goal is to provide as much information as possible with the least cognitive effort. Chunks are combined to create novel sequences that match the given moment in a given context. Berkowitz states:

> Yet not only is improvisation evolutionary adaptive, but evolution itself can be considered improvisatory. The seemingly infinite diversity of organisms result from novel combinations of genetic and molecular elements under constraints of structure, function, and environment, some constant, some constantly changing. Improvisation thus represents a fundamental force of nature through which the finite becomes infinite and the elements of the

> everyday can be constantly combined into new wholes greater than the sums of their parts. (Berkowitz, 2010, p. 183)

We need schemas to define context and chunks to operate in a coherent way inside this context. This is because the number of decisions far exceeds what is possible to handle consciously. As basic skills (involving chunking) are internalized, more attention is paid to (schema) context. On the expert (template) level, multiple chunks regroup into domain-specific retrieval structures and are accessed according to what happens in interplay with pointers to episodic long-term memory. Based on extensive experience and frequent generating experts are able to access long-term memory with the ease and high speed typically possible only for content in working memory. Most importantly the theoretical concept of long-term working memory shows that experts can use it on-line without interference, (interference is a fragile component in working memory), and by this making it well suited for explaining the processes happening in jazz guitar improvisation.

The inquiry into structural aspects of jazz improvisation has shown that

1. Jazz performers' knowledge is highly organized in deeply integrated schemas that provide an overview for the performer.
2. Jazz performers are sensitive to chunks of meaningful information. This includes detailed information about the different parts contained in the schema.
3. Jazz performers' knowledge is ready to be used when needed because it contains information about when it will be used in the form of *templates*, based on frequently generating domain-specific patterns.

In my opinion, the most fascinating aspect of improvised actions is the body's capability to react fast and combine or join intricate actions within fractions of a second. How schemas, chunks and templates work in the severe time constraints of jazz improvisation will be further discussed in the next chapter.

5 Aspects of time

The organization and capacity of memory has a profound effect on how the improviser perceives patterns of events and boundaries in time. Memory affects how the improviser decides when groups of events end and when other groups of events begin, and how these events are related in the moment. It allows decision making by comprehending event sequences as chunks and having expectations about what will happens further in the improvisation. The structure of music affects memory, and memory affect the way musical decisions are made. How do performers balance intuitive presence with analytical overview, involving implicit and explicit knowledge when improvising? What is the essence of this improvisational presence? Is it a shift from being intuitive to analytical, or is it a mixture where the musical now is more or less colored by one of these states of being?

Experience of time in jazz has not been covered extensively in musical research. However, there is a substantial amount of research in related fields, especially in cognitive psychology and phenomenology, linked to how we understand a single moment in time. In this chapter these perspectives will be inquired and related to three different time-level categories referred to by Godøy (2009) as micro, meso, and macro time. Godøy relates perception or actions of single tones to the micro level, a group of tones to the meso level and entire melodies to the macro level.

At the *micro level*, Godøy (2009) identifies features like pitch, timbre, synchrony, order, etc., but also the immediate time scale of rhythm. This sensory register lasts from 0 to 0.5 seconds. At the *meso level*, rhythm, phrases, riffs, and motives are formed into chunks at a melodic and rhythmic level. These are typically within a time frame of 0.5 to 5 seconds, but most

commonly referred to as the three-second window reflecting short-term memory processes. The third is the *macro level* where we can find a melody, a section, or an entire work, according to Godøy. This can be seen as the formal level reflecting long-term memory processes. These levels correspond to sub-chunk, chunk and supra-chunk level, as discussed in Chapter 4.

In this chapter I will focus on beat placement, accenting the beat ahead, on or after the main pulse at the micro level, melodic and rhythmic phrasing at the meso level and architecture of the solo (storytelling) at the macro level. Beat placement, phrasing and architecture of solo are all essential in making the solo coherent. These levels also operate at a simultaneous level, as demonstrated in the ability to swing.

5.1 Swing

Jazz music often stresses the two and four of the bar, at least in be-bop and swing music. The rhythmical phrasing is typically characterized by ending the phrases on an upbeat or offbeat, which ensures rhythmic continuum. The rhythmic feeling in swing affects almost everything concerned with phrasing, including the placement of consonance and the way dissonance is used within the phrase. The swing feeling is derived from subdividing quarter notes into a dotted triplet, accenting the first and third note in the triplet, rather than into two eight notes. Depending on type of performer, style played and tempo, the swing feel can change from almost even eights to very accented swinging eights.

Listeners familiar with jazz can easily identify when it is swinging, even though they typically cannot explain it in the way musicians can. This aspect is just as important as the notes that can be notated and reflects an important aspect of jazz and many oral traditions: It's not so much about *what* is played but *how* it is played. It's a way of playing that triggers a hard-to-define feeling in the listener. When being asked about his relationship to time, jazz guitarist Pat Metheny says,

> Well time . . . that is a big one, maybe the main one. To me, the way musicians ultimately sound is about how they perceive time and how well they are able to listen and live within the time. And I mean that on the most micro level and the most macro level. To play great swing time with a

> rhythm section is still a rare quality that within jazz is only achieved by the very best players. (Metheny, 2006, p. 195)

Metheny argues that the ability to play great swing time is only achieved by the few. He also states that the ability to perceive time reflects an ability to listen to what is going on in the moment and live within the time, being able to respond to what one experience in the moment from the micro to the macro level. When a musician is grooving, the minute rhythmic variations on all these levels are in time and also captivate the audience. I will now define micro, meso and macro level time as related to the improvising musician. Micro time is related to musical feeling, meso time to musical phrasing and macro time to musical style.

5.1.1 Micro timing

In jazz improvisation, rhythmic expression occurs at a very finely nuanced and rapid time scale. For swing, the placement of the tone or accent related to the beat is crucial. Small adjustments on the range of milliseconds can change the music's entire feeling (Iyer, 2002). An improviser who places his accent ahead of the beat will produce an entirely different feeling in the music versus an improviser who places his accent on the beat. The first one will produce a feeling of eagerness; the second will be more neutral, while an improviser who places her tone behind the beat will sound more laidback. The adjustment is on a micro level, but it affects the music on all levels.

How can we assimilate and produce actions on a very fast time scale when our monitoring of the same actions is not available to our conscious mind? This relates to a well-known challenge in motor control, affecting serial order in behavior and is a discussion that began with Karl Lashley's critique of simple stimuli-response and the need for anticipation in motor control. In Chapter 4 we saw that both Schmidt and Bernstein suggest that this is possible because parallel actions are chunked together in action schemas (automatically) triggered by the context. Beat placement is something that immediately triggers a feeling; it is something that reminds us of something we have heard before. Beat placement is contained in our schemas of what jazz music is supposed to be.

We have schemas of older jazz styles where the beat placement is ahead of the beat, as in Dixieland, schemas of traditional swing from the thirties

where the accent is on the beat, and schemas of bebop and modern jazz where the placement is behind the beat. Asking a jazz fan where the beat placement is found in the music will probably not make sense for her. Beat placement is essential for the music's feeling, but explicit knowledge is only necessary for the musician who needs to adjust phrasing in relation to the parameters of style. Robert Gjerdingen and Dave Perrott (2008) carried out an experiment to see how fast people could identify style. They presented brief random musical segments from samples of ten different styles, including jazz, classical and rock music. They found that listeners make very quick decisions about style; they needed only 250 milliseconds to make a decision.

> It takes about 250 ms or more to say the word "word". In such a short interval a popular song may present only one harmony, perhaps only a tone or two in the bass, and perhaps only a tone or two in the melody. At a moderate tempo of 110 beats per minute, less than half a beat will fit within 250 ms. By almost any interpretation of music theory, this time interval is too short to allow for a classification of genre.. . . Yet the participants in this study accomplished this and similar tasks with relative ease. (Gjerdingen and Perrott (2008, p. 98)

Gjerdingen and Perrot suggests that it is the *timbre* that is most important in this recognition process, containing all the spectral and rapid time-domain variability found in the acoustic signal. They conclude their investigation by stating "in a manner reminiscent of Gestalt effects, it would appear that listeners can achieve a global categorization of genre at least as fast as they can categorize any component feature" (Gjerdingen & Perrott, 2008, p. 100). Huron even finds that a listener is able to extract huge amount of data from a single sung tone (Huron, 2006). These observations do not corresponding to much of the patterns that musicologists have stressed as distinguishing different musical styles, namely large-scale musical form, phrase construction and cadences. Huron, Gjerdingen and Perott believe that the meso and macro levels are important for further information about the music but not as crucial for style identification as previously assumed. What is it that constitutes this immediate musical presence? I will start with Edmund Husserl, "the father of phenomenology" and his discussion around now-points.

5.1.2 Now-points

Husserl was fascinated by the temporality of music; in his writings he often refers to melody and tone perception. A perceived tone is an instance of temporal distribution, according to Husserl:

> Each tone has a temporal extension itself. When it begins to sound, I hear it as now; and the now that immediately precedes it changes into a past. Therefore at any given time I hear only the actually present phase of the tone, and the objectivity of the whole enduring tone is constituted in an act-continuum that is part memory, in smallest punctual part perception, and in further expectation. (1991, pp. 24–25).

The last sentence in this quote is quite central for the improvising musician, as it hints at a tri-partite model which Husserl calls *retention*, *primal impression and protention* of music. In short it explains how consciousness retains the sense of the first note as one hears the second note, a way of hearing that is also enriched by an anticipation (protention) of the next note in the phrase. Primal impression is the perception of the tone before it has been appropriated by reflection. This "act-continuum" can be seen as a *now-point* and as a privileged point of orientation.

For Husserl past and future events are modified when they are present in the now-point as retention and protention. If we do not have now-points in our mind, we would be submerged in continuous streams of tones. Musical patterns like melodies, chord progressions, intervals, etc. would be almost impossible to identify. A now-point is then a single moment in time, defining the state of our system at a particular point in time. Husserl's main point is that perceiving and thinking are experienced as a series of now-points. We hear and see by chunking our sensations and mental images into compressed now-points distributed in time. We anticipate future events, and this expectation or protention enables us to be surprised when approximate understandings are readjusted, for example when improvising over a well-known standard tune.

The subjective experience of time is crucial for the improviser, where actions are planned according to the past and future as they unfold. Experience of time is quite different from standard objective analysis of time where time moves along at a constant rate. Even though the immediate past can be experienced in the present, it is in a different mode from what was originally experienced. The greater the elapsed time, the less details are heard in the echo of the past. Husserl's retention corresponds to what is called *sensory*

memory, which includes *echoic memory* and *iconic memory*, with ability to store an image of the immediate past up to several seconds, although it usually decays in less than a second (Snyder, 2000, p. 4).

Actions on the micro level are for the most part defined by relations and situations that are not paid much attention to. They are hardwired and happen automatically as we categorize perceptual cues from the environment (G. M. Edelman, 1987). At this time level there is little internal consciousness of the external world. It is simply a bodily existence with little internal reference to anything outside the body itself; it is pure action or sensing. As French anthropologist Pierre Bourdieu says, "principles embodied . . . are placed beyond the grasp of consciousness, and hence cannot be touched by voluntary, deliberate transformation, cannot even be made explicit" . . . (1977, p. 94). However, musical ideas and their corresponding qualities may become salient for the improviser if they provide information that can guide further direction in the solo. If the musical content of the ideas are paid attention to, they become solidified. Saliency provides an estimate of how relevant previously heard musical qualities are to what is expected further.

How can we see pure action as related to consciousness in improvisation? In the foreword to Dave Sudnow's book *Ways of the hand – A Rewritten Account*, Hubert L. Dreyfuss states that when jazz improvisation reaches its peak, "[. . .] there is finally no longer an I that plans, not even a mind that aims ahead, but a jazz hand that knows at each moment how to reach for the music" (Sudnow, 2001). Dreyfuss comments on the issues of the lived body as a conscious "I."

> In the course of his detailed phenomenology, Sudnow implicitly corrects a subtle but surprising error in Phenomenology of Perception. Merleau-Ponty occasionally characterizes the lived body as an "I can" whereas Sudnow is clear that it is not he but his hand that reaches for the jazz. . . . The only way to account for Merleau-Ponty's misleading characterization of the egoless agency of the skilled body involved in a task is that, for reasons we cannot explore here, he took over the expression "I can" from Husserl, who did think of all action as produced by an ego's aiming at a goal. (In Sudnow, 2001)

Husserl uses the expression "I can," and this might imply that all action can be produced "by an ego's aiming at a goal." What about all the actions one does without conscious intention? How can the ego interpret something that has not reached consciousness? Husserl states that all knowledge is a mental

experience: Knowledge belongs to a knowing subject (Husserl, 2001, pp. 24-25). Merleau-Ponty states that all knowledge is a bodily experience, and "I can" is a part of this experience. "Indeed it is not possible to build motion out of static perceptions . . . Motion is nothing without a body in motion which describes and provides it with unity" (Merleau-Ponty, 1962, p. 27).

According to Merleau-Ponty's view, perception is deeply ingrained in action, and ideas are remembered as part of this bodily awareness. Position and shape of fingers on the instrument in the now are determined by recent action, and position and shape in the now determine preparations for future actions. This fusion of micro-level actions and sounds are often sub-conscious. Sometimes I am surprised to find my hand being in position well before playing a phrase. It feels like my hand has prepared for the difficulties involved in playing the particular phrase by anticipating the position required for generating the action. The problem from a research perspective is that it is hard to see or observe this "surprise" beyond music-related actions; subjective reflections are needed to catch the phenomenological experience involved.

5.1.3 Introspective micro time

Time is often the first thing that suffers when execution is not fluent. Identifying the details of movement in time is hard because it is based on habits beyond explicit control. I experienced this phenomenon some years back when I felt my phrasing was not rhythmically in time. I played with an accent that was laid back but not in a good way, sounding forced. Reflecting on this I started to notice that I picked the strings harder than necessary when playing single lines. My right shoulder sometimes got locked when I was instigating particular phrases, and this was especially evident in my "double-time" phrasing. I felt the pressure to make the phrase very rhythmically, and by doing so my picking became forced and rigid. All these movements were just a part of my playing style and not conscious at all. Analyzing the micro movements, I found that instead of letting the pick return back as a result of the connection with the strings, I forced the movement back from the string by using unnecessary energy in the movement.

Hitting one tone on one string can be seen as a chunked motor action consisting of several movements in order to produce a tone. In my case

the tone's production had too much tension buildup before picking it, and too little energy release after being picked. I was focusing on accenting my phrasing in a particular way, but the way I did it made my phrasing worse.

Another observation was that when these 16th notes passages were played, my left forearm pressed the guitar away from me, making me holding the guitar neck much more firmly than necessary. In fact, by doing so I was working against the free left-hand movements I had been practicing for years after reading Mick Goodrick's (1987) influential book *The Advancing Guitarist*, focusing on moving the hand back and forth on one or two strings. Reflecting on my time, I found that I was forcing the movement in this direction too, directing the hand instead of being directed by the energy of the movement itself. This also affected my breathing; I kept holding my breath until the phrase was finished.

I then began to imagine micro finger movements on the guitar, moving the fingers back and forth over one string being guided by slow movements and only occasionally land on a fret when I heard the tone as a part of my larger forearm movements. Touching the strings slightly and allowing the string's resistance to push my finger back produced the tone itself. Most rewarding in these exercises was the focus on breathing. I found that my arm movements were freer when focusing on the breathing patterns and that this energy even made me more aware of the music being played. Most importantly, my timing became much better by focusing on these micro movements in time.

Summing up, for the micro-level aspect of time, timbre seems to be the most important aspect for style recognition. Beat placement is another key feature in this process, defining upbeat and the triplet feeling of eights as essential in swing. Relating to the main beat is essential because the main beat defines both hand movements and musical phrasing. Actions on this level are mostly defined by habits and are hard to define explicitly. Detailed introspective analysis of "thinking on action" is, however, possible and can give substantial information about implicit actions as demonstrated above. Upbeat versus downbeat phrasing will be further inquired in the Chapter 8 analysis of the guitarists' solos.

5.2 Meso timing

Although sensations unfold in time, chunks are also perceived and conceived immediately in now-points. Coarticulation can explain part of this phenomenon, where micro-level actions and sounds are fused into the meso level by being paid attention to and experienced as acts in a continuum. How much can we reasonably monitor in this continuum of own actions while improvising? This is hard to define exactly, because it is a subjective process, and much of the time it is an automatic subconscious process.

Benjamin Libet has shown that continuous conscious monitoring of motor movements is first possible after 0.5 seconds (Libet, 2004). This means that conscious control is too slow for the continuous monitoring of single-tone events; it has to be chunked in some way. According to Libet the speed potential for action is *hard wired*, based on biology, and is faster than our conscious mind. This has been shown in several studies measuring temporal consciousness. Marc Jeannerod has demonstrated that the conscious mind is about 3 to 400 milliseconds later than the neurons firing the action (Jeannerod, 2006).

Giorgio Marchetti (Marchetti, 2010) has criticized Libet's research and argued that even if Libet's experiments show a biological potential for action that is faster than consciousness, people participating in the experiments are informed about the intention of the research (time and consciousness) and thus form a readiness potential for action ahead. This schematic feed-forward enables the nerve circuits to react faster, according to Marchetti. Related to improvisation, it is possible that the same mechanism is operating: We prepare for action when we enter a context where we are supposed to generate improvised actions in a fraction of a second.

Jason Brown, who has a background from neuroscience, is much in line with Marchetti. He suggests that schematic expectation anticipates short-term memory and perception. "Instead of perception laying down memory, memory lays down perception" (Brown, 2010, p. 12). We group incoming information according to what we expect (schema based) rather than to what we actually hear and see. Browne's definition resembles Merleau-Ponty's notion, "we remember events into perception" (Merleau-Ponty, 1962, p. 21). Schemas in long-term memory then actualize perceptions; the schemas, seen as for example "head-solo-head out" (theme – variations – theme) in jazz improvisation, are in this way antecedent to conscious

experience. We do not normally ask about these issues when improvising together. They are instead "rules of the game." In this way, much of what we perceive is going from long-term memory to short-term memory and finally to perception. This involves inverting the traditional information processing view.

Obviously, there are many philosophical issues associated with Brown's perspective on perception. Reflection makes us aware of what we already are; sensing is recognizing, according to Brown. And when "memory lays down perception" this means that the pre-reflective defines the reflective constrained by the experiences of the individual who is interpreting. According to Schechner most experiences like these are bodily based, based on lived experience (Schechner, 2006, p. 141). Schechner has studied improvised and staged behavior in theatre and sees most of the actions as *restored behavior*. According to Schechner this means we engage in actions and ways of moving that are meaningful. We remember the movements that reach a desired destination and try to forget the movements that go nowhere.

In his introspective accounts of improvisation, Sudnow shares Schechner's view that it is the body that remembers. Sudnow learns improvisation by imitating the movements of jazz pianists. Schechner states that actors learn huge amount of texts by doing the movements that correspond to the text in the play; the ways of moving trigger the words and the images in the actor during performance. In both cases it is the body and action that cues the conscious mind. It is embodied and pre-reflective. Jazz drummer Max Roach states that playing is like having a conversation responding to this embodied and pre-reflective self.

> After you initiate the solo, one phrase determines what the next is going to be. From the first note that you hear, you are responding to what you just played: you just said this on your instrument, and now that's a constant. What follows from that? And so on and so forth . . . It's like language: you're talking, you're speaking, you're responding to yourself. When I play, it's like having a conversation with myself. (Berliner, 1994, p. 192)

When improvising, one needs to instigate patterns–forming the music as well as being formed by the music in an embodied way. Longer phrases are more difficult to generate, since more constraint is put on the memory and mental agility required to transform it. In the improviser's mind a chunked phrase is heard as a unit and the hand is used to generate it as a

unit, but sometimes the music changes direction and the very same phrase sounds out of context. Two things are happening at the same time: a need for finishing the imagined phrase (finger memory) and a need for changing the fingers' direction in the middle of the movement (auditive memory) based on what is happening musically. Robert Levin, who is an improviser in the baroque tradition, describes this process as "a highly explosive sort of relationship" where you have to be in the moment both mentally and bodily, but with the right balance. This involves trusting the fingers to do the actions without any delay:

> When I play, I am reacting . . . your fingers play a kind of, how shall I say, a potentially fateful role in all this, because if your fingers get ahead of your brain when you're improvising, you get nonsense or emptiness. If your brain gets too far ahead of your fingers, your fingers break down, because they're not keeping up with your train of thought. So the two of them have a rather essential and highly explosive sort of relationship . . . I do not for one millisecond when I'm improvising think of what it is I'm going to be doing. (Extract from Robert Levin interview . . . in Aaron L. Berkowitz, 2010, p. 123)

The quote above shows the importance of body-mind synchronization. Levin's statement might indicate that his coordinated finger movements follow a movement grammar that is linked to syntactical rules in the music. When the musical grammar and the movement grammar do not align, the "essential and highly explosive sort of relationship" breaks down.

In a lever-moving task, Charles H. Shea and Gabriela Wulf (2005) showed that the longer a sequence is, the more specific the movement information has to be in the associated schema. Most importantly they found that the more complex the action, the more dependent it was on being performed by the same effectors (organ, cells). In many cases this is tacit knowledge; we just do it without thinking. Thinking might stumble the continuity, and Merleau-Ponty even goes as far as to say, "thinking a movement is destroying the movement" (Merleau-Ponty, 1962). This is also known as choking.

5.2.1 Choking

Choking describes how performers can suddenly start to make mistakes by beginning to doubt their own abilities (Baumeister & Showers, 2006). A single action of moving the hand from one chord to another on the instrument can suddenly stop because one thinks about what one actually does in the movement, and also what happens if one does not reach the right

chord. Choking might seem a bit strange in this context, when looking at this situation from an outsider's position. Considering the simplicity of the action, the short distance in time and space, and the performer execution of it thousands of times without even thinking about it. The same would probably happen if you had to walk on a board 20 meters above the ground. You know how to walk, but a new setting makes a significant change in how you perceive your basic knowledge.

Merleau-Ponty believes that when consciousness enters the mind, a movement's automatic flow suffers. The fragile point is that attention resources are allocated on the wrong place and at the wrong time. Instead of trusting the body to perform actions, one starts to rely on continuous feedback and a constant monitoring on own actions. The immediate actions become less fluent because one is questioning the actions in the moment of performing them. Sudnow shares Merleau-Ponty's view on automaticity and finds that problems occur and flow is slowed down or interrupted when the mind interferes with the hand's directions. Most actions, except for very simple skills, are more fluent when focusing on the schema rather than the kinematic details. Focusing on the kinematic details might lead to choking. Using organizing metaphors for guiding the improvisation, like "go for it" and "play more laid-back," seems to be a way to control the natural unfolding of movements in time.

In jazz improvisation Sudnow insists that the mind must stay on the imaginative level, the hand on the production level, ideally being able to carry out actions without any delay. In the beginning Sudnow reaches for the chunks or segments of the sound, like scales or chords as a whole. He then goes to an intermittent phase where he combines chunks of sound and finally to highest level of internalized actions performed by a skilled body. The hand's movements are a result of the entire body movement, moving back and forth, singing and breathing with the phrases. Being able to focus entirely on the development of a solo, "doing singing with the fingers," also helps to keep choking away, Sudnow says:

> From an upright posture I look at my hands on the piano keyboard during play with a look that's hardly a look at all. But standing back, I find that I proceed through and in a terrain nexus, doing singing with my fingers, so to speak, a single voice at the top of the fingers, going for each next note in saying just now and just then, just this soft and just this hard, just here and just there, with definiteness of aim throughout, taking my fingers to places, so to speak, and being guided, so to speak. I sing with my fingers, so

> to speak, for there's a new being, my body, and it this being (here too, so to speak) that sings. (Sudnow & Dreyfus, 2001, pp. 129-130)

For Sudnow the many "presents" of progressively richer and more detailed bodily movements result in "singing fingers." His fingers are being guided by a single (inner) voice "taking my fingers to places" and by a body allowing his mind to be "guided" by a single inner voice. As previously mentioned, Paul Berliner (1994) defines this single inner voice as the singing mind, and defines it as an archetypical trait in most great improvisers.

5.2.2 Phrasing in real time

According to Berliner phrasing in real time can be seen as collaboration between a cognitive mind (thinking an idea), a singing mind (hearing the phrase with the "inner ear") and an embodied mind (doing the actions). In his view, a theoretical concept might be the starting point for an improvisation, like deciding to play a certain triad and then the singing mind might take over and choose the next tones from an aural image and extend the triad to a coherent phrase. The cognitive and analytical mind approves the action and prepares to repeat the phrase in another location on the instrument, recognizing that it is out of range; the playing fingers then have to transform the pattern in a fraction of a second and perform the phrase to fit the range of the instrument, according to Berliner. The body is adjusting to the whim of the moment, alternating between expectations, decision making, recognition and feedback. Paul Berliner describes this process vividly:

> On one occasion, I had no sooner begun a phrase designated for my solo's eight measure than I found myself playing another phrase altogether, one that I had practiced rigorously months earlier and then abandoned. What was interesting about the maneuver was that the intended phrase and its inadvertent replacement, although comprising different melodies, began with the same finger pattern sequence. It was as if my fingers considered the two phrases to be logical equivalents on this basis and switched me from one to the other with the ease of a signalman switching a train to an adjacent track. (Berliner, 1994, pp. 208–209)

According to Schmidt and Lee (2005) this describes an *open-loop control theory*, suggesting that one needs attention only for initiating the beginning of the action. Although feedback is involved in this open-loop process intermittently, time constraints prevent ongoing movements from being modified. In other words, they are chunk-based and triggered as a single

action. This makes it reasonable to believe that the body stores motor schemas that can be triggered faster than any conscious thought. Berliner continues his reflections by defining the importance of the body in improvisation.

> In another instance, when I was practicing a long Lee Morgan solo from memory, my fingers leaped smoothly and directly from the first half of a phrase in one solo chorus to the second half of another phrase in another chorus. Only then did I realize that the two phrases contained a fragment in common that, serving as a bridge in performance, led me instantly across all the intervening material and created a new phrase in the process. These incidents illustrate the body's capacity to dictate with great assurance during improvisations by giving momentary primacy to the physical logic of patterned movement over the strictly aural logic of melodic form. (Berliner, 1994, p. 209)

Schmidt and Lee (2005, p. 182) suggest that due to time constraints and complexity involved in the action itself, movements like this are very hard to generate if the individual chunks are not pre-learned. Feedback is simply too slow for the on-going regulation of such rapid movements. General levels of improvisational expertise also affect this capability of monitoring feedback. That is, an advanced improviser has the ability to imagine precisely how a phrase should sound in advance, and also the ability to immediately hear what has to be done to change the phrase to match intended output.

5.2.3 Introspective meso time

Allowing the body to be a guide involves losing some of the conscious analytical mind. As an improviser, I am faced with the dilemma of giving in to the situation or controlling it. This can be experienced when phrasing in up-tempo tunes. Sometimes the tempo is so fast that a bridging note would have joined a phrase in slower tempo, but in high-speed tempos I need to create a rest. As a performer I am living inside an imperfect situation in real time, to reach the right fingering. The tone's placement in time is regulated by beat and metric pulse. The hand movements are regulated by the placement of these beats, known as *goal postures* (Godøy, (2008, p. 124). My hand typically moves between phrases on an upbeat, and the trajectories between my phrases are more like a comma than a period. The hand is finishing a phrase at the same time as the next phrase is heard with the inner mind, preparing a new configuration of the hand's position. In this way my hand's movement and my thinking are often in two different places.

I have found a challenge in being in a present now, colored by some moments of flow, and my own analytical thinking in the situation. The two ways of relating to a present as experienced in a moment may be quite demanding; sometimes I have found myself reflecting on my own playing, instead of giving in to the moment and just play. The analytical part does somehow disturb the essence of being in the moment, but being completely in the moment seems to make the structure of the improvisations less interesting.

I sometimes start to sing along with my guitar when musical ideas stop in my imagination. Usually this is not intentional; it just happens. By singing the phrases, I feel an attachment to something more organic in my playing. It is like breathing life into phrases that normally are only in the fingers. The phrasing changes character by being shaped and restricted by my own breathing, almost like performing on a wind instrument. Through the singing, the inspiration comes back and I continue in my soloing without necessarily singing any more. It seems as the vocal part has connected my body into the improvisation again.

Singing also happens on the other end of the scale when I experience an inspiration so strong that I have to sing the ideas. The singing works as a backup for ideas that I do not want to disappear. A question I have asked myself is whether I sing the ideas that I hear from the inside, or if I imitate the ideas that are being played on the instrument. What comes first? Is it ideas created by fingers in movement or musical ideas transformed by fingers in movement, or a combination of the two? I believe some ideas are heard and translated to the guitar, while other ideas are in the fingers and direct me. It is a very special kind of being in the moment; I play the guitar, "but the guitar also plays me." I act toward the guitar, but the guitar also reacts by responding immediately to my actions.

As an improviser I experience embodied moments when my fingers play coherent lines beyond my conscious grasp. My fingers are moving based on a procedural "how to" memory that is activated when my hands touch the instrument. The improvised lines are released by the settings and the severe time constraints of real-time performance. When the sounds and the settings are right, the music is "going by itself." I can concentrate on the larger timescales of music.

Summing up the meso level, phrasing in meso time seems to be dependent on pre-learned patterns to some extent, since monitoring of single tones is impossible on a note-to-note basis. The faster the tempo, the more it is based on long-term memory representations seen as schemas. The body executes patterns based on finger memory and can make connections beyond the conscious mind, switching from one phrase to another based on similarity in execution. The longer the phrase, the more its genesis depends on using the same fingering. However, living inside an imperfect situation the improviser needs to create shortcuts like pauses to reach the right fingering. It seems as though improvisers are combining a cognitive, singing and embodied mind to generate phrases. Reflecting on own phrasing, singing the phrases seems to give more substance to the phrasing; it also affects the length in phrases and space between phrases constrained by own breath. When the music "breathes," it allows both the performer and listener to digest ideas in relation to the overall form or macro form.

5.3 Macro timing

Chess studies have shown that it takes 50 milliseconds (ms) to encode a chunk into short-term memory and 250 ms to encode a chunk into a template slot (Gobet & Simon, 2000). In improvisation this could mean that one needs 50 ms to recall a familiar phrase and 250 ms to make variations on the same phrase, according to context. This context greatly affects improvisation and is an important part of macro timing. Within 250 ms the improviser can make choices that affect the solo's overall direction. Observing improvisers' actions and studying transcriptions of their solos is a way to illuminate their overall *pacing* design, balancing play and rest activity to add intensity and direction in their solo.

Andreas C. Lehmann and Stephan Goldhahn (2009) researched pacing in relation to professional jazz improvisation, framing the question: When do performers have time to think during performance? Their research focused on written transcriptions of famous solos—12 choruses of John Coltrane's *Giant Steps* and 5 choruses of Miles Davis's solo on *Someday My Prince Will Come*. The average length of John Coltrane's phrases was 3.0 seconds and for Miles Davis it was 3.4 seconds. These phrases were shorter than noticeable breaths in phrasing which was around 5 seconds. This might indicate that

it is not the physical capacity of breath itself, which define phrase length but possibly some other structures. The research questioned if improvised solos are chunked in a way similar to language, reflecting the performer's and listeners' cognitive constraints. They found that musical chunks, which they refer to as playing bursts, are slightly longer than those observed in speech. According to Fenk and Fenk, speech is an average length of between 2 and 5 seconds, and with a content of 5 complex or 10 very simple syllables, whereas music is between 5 to 11 notes within a 2 second span (Fenk & Fenk, 2005, p. 2476).

Their research also found that more novelty was most prevalent after longer pauses and in the beginning of a new formal section. This suggests that it might be an underlying representation of form similar to musical composition or storytelling in improvisation. The improviser knows the salient structural places in the composition and situates their most innovative ideas in these places, i.e. cadences. At the same time the improviser may consciously try to surprise the listener with odd placement of phrases that are in conflict with the underlying scheme. If this is the case, is it possible to say that the phrases are more chunked in places like this? According to chess theory, situating a template chunk in an unexpected place demands allocating a lot of resources in working memory. It might be plausible to suggest that an already strained working memory will select well-known phrases on well-known places in the song form, in order to avoid additional load on working memory.

For the improviser the ability to keep the macro perspective alive in real time is a challenge. Balancing intuition in the moment with distribution of ideas over time is very much dependent on automaticity in execution, which allows for allocating resources in working memory to the solo's overall structure. Dedication, planning, self-efficacy and commitment are the most important psychological characteristics of such performance, according to Pressing. He states:

> The accompanying feeling of automaticity, about which much metaphysical speculation exists in the improvisation literature, can be simply viewed as a natural result of considerable practice. A stage at which it has become possible to completely dispense with conscious monitoring of motor programs, so that the hands appear to have a life on their own, driven by the musical constraints of the situation . . . In a sense, the performer is played by the music. (Pressing, 1988 p. 139)

Studies on the use of patterns by expert jazz improvisers playing guitar (Finkelman, 1997), saxophone (Owens, 1974) and piano (Goldman, 2012) align with Pressing's view of automaticity, describing longer action sequences as a concatenation of smaller sub-movements. These sub-movements are stored as general motor programs or schemas. According to Shea and Wulf (2005) these are effector independent and contain relative timing, sequence and force information, except for longer phrases as discussed earlier. Automaticity allows for "being in the music" in a special way, often referred to as moments of transcendence where the limits of micro, meso and macro chunking seem to be less important. When the performer "is played by the music" it is also referred to as flow.

5.3.1 Flow

Mihaly Csikszentmihalyi (1996) describes flow as a state of mind in which a person is fully immersed in a feeling of energized focus and a heightened sense of involvement in the activity being carried out. Time is experienced as something coming from the inside, where the present is heightened and the past and future are perceptually subordinated according to Csikszentmihalyi. The uniqueness of time perception and the feeling of time coming from the inside are elaborated by Pat Metheny:

> To me, when I think of someone like Roy Haynes—his "time" is his own. He owns it, every nanosecond of it. And he can offer it in connection with a personal story that gives it weight, or he can offer it as a human being that is equally conversant and interested in the things that make this moment in time unique. (Metheny, 2006, p. 195)

A unique personal time is, as I read it, an ability to use variety in tempo and space on a macro level, and adding variety by placing the accent ahead, on or after the beat, depending on musical context on the micro level. When the performer "owns the time" and is able to communicate it, it also affects the listener. According to Metheny it a rare trait to be able to communicate time with a "personal story that gives it weight" and that makes the "moment in time unique." Preconceived ideas might actually disturb the emergence of new ideas during performance. Jazz pianist Keith Jarrett states:

> When I go on stage, if I have an idea in my head, it's going to be in my way. Those notes and feelings come to the player, come to the improviser, if he lets them. But if there's an idea in the way, those notes and those feelings

> will be restricted to whatever that idea started to be. (In Noice et al., 2008, p. 76)

Jarret indicates that one should be careful about forcing what one is doing in a specific direction, as this delimits one's scope of other possible ideas. Most probable, the harder one tries, the less it will be happening. Rather, he suggests an open mind that allows for letting the power of flow direct one's playing. These reflections seem to indicate a very intuitive way of improvising, resembling Sudnow's notion of "singing fingers" and Merleau-Ponty's notion of "embodied mind." Allowing the idea to appear in mind without force is sometimes referred to as *momentary intuition*. What then is this momentary intuition that can extend from a fraction of a second to hours? How can momentary intuition extend to such long durations? The ability to hear or imagine a longer piece of music in a sudden glance or vision can be explained in two ways: The musician has extraordinary ability to register sensory information or an extraordinary ability to make use of systems in order to remember anything. The first explanation is called an eidetic view; the latter is called a chunking view.

The *eidetic* view is based in a certain romantic frame of explanation, in which the music is realized in a moment of extremely vivid tonal imagery, often in a spirit of divine inspiration. According to Sloboda, (1985, p. 3) it can be seen as the persistence of especially strong imagery over time. Eidetic memory is also often referred to as photographic memory. Recalling all the details of a picture or words in a book after having a glimpse of it, or recalling a complete work of music with all details in a first hearing are examples of such an eidetic ability. In the book *A Composer's World* Paul Hindemith writes*:*

> A genuine creator . . . will . . . have the gift of seeing . . . illuminated in the mind's eye as if by flash of lightning—a complete musical form (though its subsequent realization in a performance may take three hours or more; [and] he will have the energy, persistence, and skill to bring this envisioned form into existence, so that even after months of work not one of its details will be lost or fail to fit into his photographic picture. (In Sloboda, 1985, p. 120)

The existence of an *eidetic store* that preserves raw sensory data without further processing has not been demonstrated so far, according to Sloboda. Even though composers and artists may describe this experience as a kind of immediate cognition, it is most possible a result of much experience within a particular field and an extraordinary ability to organize information. But

how does such a genuine creator's mind operate? Sloboda suggests that a genuine creator is "seeing" in the same way as many experts do when trying to store complex material in mind. That is, identifying musical patterns based on vast experience and the ability to identify unfamiliar groups of sounds by chunking them into familiar sounds. In the same way, Jazz guitarists link these sounds to particular visual patterns on the fretboard. They do not go from one position to another but take in larger patterns in one chunk, immediately recognizing different familiar groupings on the board. At a certain level the visual patterns become less important. Discussing the ear-hand relationship, my interlocutor Lage Lund says: "If I have to adjust, . . . move to a different place on the neck to play it then it's going to get in the way of the idea that I'm playing. Basically I can get the sound everywhere."

The chunking hypothesis assumes that this type of experience is most often a product of well-rehearsed work done ahead of the actual performance. According to Huron, four schematic expectations might be important in such a process (2006, p. 237). Schematic expectations arise from long-term semantic memory, for example musical structures combined in stylistic standardized ways, whereas *veridical* expectations arise from episodic memory, for example frequent encounters with the specific piece being performed. *Dynamic* expectations arise from short-term memory guided by a great number of repetitions and standardized ways of using dynamics in cadences, introductions, endings, etc. Finally, conscious expectations arise from long-term memory that immediately tells the performer if frequently recurring patterns of melodic shape, guided by common harmonic patterns, standardized rhythmical groupings, etc., do not fit exactly what they are supposed to fit.

The eidetic view sees macro chunking as altered states of mind leading to momentary intuition. The chunking view sees it as well-structured practise strategies that organize the performance. But is it either the one or the other? Maybe the right thing will be to think of the two processes as complementary. Musicians use musical structure as a retrieval scheme and have practised using performance cues to elicit this knowledge from long-term memory. Of course, this is not simply the logic of musical structure; it is emotion and learned behavior, where some of the behavior might be characterized as artistic and inspirational. To be in an artistic flow means to have the music under control in the actual performance. Talking about his

preparations for learning new material and obtaining a macro perspective on the music, Metheny says:

> The key to what it is that will allow me to get to my best as an improviser, is familiarity. I really need to know the material inside out and backwards and forwards, in order to get to the places where I know I can offer the best stuff. That, in my case, has never been an easy thing. I've never been what you call, "a quick study". I need to play over, and over, and over again, to get to where I've "got it". I can function and learn something pretty quick and kind of deal with it, but in terms of really illuminating the ins and outs of a particular set of chords, or a particular playing situation, for me to be at my best, I got to be able to just know it so well, that I can forget it. That means making a loop on a sequencer or something, or just playing it for hours, and hours, and hours, until it just disappears and that I'm not thinking about it. Until it's not an issue and it's just sound and that can take some time. I need to really prepare myself to do well. (Jazz Improvisation Magazine, 2004)

Ericson (2006) suggests that the most common way of achieving automaticity is by investing more time than what is needed for basic memory and organizing it in a sequential and logical manner, as described by Metheny. To be well prepared and over-learned is also the most effective strategy for overcoming performance anxiety that can stop the creative flow, according to Ericsson.

Being well prepared in jazz improvisation does not mean knowing exactly what is going to happen. On the contrary, the attraction is to enter a field where the unexpected is alive. For example, one does not always hit the target when aiming for a particular tone. As an improviser, one has to relate to the actual rather than imagined tone being played, and a new musical path has to be formed immediately. These insights can also be coupled with Alfred Pike's concepts of *intuitive cognition* and *prevision* from his *A Phenomenology of Jazz* (1974). These notions capture the improviser's ability to immediately discover and search for new fundamental qualities and possibilities for new development in a given musical event. Pike states:

> What is first given must be developed. The incipient jazz image has its future horizons, and the improviser successively changes his viewpoint as he strives for these horizons. The immediate perceptual field contains within itself the potential structure of future fields, (A. Pike, 1974, p. 89)

The improviser has to relate to the uncertainty of discovering the music anew, and whatever happens has to be alert for new possibilities emerging in the situation. As such, musical improvisation in the present is always in negotiation with the future. When improvising in a feeling of flow,

uncertainty and missed notes can be seen as paths for new possibilities. The jazz pianist Kenny Barron says, "if you play something you didn't really mean to play, play it again. If you repeat it, it sounds like that's what you meant to play" (In Berliner, 1994, p. 212). This is an important statement, since error correction is very demanding for the improviser's real-time processing, affecting both time and planning ahead (Pressing, 1988). It is much easier to repeat something than to evaluate what went wrong and then try out a new response to the specific situation. Most importantly, if one is occupied with error correction, less attention is paid to what is going on in the musical interplay.

5.3.2 The presence and interplay

In vibrant interplay situations there is something that immediately correlates between players, albeit in different ways. In the moment an improviser engages in interplay, he is transformed to a player constrained by the rules of the actual performance. Assimilated understanding of the rules used in the setting makes meaningful contribution to the interplay easier. Michael Csikszentmihalyi states:

> Contrary to what one might expect from its spontaneous nature, musical improvisation depends very heavily on musical tradition, on tacit rules . . . It is only with reference to a thoroughly internalized body of works performed in a coherent style that improvisation can be performed by the musician and understood by the audience. (Csikszentmihalyi & Rich, 1996, p. 51)

One gets a feeling for situations that one happens to be engaged in frequently. Improvising together with new musicians is possible and meaningful because they know the same tunes and the traditions of improvising over these tunes. In a hermeneutic tradition one person comes to an understanding with another about something they both understand. The situation is embedded with uncertainty in a way that is well described by the Swedish sociologist Johan Asplund: "I do not know what I have said until you have answered and you do not know what you have said before I have answered. You show me what I have said and I show you what you have said" (In Molander, 2008, p. 12). The quotation illustrates that improvisation often depends on others; one cannot entirely understand own actions before another shows them by responding to the same actions.

When jazz musicians are deeply focused in interplay, they are capable of transforming objects or creating new ones in novel ways. Musicians who have never met can interact and create new improvising environments on the spot. Hard to capture fully in words, these transformations seem to arise out of heightened physical movement and of exchange of a special kind of moving energy between the musicians who play. When these "magical" moments happen both players and audience quite often experience them. How is this possible?

Neurobiologists have in recent years postulated that a specific type of neuron in the F5 region of the Amygdala is involved in covert imitation and emphatic reactions toward others, in what is referred to as *mirror neuron theory*. According to Rizzolatti et al. (1996), we mirror ourselves in interplay situations by imitating movements of others, and even concluding movements not finished by other players. Research within mirror neuron theory proposes that a specific type of neuron is involved in covert imitation and emphatic reactions toward others. Whether or not mirror neurons exist is still heavily debated. Research within cognition seems to indicate, at least for improvisation, a distributed processing instead of a specific type of mirror neuron being activated (Berkowitz & Ansari, 2008; Limb & Braun, 2008). Some of these processes happening in real time might also be explained in form of *attuning* and *entrainment*, which explains how people gradually synchronize thoughts and movements when being together. This interaction is crucial in jazz improvisation and is a skill that characterizes the best players in jazz.

Responsive relationships in interplay require that each member of a group represents the others' actions and plans his actions in relation to what the others will do in real time. This involves the ability of rapid integration of actions produced by oneself and by others. As earlier mentioned, Berliner refers to this exchange of ideas as negotiation in the interplay; the improviser's ideas have to be negotiated with the overall sound from the rest of the band (Berliner, 1994). It is a switch between receiving ideas from the band and keeping the direction of one's own ideas. It is also a shift between monitoring one's own actions and the actions of others. Unexpected sensory changes, which might happen quite frequently in interplay, require 4 to 500 ms (Pressing, 1988). Balancing executive control of improvisation is then dependent on a hierarchical system that is flexible and can be allocated

several places, depending on the need of the situation—sometimes focusing on interplay and sometimes on monitoring one's own actions.

5.3.3 Introspective macro time

In my own playing I have found the macro level to be easy and difficult at the same time. If I establish a good groove with a melodic idea on top of it, the form almost establishes itself for a period of time. If I rely too much on preconceived ideas the solo as a whole seems to suffer, it sounds like ideas are pasted into a form without really belonging there. As I have developed as an improviser, it seems that I have more patience to wait for the good idea, and develop my phrases based on interplay and what is happening in the interplay. However, my experiments with form seem to develop up to certain limits. Retrospectively, I have found these limits to be harmonic points that are not sufficiently developed in practise. Improvising over these harmonic areas, I find my ideas to be more stereotypic and rigid than the rest of the solo. My fingers play the same ideas, and my ear connects to these finger habits and reinforces them, since my thinking is restrained to use certain harmonic solutions in these places.

One way I have developed routines for delimiting harmonic constraints is by using certain rhythmical figures throughout the form. These figures force me to use other fingerings and melodic ideas at these harmonically critical points. Establishing macro time is not a rhythmical feeling, since rhythm is not experienced beyond meso time. However, hearing a different time throughout the entire form and using it throughout the whole song form is possible. Sequencing rhythmical ideas establishes a feeling of coherency that sometimes is even more substantial than the melodic ideas used in the phrasing. These issues will be further elaborated in the fieldwork inquiry.

5.3.4 Improvisation and time

This chapter has described phenomenological aspects of time, and especially improvised (real) time. Real-time constraints are crucial for understanding jazz guitar improvisation; it is these constraints that place such a heavy load on the jazz guitarist's working memory in performance and separate it from more fixed (note-based) performance. The guitarist's knowledge has to be internalized and constructed in a specific way to allow for rapid and flexible

responding in fractions of a second in performance. Based on this chapter, three characteristics illustrate how improvisers deal with time:

- *The intuitive improviser*: generates ideas based on associating in the moment. This might be very creative but can also sound like arbitrarily jumping from idea to idea without an overarching plan.
- *The analytical improviser*: has developed strategies in practise, but the performance might sound stereotypic and not really open for impulses. Ideas are generated based on control—knowing when and where to use phrases according to musical structure.
- *The expert improviser*: can change course and remain open to new ideas according to what happens in the situation, ensuring variety on the micro, meso and macro level.

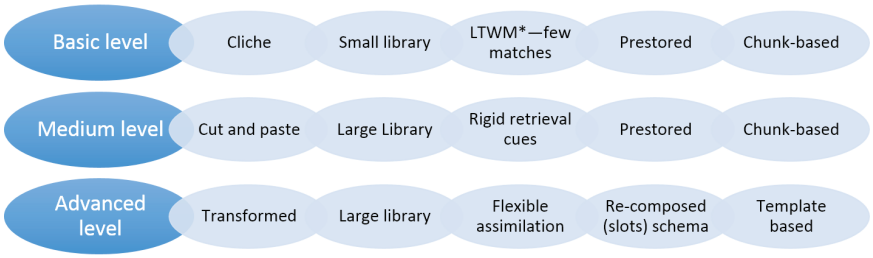


Figure 5.1 Basic, medium and advanced levels of improvisation. On the *basic level* the improviser works within rigid frames, and ideas are generated based on rigid execution of chunks. On the *medium level* the improviser has a large repertoire of ideas, although they are not necessarily linked to musical interaction. On the *advanced level* flexible assimilation of ideas from long-term memory are accessed and transformed according to what is happening in the musical moment.

These types of characteristics can be related to three levels of expertise in improvisation:

Only at the advanced level is improvisation really flexible within constraints. The improviser combines micro-level ideas with a macro overview while improvising. The improviser is less dependent on continuous feedback and can anticipate phrases (meso chunking) using targeting for the end of the phrases. At this level the player becomes more orientated toward external feedback since monitoring one's own actions is more controlled and skilled.

Having discussed the structure of chunks and schemas, and the critical time aspects of real-time jazz performance, the next chapter moves on to describe jazz guitar knowledge based on a standard tune. The chapter outlines choices and potential strategies that (normally) have to be understood and implemented in practise in order to be successful in performance.

6 Form

Jazz is not just, "well, man, this is what I feel like playing."
It's a very structured thing that comes down from a tradition
and requires a lot of thought and study.

(Wynton Marsalis in Berliner, 1994, 63)

The aim of this chapter is to analyze the harmonic form of *All the Things You Are* to find different knowledge representations of the tune. The analysis is primarily based on my experiential knowledge as a jazz guitarist for more than 30 years. The discussion of the tune's structure will provide the reader with the background information needed for understanding some of the questions I pose to the interlocutors in the fieldwork projects analyzed in the next chapter. The analysis is based on concepts discussed in the previous theory chapters and focuses on the formation of flexible retrieval structures or templates that might appear in different forms depending on the situation.

Tellef Kvifte reflects on form in music and the spontaneous creation of images that happens in music making, and he states, " . . . part of the process of learning to listen to and play in a specific genre of music, consists of the development of images that 'work' in some sense, giving us what we experience an understanding of the music in question" (Kvifte, 2001, p. 219). He further reflects on the importance of using the experiential knowledge of insiders in this process:

> Reading music theory, I sometimes get a feeling that 'form' is a relatively fixed entity, an entity that one may discover given good analytical tools and procedures that are applied to musical notation. But in a musical genre where music notation is no important part of teaching and transmission of musical works, such procedures seem irrelevant if the outcome is not in some way grounded in the experiences of insiders. (Kvifte, 2001, p. 219)

It might be argued that jazz music is no longer entirely based on oral traditions, and that music notation is an important part of jazz education. Still, I believe that the individual way of approaching this music based on oral transmission is highly alive. This chapter is my way of representing form and tradition. The chapter is divided in two main parts: the first deals mainly with *harmonic rules* and the second part with *visual patterns*. I will link the psychological concepts of schema, chunks and templates to musical form, symbolizing a movement from the psychological mechanisms that enable improvisation to how such abilities are acquired within a musical form.

6.1 Harmonic rules

6.1.1 Parts: chunks

All the Things You Are is a standard tune that entails many of the most common harmonic progressions found in jazz. The movement in circle of fourths is quite common in jazz; when I hear the bass movement in fourths, an expectation of a certain progression is already established. The most common harmonic formula in jazz, the II-V-I progression, is already introduced in the song's second measure. When I hear the minor quality in the second measure, I also know that the far most common minor chord in jazz is a type of minor seventh chord, so the educated guess goes for a minor seventh chord. Detecting a quality is then based on a combination of actual perception being coupled with a template in long-term memory, including a sound template with a defined name. Most people are not surprised of the sound of A minor seventh, but it takes an expert to correctly identify it with a name in different contexts. I can hear the II-V-I, but it is harder to identify exactly how this chunk is related to the rest. The concept of a fourth movement can be important in detecting the rest of the structure.

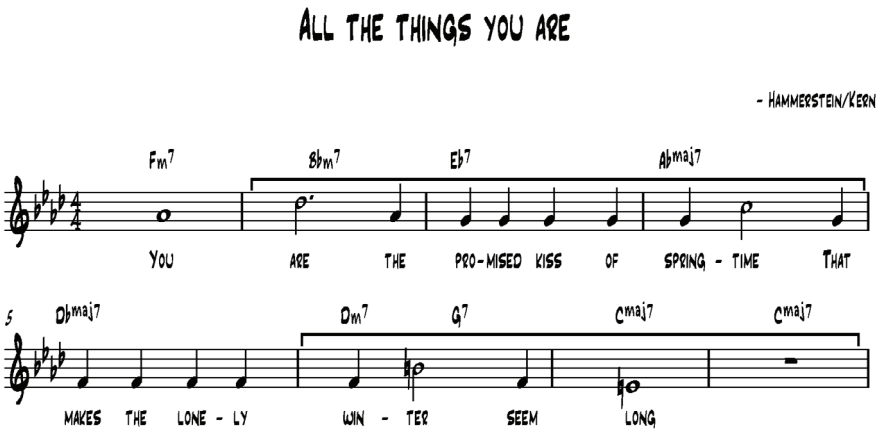


Figure 6.1 *Formula chunking*. The II-V-I progression outlines 75% of the information found in the first eight bars of the tune. The first II-V-I progression is in A♭ major (bar 2 to 5) the second in C major (bar 6 to 8). The line indicates chunk lengths.

By chunking the progression in form of a familiar progression, the II-V-I progression formula, we have outlined two chunks (see figure 6.1). However, we need to know the content of the other chords as well. By employing a different chunking strategy these chords might be included. The first five bar progression might be seen as a single chunk or image consisting of five chords within the tonality of A♭. The II-V-I progression outlines ⅗ths of the first tonality chunk and the entire second chunk. Defining the first and last chord (Fm^{7} and D♭^{maj}) completes the identification.

Formula chunking generate two chunks that have the same size, three bars each. Tonality chunking, as illustrated in Figure 6.2, generates one large

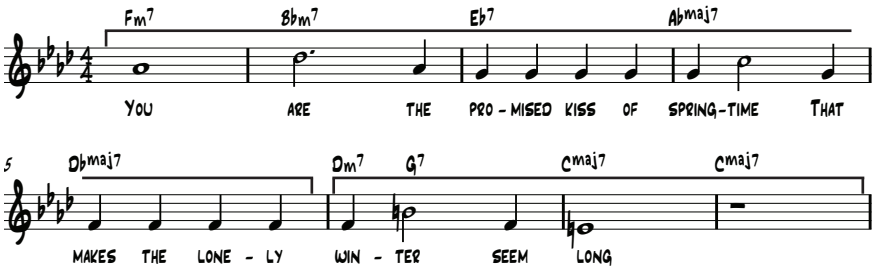


Figure 6.2 *Tonality chunking*. First five chords and three last chords are chunked together and define it as two tonalities: Ab major tonality (1 to 5) and C major tonality (6 to 8). The line indicates tonality chunks.

five bar chunk and a smaller three bar chunk. Reflecting on the need for symmetry, which seems to be universal in human processing (Huron, 2006), another solution appears, namely melodic chunking based on an equal 4 + 4 division as illustrated in Figure 6.3. The *antecedent phrase* defining the first half of the section ends with a temporary cadence (II-V-I progression) in bar four before the *consequent phrase* ends with a stronger cadence in bar 8. I will return to the implications of the different ways chunking can happen later in the chapter, when speaking of fuzzy boundaries and in my findings showing the guitarists chunking strategies. For now it is enough to mention that boundaries in time and structure are very much influenced by context.

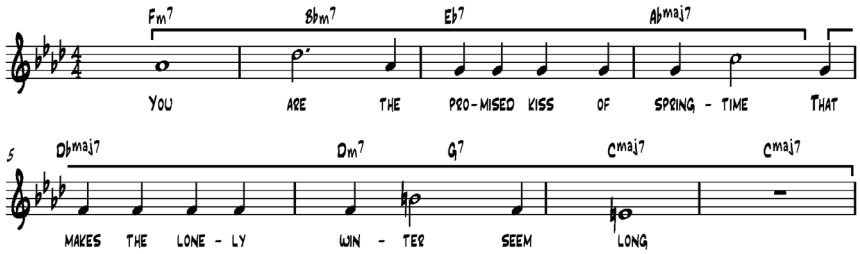


Figure 6.3 *Melodic symmetrical chunking*. By dividing the section based on melody, two equal four bar chunks appear: chunk 1, the antecedent phrase (You are the promised kiss of spring-time), and chunk 2, the consequent phrase (that makes the lonely winter seem long). The line indicates melody chunks.

Then we return to tonality chunking based on a five bar section. Table 6.1 indicates different levels of approaching the same harmonies, as tonality, bass notes, function, chords, modalities and movements. The bold text illustrates the II-V-I progression in the first tonality of A♭. Frequent encounters with the (bold) II-V-I progression simplify recognition of the entire chunk and speed up processing capacity.

Recognizing the progression and explicitly giving the progression a name is, however, only the first part of the process. This declarative knowledge has to be tied to a way of performing it; it has to be rapidly accessible on the instrument in improvisation. Some of the information has to be visualized in this process. Linking an auditory image to a visual image on the instrument is a time-consuming process. One of the most common ways is to imagine the bass movement and then imagine the underlying chords. The declarative knowledge is tied to procedural knowledge, and finally to motor knowledge

Tonality:	A♭				
Bars:	1	2	3	4	5
Bass notes: (Db pentatonic)	F	**B♭**	**E♭**	**A♭**	D♭
Chords:	Fm^7	**$B♭m^7$**	**$E♭^7$**	**$A♭^{maj}$**	$D♭^{maj}$
Function:	VIm^7	**IIm^7**	**V^7**	**I^{maj}**	IV^{maj}
Modalities:	Aeolian	**Dorian**	**Mixolydian**	**Ionian**	Lydian
Melody/lyrics:	You	**are the**	**pro-mised kiss of**	**spring-time**	(that)
Movements:	Chunk 1	**Chunk 2**	**Chunk 3**	**Chunk 4**	Chunk 5

Table 6.1 Hierarchical levels of chunking. On the top is the tonality, which offers the notes available for playing over the first five bars. The bass notes (root movement) are chunked as a Db pentatonic scale. Chords with function and modalities are triggered from the bass notes. Melody can be chunked with lyrics. Movements might be generated as single chunks. The II-V-I progression (outlined in bold) will often be chunked as one single chunk based on its frequency in tonal jazz.

in the act of playing. On the bottom level, separate action units defined as chunks can be integrated as a single continuous movement act.

Using the sol-fa system (do-re-mi-fa-so-la-ti-do) for linking tonal pitches (in this case the major scale) to a tonal function is quite effective (Norman, 2003, p. 108). The above progression will then be sung as (la-re-so-do-fa) and the common II-V-I progression will always be named re-so-do. The idea of having a name for a pitch is quite common in many musical cultures (Solis & Nettl, 2009). Naming pitches helps with identification and is an effective pedagogical tool. When teaching Indian music, it is quite common that the teacher only sings or says the syllables for the pitches and then the student translates these syllables to actual music on the instrument. The advantage of making a clear image of the music ahead by singing the pitches is that the emotional content and expression will be different. As mentioned earlier, Berliner refers to this as the "the singing mind" (Berliner, 1994). The instrument is viewed as an extension of the body and the imagined sound one hears with the inner ear. Transforming this image to the instrument gives the music expressive qualities.

> It may be possible to perform phrases on an instrument mechanically, the argument goes, by translating representations like chord symbols directly into finger patterns without prehearing the sounds for which they stand, but singing requires that artists both grasp the ideas firmly in their imaginations and invest them with expressive qualities. (Berliner, 1994, 181)

Semantic representation

Baker (1988) uses the term *total saturation* to refer to making a matrix of variations, which basically implies checking out many possibilities on a certain principle, progression or idea. Total saturation is a device used by players like Coltrane to ensure that knowledge is updated and executable at all times. According to Baker, Coltrane was constantly looking for extensions and alterations in his harmonic knowledge. By combining the matrix in all sorts of ways, he had a relatively steady image of the whole chunk, and was at the same time very much aware of how far down in the deep structure he was moving. For the advanced improviser the image of a chord in a progression might immediately generate function, with possible extensions and alterations.

Bars:	1	2	3	4	5
Basic level	Fm^7	$B♭m^7$	$E♭^7$	$A♭^{maj}$	$D♭^{maj}$
	VIm^7(la)	IIm^7 (re)	V^7 (so)	I^{maj} (do)	IV^{maj} (fa)
Extension level	Go	Cm	Fm	B♭m	E♭
Alteration level	Bm^7	Em^7	A^7	A♭/D	D♭/G
Combination	Fm^7 Bm^7	$B♭m^7$ E7	$E♭^7$ A^7	$A♭^{maj}$ D^7	$D♭^{maj}$

Table 6.2 Tonality chunk seen at a basic level with standard chords, extended level with top tones, altered level including tritone substitutions, and alterations combined with standard progression

In the above A♭ major schema (Table 6.2) everything is included from the previous schema (Table 6.1), but the chord tones and scales belonging to each chord, the bass line and harmonic movement in fourths are chunked and automatically processed when the chords are given. Due to more capacity in the working memory, the improviser can introduce some basic extensions and substitutions on the progression. The extensions are hierarchically built on the previous information. This means continuing to pick chord tones from the tonality (A♭) in thirds after the fourth chord tone. For example, when Fm^7 = F-A♭-C-E♭, then G-B♭-D♭; the improviser can add a triad on top of each chord based on his knowledge of tonality.

Alterations are built on the knowledge of making tritone substitutions on dominant seventh chords in a 2-5-1 progression where the bass line can be moved a tritone away, resulting in a series of altered chords when superimposed on the basic chords. Or as seen in the bottom of the table, where a combination of standard progressions and alterations are used

together, a chromatic approach is typically utilized for chords on an upbeat in the last part of the bar. I will elaborate on the harmonic implications later in the chapter. The total saturation principle can be seen as a variant of the "ars combinatoria" principle discussed in Chapter 4, and outlines how jazz musicians use recombination techniques in similar ways as in the baroque period, i.e. learning variations based on a prototype in all keys.

Production rules: if-then strategies

The improviser is working on three potential levels: a basic level, an extension level and an altered level. Going up and down in the hierarchy between a basic surface level and a deep structure, seen as extensions and alterations of the basic scheme, is a way of strengthening harmonic awareness. The connection between the three levels is made stronger by applying production rules in the form of IF-THEN (Sloboda, 1985). IF the II-V-I progression appears, THEN apply a tritone substitute. Even the tritone substitution will have a production rule: IF the IIm^7 chord appears, THEN move chromatically down to the seventh chord, then chromatically down to the I major chord.

Production rules are a way of understanding all the details involved in simple actions and can be extremely detailed, going all the way to describing details of the hand movements involved in performing the music. In computer science, chunking is a common way of describing the interconnections between all the possible factors that can influence a production system at any given time (Sloboda, 1985). Generating a chunked action is dependent on a coordinated auditive, visual and motor system. In each of these systems there will be different production rules happening simultaneously. For the improviser such detailed knowledge is probably processed at one stage in the process but is probably too detailed to have any practical use in the moment of playing. More general rules, like IF applying extended triads, THEN use them according to given tonality, are more practical for the improviser.

6.1.2 Overview: schemas

Knowing the chunks or different harmonic parts is important, but the parts are connected in a larger framework provided by the schema, which gives an overview of the larger harmonic context. Going back to the standard tune

All the Things You Are and further in the progression, we have a three-chord structure—a II-V-I progression in C major. This knowledge does not contain any new information beside transposition of the previous II-V-I in A♭ major to a new key C major. However, for the procedural memory it is a heavier load, relocating and finding new shapes and fingerings on the instrument in the new key.

Having worked out the first eight bars of the tune, the rest of the progression is very much a repetition of earlier material. Measures 9 to 16 are a repetition of the first eight bars transposed up a fifth, from (A♭-C) to (E♭-G), the bridge consists of two II-V-I progressions in G major and E major, with an ending bar using a $C^{7\sharp5}$ chord. The A♭ tonality chunk then appears again, and goes into an extended A section by using two interspersed chords: a D♭m^7 chord (D♭ dorian = B major scale) measure 30 and a B^{o7} in measure 32 (B diminished scale) between a Cm^7 in measure 31 (C Phrygian = A♭ major scale) before returning to A♭ major in a II-V-I progression and a dominant II-V G^7 to C^7 or $C^{7\sharp5\sharp9}$ (altered) in the final measure 36. The chunks are outlined as follows:

A1 part:	A♭ (5) + C (3)
A2 part:	E♭ (5) + G (3)
Bridge:	G (4) + E (3) + C alt (1)
A1' part:	A♭ (5) + B (1) + A♭ (1) + B (C♭) dim (1) + A♭ (3) + C alt (1)

Even the different sections can be chunked to a higher level identifying each section with its related tonality to a chord structure. Imagining three different chord chunks entails all the information about 36 measures of this standard tune, representing the three main sections of the tune. Imagining a 4 + 3 + 4 division of chunks adds up to a total of 11 chunked tonalities.

A1, A2:	A♭–C–E♭–G = $A♭^{maj}$ (4 tonalities)
Bridge:	G–E–C = C (3 tonalities)
A':	A♭–C♭–A♭–C = A♭/m (4 tonalities)

The different sections can again be chunked to an **A♭$^{maj(\sharp5\sharp9)}$** structure, seeing the entire tune being tied to each other in chunks related by major and minor thirds. What we then experience is a complete picture of the entire song chunked into one harmonic structure.

Joins: the active schema part

In what is known as the *serial position effect*, Hermann Ebbinghaus demonstrated early in the twentieth century that we tend to remember the first and last items of a list better than the ones in the middle. Ebbinghaus was both the subject and the experimenter in this research (Brock, Louw, & Hoorn, 2004, p. 12) and found consistent patterns in his memory. His research was later confirmed by principles known as the *primacy* (first items) and *recency* (last items) effect. This means that the improviser probably has a better recall of the first and last chord in a chord sequence. The primacy effect is due to more processing power in the beginning of a chunk, and the recency effect, which enables short rehearsal in working memory, is due to the fact that the last items are not immediately overwritten with new information. Rests in music enable improvisers and audiences to reflect on what has been presented and prepare them for the next passage to come.

What happens in the rests between chunks? How do we, for example, remember sequences of chords? Related to our memory, the crucial point is between the last chord of a chunked sequence and the first chord of the next chord sequence. Musicians call this the *joins* in the progression (Coker et al., 1997). The joins or neural synapses are the "glue" that makes chunks more stable in our memory by having them integrated with other chunks in schema networks, according to Richard A. Smith (2005). It is little use to have chunks ready if you do not know where to use them. A schema is then a network of chunks and joins. The joins are crucial in making the step from individual actions or thoughts to integrated actions (movement) and thoughts. On next pages are the three joins in the first 16 chords of *All the Things You Are*.

There are three joins between the four chunks before the bridge in the song. The joins can be seen as train-track switches; they greatly affect the music's direction. The third chunk is the same as the first chunk but transposed up a fifth. Joins number 1 and 3 are defined as strong connections, being tied by the strong chord tones 3 and 7. Join number 2 is weaker, being connected via the comparably less characteristic chord tones 1 and 5. The rest of the progression is tied up in similar joins.

In my own playing I have found it essential to make smooth transitions between these chunks. Practicing the joins in isolation has improved my

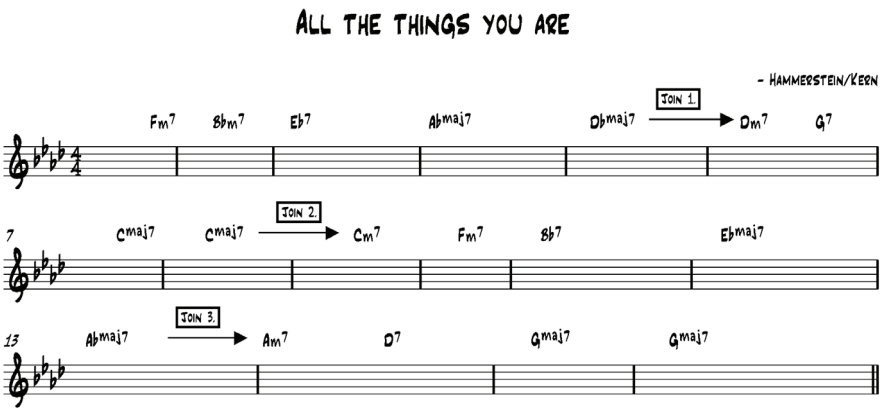


Figure 6.4 Joins. Chunks are connected via joins in a (harmonic) schema.

Join 1, bar 6 to 7:	I $D\flat^{maj}$	I Dm^7	I = b2, common chord tones 3 and 7 (F and C)
Join 2, bar 8 to 9:	I C^{maj}	I Cm^7	I = maj/minor, common chord tones 1 and 5 (C and G)
Join 3, bar 13 to 14:	I $A\flat^{maj}$	I Am^7	I = b2, common chord tones 3 and 7 (C and G)

skills greatly, because it defines the important end and start point for each chunk. I memorize each chunk as a single unit (preferably with a name), i.e. Fm^7–$B\flat m^7$–$E\flat^7$–$A\flat^{maj}$–**$D\flat^{maj}$** (chunked as a five chord chunk named circle of fourths or D♭ major pentatonic bass line) linked with **Dm^7**-G^7-C^{maj} (chunked as a three chord chunk named II-V-I). The bold text of the $D\flat^{maj}$ and Dm^7 defines the join from A♭ major to C major. The D♭ major as a lydian IV chord in A♭ major and the Dm^7 as a IIm^7 in C major. In my memory the joins become the focus when the chunks themselves are internalized. The joins marked with ( ) m define a switch from major to minor, in this case from a C^{maj7} to a Cm^7, and later from $D\flat^{maj}$ to $D\flat m^7$.

A parts (16 bars)	A♭	(b2)	C	(m)	E♭	(b2)	G	(2)
B part (8 bars)	G	(b2)	E	(3)	C	(4)		
A' part (12 bars)	A♭	(m)	C♭	(b2)	A♭	(b2)	C♭°	(b2) A♭ (3) C (3)

Sometimes I make fast-forward and slow motion zooming in my mind of these chunks and joins to enhance the memory. I prefer to zoom fast-forward on the chunk itself and then find different ways of playing the joins, imagining them in a much slower tempo focusing on common tones and stepwise movements between the chunks.

A hierarchical representation

The linking of chunks and joins ensures a hierarchical structure of the tune in the mind when improvising. This means that through goal-directed chunking in practise, if one gets lost in the song form in performance, one has already made a structure on several levels that will help one relate back to the structure again. A hierarchal model might look like this:

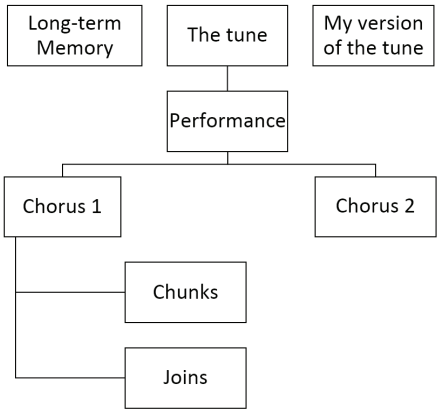


Figure 6.5 Hierarchy. Shows how performance is related in levels, the upper level being more abstract or general than the lower levels. Chunks and joins are separate entities but are linked to the same level. Chunks enable joins, and joins enable chunks.

As Pressing (1988) points out, this is a much more likely model for improvisation than a linear associative one, where ideas are generated only on basis of the ideas coming from the current or previous phrase. The linear (or associative) model makes no connection to an upper level, and will be very hard to manage because improvisers have to choose among potentially hundreds of ideas every time a new stimulus is offered. No rules are used for selecting the incoming stimuli, meaning that the improviser has no filter (i.e. focusing on rhythmic, melodic or harmonic aspects) to select ideas. Another more serious limitation with the associative model is that if one loses one's place in the improvisation, no information is available at another level. One has to search from the start again since the only way to each chunk goes from the beginning. An associative model will also reflect teaching of the tune, since one can only structurally recall it from the beginning. Pre-learned fingerings and consciousness about the tune initiate the piece automatically from the beginning. On next page is an example of an associative model.

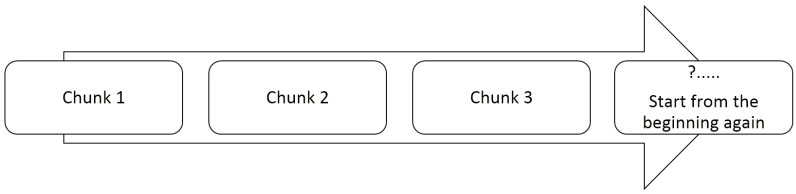


Figure 6.6 Associative chain. Ideas are only generated on the basis of the ideas happening in the moment. The question mark indicates that one probably has to start from beginning to remember the tune.

Associative chaining as defined by Bernstein (1996) in Chapter 4 develops spontaneously during learning, while memorization transforms the motor and auditory chains and makes them content addressable. The hierarchy provides a safety net for memory and is likely to be more explicit (conscious) and include more declarative (facts and language-based) information than that found in associative memory, according to Chaffin et al. (2009, p. 352). The procedural information is more implicit and associative. Smooth musical performance then involves a balanced combination of declarative and procedural information.

As a performer, the crucial question is whether or not I can trust my memory when on stage. Forming an associative chain is only the first step; the real safety net is having a vivid mental representation of the entire form in mind. Road maps formed in practise provide landmarks for the performance. Years of practise and frequent generation make these roadmaps very effective as retrieval schemes in performance. According to Ericsson (2009), expert memory involves quite extensive recoding or chunking capabilities. This involves forming a vivid image of the things to be remembered, a large knowledge base and frequent generation of the knowledge to be used. This is in accordance with Pressing's writings on how jazz experts improvise (Pressing, 1998).

Hierarchy allows for flexibility, and introducing new material in the hierarchy should not cause much problem, as long as one knows the level in the hierarchy the information belongs to. Retrieval cues are offered everywhere in the system, using the chunks and joins. Changing the existing structure with another rule does not change the structure itself but only my way of thinking about the structure. Looking at the entire harmonic structure of *All the Things You Are*, I might imagine it in two different ways:

Standard

A parts (16 bars)	A♭	(b2)	C	(m)	E♭	(b2)	G	(2)
B part (8 bars)	G	(b2)	E	(3)	C	(4)		
A' part (12 bars)	A♭	(m)	C♭	(b2)	A♭	(b2)	C♭°	(b2) A♭ (3) C (3)

Transposition

A parts (16 bars)	A♭	(b2)	C	up a 5th		
B part (8 bars)	G	(b2)		down b3	end C	
A' part (12 bars)	A♭	(m)		(chromatics down) A♭	(3)	end C

The tune can be represented in two different ways: by imagining the tune as an entire progression of chunks and joins (standard) or as smaller sections being transposed (transposition). In the transposition example shown above, I think of the entire A part or section as one single chunk being transposed up a fifth, and the first four bars of the B section as one chunked II-V-I progression being transposed down a third with a variation in the end. A combination between the standard and transposition model is also possible. The important thing is to make some chunked associations that make retrieval easier. Underneath is a simple hierarchical model for *All the Things You Are* illustrating the different levels an A part might have in the mind of an improviser playing it from beginning to end.

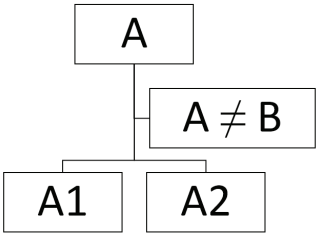


Figure 6.7 Three image levels of the A section. Top, unifying level (A is A); center, contrasting to B section (A is different from B); bottom as prolongation of an earlier A section (A' is different from A).

The A on the top of Figure 6.7 represents one single unit in the mind. In the center level it is contrasted with another section, the B part of the tune. On the bottom level the A section is divided into two parts, chunk 1 (first five bars) with a tag (seven bars) making it four bars longer than the standard A

part. The main part of the A section (chunk 1) is similar in all cases, but the context make us expect something different each time it appears. Knowledge of form in standard tunes make me expect a different version of A the second time it appears, ending it with a cadence (preparing for the B section) and the third time as a final A with a possible coda and tag section.

Schema expectation is guiding the good ear

Much of what we accept as evidence of a good ear is recognition of things we know, based on schema expectations, logic and what is possible after a process of elimination. Before improvising over *All the Things You Are*, one already possesses certain facts about the tune:

1. It is 36 measures long and has an AABA' section form,
2. The changes move in some variation of II-V-I most of the time,
3. The major tonalities are related in thirds,
4. The melody uses all chromatic pitches throughout the song,
5. The melodic interval most used in the A section is a fourth; in the B section a variation on a major triad structure is most used,
6. The melody fits with the harmony, outlining mostly thirds,
7. The basic rhythm appears as quarter notes.

All of this information is available before I improvise the first note; this also means that my ear is relieved of a considerable part of its burden while improvising. I have both analyzed the tune and outlined the declarative knowledge referred to above, in advance. Harmonic, melodic and rhythmic chunks in long-term memory (i.e. licks, phrases, rhythmic concepts) are prepared as potential action units released by the right cue. Knowing the general outline of the tune facilitates transcribing solos on the tune. Schematic knowledge of melody construction further aids us by setting up probabilities about how the lines move and where certain notes go. This is general or schema knowledge summarizing previous experience, and it tells us what to expect. It does not say that it should be played a specific way. What a schema does is to make a good start for the improvisation, since it offers a mental representation of the entire form based on experience.

Experience is related to statistics and frequency of occurrences. Huron shows in his book *Sweet Anticipation* (Huron, 2006) how schematic expectations greatly enhance a good ear in melodic predictions as well. For example, if a line has just moved with a large ascending skip, it will probably

descend with one step in the next movement. In addition, repetition, which is generally much more frequent in music than in for instance language, provides additional schemas that guide expectation (Huron, 2006, pp. 229–231).

Fuzzy borders

Having outlined a generative harmonic structure for the entire tune, I also realize that there are other possible ways of chunking the song. As previously mentioned, the melody has a 4 + 4 measure structure; this is also a very common way to hear the metrical groupings in the tune. So, that leaves me with a puzzle: Am I chunking based on harmony, melody or metric structure? What is the strongest factor related to improvisation, and how does one relate to a possible conflict between these different mental structures? These questions indicate that borders between chunks on a tune like this is *fuzzy*, meaning flexible or blurred based on what is happening in the interplay. The transition points between tonalities are then not as objective as one might like to think. Even though the joins remain the same, for example from $D♭^{maj}$ to Dm^7, different tones need to be used independently of how I perceive borders between chunks.

The Dbma7 chord can be analyzed as an altered G^7 chord, $G^{11\,(b5b9)}$ chord and then used as an alternative tritone substitution, lacking the major third.[5] The Dm^7 chord might be analyzed as a G^{9sus4} chord. This makes the progression a G^7 alt dominant seventh altered to a normal seventh in the fifth and sixth bars before resolving to C major seventh in bars seven and eight. Experientially, one has to choose one of the possibilities at a time. If I imagine the 5 + 3 combination of chords, I must exclude the 4 + 4 solution. This happens in the same way as the principle of exclusive allocation works according to gestalt rules, implying that the mind forms only one image at a time, i.e. a vase or two silhouettes, a duck or a rabbit.

Fuzzy borders can be a problem with hierarchies. For example, if I should construct a module that is going to carry higher-order units, I need to know the size of the lower ones. In a hierarchy, the chunks need to be stable; however, I can change the arrangement of the chunks to create a new punctuation in the model. Changing the chunking order from three plus five

5 The chord is a Neapolitan chord. Normally the sixth will be in the bass (Neapolitan sixth chord) offering a stepwise movement from the subdominant bass note to the upcoming dominant.

to four plus four does affect the rest of the hierarchy. This means a hierarchic model offers a lot of information as long as the chunks are stable. When borders are fuzzy, an alternative model is needed.

A crucial question is how flexible the system is. How does one switch between two scale systems as an improviser in fraction of a second? Does one form an image of each separate chord represented in the two scale systems, or does one mainly form an image of the single tones inherent in the scale when improvising? How is a horizontal scale approach combined with a vertical harmonic approach? How much is strategy a result of context? Improvising over two very different chord progressions might offer an answer to this.

A standard tune like *All the Things You Are* compared to a modal tune like *So What* implies two very different ways of using harmonic knowledge. The time constraints related to *playing changes*, meaning outlining the harmonic progression, gives you only a limited amount of time to react to each chord. On *So What*, we find a minor seventh chord structure (as we have in *All the Things You Are*), but the improviser has much more time to relate to this single chord; a different kind of time is governing the same chord structure.

Merged hierarchies

So What has an AABA structure, the A section contains eight bars of Dm^7 (dorian quality) and is repeated before moving the A part up a half step for eight bars in the B section and then moving back again to the A part again. The entire tune contains four, eight bar sections adding up to a total of 32 bars for the entire tune. For the improviser, 75 percent of the time is used playing on a Dm^7, and 25 percent of the time it is just transposed up a half step ($E\flat m^7$) before returning to Dm^7 again. Given much more time to think on the same chord (chunk) transforms the chord into something much more flexible in my mind. I approach the chord by merging different tonal hierarchies, which adds more variety for improvising, switching between an inside playing approach (mixolydian scale) and an outside playing approach (altered scale).

G mixolydian scale

G^{7}	Am^{7}	$B^{ø(m7b5)}$	C^{maj}	Dm^{7}	Em^{7}	F^{maj}

G altered scale

$G^{ø}$	$A♭m^{maj7}$	$B♭m^{7}$	$C♭^{maj♯5}$	$D♭^{7}$	$E♭^{7}$	$F^{ø}$

On a modal tune like *So What*, one has much more time to elaborate long associative chains in a harmonic fashion on each chord. One might start with a movement of harmonic triad shapes over the fretboard: I normally have a very clear visual representation of these triad shapes or chunks, imagining them as multi-sensory *sonic* images, with sound, vision, and a detailed feeling for execution. When I improvise, I often start with these very simple sonic shapes and then see how many ways a single pattern might transform over a simple chord. This resembles the chess master having a certain position on the chessboard and thinking, "given this situation, how many ways can I move?" Related to an upcoming type of G^{7}, my ears immediately anticipate different solutions to the upcoming chord. These circumstances, having time to think in the now in relation to the specific tune, is what Pressing defines as referent-based improvising.

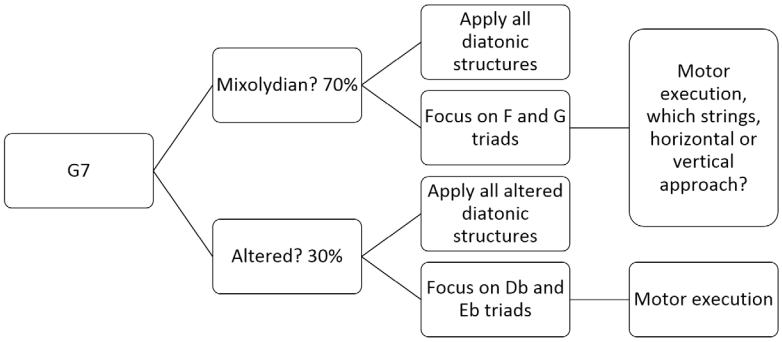


Figure 6.8 Single chord strategy for improvising.

The model in Figure 6.8 shows a G^{7} chord to the far left, with the context defining how it is going to be played. In a swing context one might presume a 70 percent favor of a mixolydian strategy, compared to an altered one. When identifying a mixolydian scale, one has to generate a mixolydian structure. This can also involve different choices like playing diatonic

structures or focusing on two triad structures (F-G or D♭-E♭), as seen in the third row of the strategy model above. In the fourth row, motor execution is needed, again involving a choice—which strings and whether to play with a horizontal or vertical approach. Decisions to choose consonance or dissonance or standard versus altered choices are made in a fraction of a second and are all related to the constraints of working memory.

An efficient long-term working memory requires efficient use of both short-term memory and long-term memory, as already discussed in Chapter 4. I need to be able to anticipate future retrieval demands and thus identify and refine retrieval cues that uniquely index the information I need. By reactivating the corresponding retrieval cue of a D♭ to E♭ major triad when a G^7 chord appears, I can access the desired information of an altered tonality in memory. Coupling this mental imagery with corporeal action produces perception-action couplings (Godøy & Leman, 2010). A perception-action coupling should provide controlled retrieval as long as a given retrieval cue is associated with only a single chunk of information.

In improvisation, however, a series of similar tasks are frequently repeated, transformed and modified within a relatively short period of time. Hence, the same retrieval cue is linked to many different results at the same time. An altered tonality is not only a D♭-E♭ triad association with a G^7; it is also triad associations in all other keys, for instance D-E on $A♭^7$, E♭-F on A^7, etc. Thinking of a simple D♭ triad is also heavily defined by context, whether a major triad, a B♭m^7 from the third, a 13^{th} structure from a C♭ chord, or an altered structure from G^7. In my own practice I have found it crucial to overcome this interference from several different chunks associated with the same concept or retrieval cue by generating an integrated memory representation that includes most central chunks. I mainly use two concepts: a *story construction mnemonic* (memory aid) mode and a *method of loci* (location of retrieval cue). Both memory aids involve long-term working memory processes found within expertise (Guida et al., 2012).

When I practise improvising in the story construction mnemonic mode, I imagine the basic chunk level as the plain information level of the story; it is the introduction of characters (chord progression and melody) with no special additional features. The extension level represents additional features of these characters, but still recognizable, introducing upper chord structures, some new rhythmic concepts, etc. to add tension. On the altered level, I transform some of the characters completely by introducing

ambiguity to the setting, in the form of, for instance, alterations, in-out playing, or poly-rhythmic playing. Analyzing some of my solos, there seems to be a certain schematic structure to the levels in this story construction mode, where each part roughly contains one quarter of the solo. On the previously mentioned *So What* tune, I could think something like this:

1. Basic level: G^7 (G-B-D-F) chord tones, simple melodic motives (¼ of solo),
2. Extension level (G-A-B-C-D-E-F): scale tones, extension tones chunked as an A minor chord and other modal chords (¼ of solo),
3. Altered level (D♭-E♭-F-A♭-B♭): scale tones, altered tones chunked as a D♭ major pentatonic scale with related chord structures (¼ of solo).
4. Basic level: G^7 (G-B-D-F) chord tones, simple melodic motives (¼ of solo).

I define this as the schema level of improvisation; no specific directions are given, although a very general outline of the solo helps me maintain a direction. It tells me in a very rough outline where the tension curve is going in the solo. This general outline, however, has to be coupled with specific action instructions corresponding to the tune I am improvising over. I define this as the chunk level of improvisation. The very general road-map (schema) has to be linked to specific actions telling me when and where to perform it on the guitar. I will elaborate on the visual aspects of this later. For now it is enough to state that on each level in the schema-based improvisation, I link chunked multi-sensory patterns (auditive, visual and motoric). I define the story mode (a) as schema based and the specific actions (b) as chunk based:

1. Basic level: G^7 (G-B-D-F) chord tones, simple melodic motives (¼ of solo).
   a. Calm and melodic,
   b. Form chunks on different location on the guitar related to G^7.
2. Extension level: (G-A-B-C-D-E-F) scale tones, extension tones chunked as an A minor chord and other modal chords (¼ of solo).
   a. Elaborate on calm and melodic,
   b. Form chunks on different location on the guitar related to G^7 modality.

3 Altered level: (D♭-E♭-F-A♭-B♭) scale tones, altered tones chunked as a D♭ major pentatonic scale with related chord structures (¼ of solo).
   a Transform calm and melodic—peak tension,
   b Form chunks on different location on the guitar related to G^7 altered modality.

4 Basic level: G^7 (G-B-D-F) chord tones, simple melodic motives (¼ of solo).
   a Transform excitement and tension to calm and settled,
   b Transform multi-sensory chunks on different locations on the guitar related to G^7 altered modality (peak tension) to G mixolydian—(calm and melodic).

This is a strategy and a way to practise and must be understood as such. Forcing improvisation to work in a special way can very easily lead to a kind of formula-based improvisation that relates more to the formula (i.e. calm, more excitement, peak, then calm) than to what is going on musically in the moment. This being said, many studies on the narrative (structural) aspects of spontaneous and composed behavior show a preference of a similar structure to the one above, according to Sloboda (1985). For example, a storyteller uses the *plot* as his referent in the same way as an improviser uses the lead-sheet. The plot and the lead sheet both refer to well-known objects within well-defined frames or schemas, i.e. the hero and bandit schema in the plot or the harmonic (cadences) and melodic (arpeggios, scales, etc.) schemas found in a tune.

Listening to altered scales played over a regular dominant chord (level 3) makes less sense to an audience unfamiliar with this type of harmony or tune played. They are less familiar with the point of departure (standard progression) and are not able to appreciate the efforts involved in transforming the original schema with an altered schema. When audience and performer both know the tune being played; they leave a pointer in short-term memory and compare it with similar references in long-term memory. Based on familiarity with in-out playing, they can appreciate the challenges of the harmonic progression and the corresponding efforts of the improviser in resolving dissonance and consonance in an appropriate but novel way.

Thinking in dissonance might involve a detailed schema on each single chord, but it is normally more effective to chunk several chords and employ

a dissonant scale over several chords. This can be a good strategy when working over a basic chord progression, like the first five bars of *All the Things You Are.* Here the improviser can experiment with playing the major pentatonic (D major pentatonic), a tritone from intended key (A♭) to make a dissonant chunk over five chords. The improviser leaves only two markers (A♭ major and D major pentatonic) in memory to improvise over these five chords. The result is less constraint on working memory. However, the price of chunking in this way ends in playing that does not adequately cover the nuances of the progression. Some improvisers prefer to balance their approach via chord tone-based improvisation for a section before returning to a more general tonal approach. The resulting schema might look like the figure below.

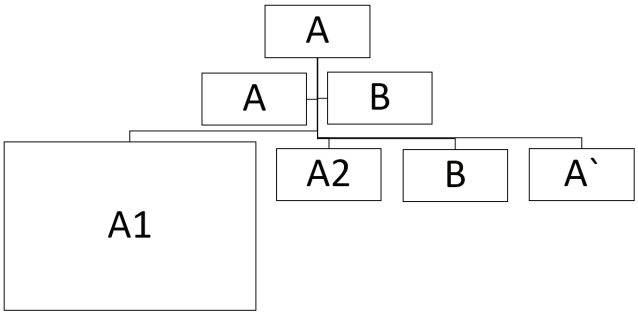


Figure 6.9 Working memory capacity, utilized to its full size on the first (A1) part of an AABA' form. While playing the first A part on top, semi-activated LTM of B (schemas) moves into consciousness on the second level. On the third level, semi-activated LTM moves out of consciousness and primes new associations for more detailed activation in A1.

At the A1 level the improviser is involved in thinking about each chord, thus exhausting working memory capacity. At the A2, B1 and B2 levels, the improviser's working memory is less constrained due to a different chunking strategy—thinking in larger tonalities. There seems to be a compromise in both approaches, namely heavy strain on working memory while producing the exact tensions on each chord and less nuances by employing larger chunks over all the chords. Is it possible to rapidly cover the nuances of the chord progression with less strain on working memory? The use of templates seems to work well in this respect, linking a prototype basic chord with a few units (chords) that can stay in short-term memory without any further practise and be used for adding variation to the basic

(chord) form. Their application has to be analyzed in advance, pinpointing exactly what is gained by using these structures in improvisation.

6.1.3 Expertise: harmonic templates

Switching between a basic, extended and altered schema should be more or less automatic provided one has an overview of the musical form and is able to join the ideas in a logical manner. This means that every single extension and alteration is tied to a template (basic form) and when the basic chords appear, the possibility of using an extension or alteration should be in the mind of the improviser immediately, given the right setting and the right cue. For instance, if the piano player starts to respond to the gradual build-up in the music and starts to use extensions and alterations, the soloist's ear and hand should be prepared to react immediately to this impulse. What we then experience is an ability to bring external impulses in, by identifying the impulses, and as a second stage, respond immediately to this by having a motor action available at hand. This will also be the case the other way around. If the soloist introduces extensions and alterations, the accompanying players must be able to identify and follow the direction given by the soloist. It is all about listening and the ability to shape a common musical direction in the course of performance.

Research on short-term memory capacity (Cowan, 2001) has shown that patterns around four items (i.e. chords) will appear fast and immediate in mind, depending somewhat on the pattern's complexity. In the earlier discussion on chess masters' chunking systems, we found that chess masters seldom add a single item to an existing template chunk but prefer to add small chunks together to make a new template chunk. Often the separate chunks are well-known identities but combined in a new way.

A scale consisting of seven notes identified as two Ionian *tetrachords* is an example of such chunking. A tetrachord is a combination of four specific tones. Tetra means four and chord in this case means a collection of tones. Ron Miller (1992) uses this ancient system of tetrachords to link different modes in jazz harmony. Miller sees the different modes as a combination of two tetrachord chunks separated by an interval. He links the various tetrachords with the size of the interval in asterisks. The number with an asterisk refers to the number of semitones: a half step is one semitone, a whole step is two semitones, and a minor third is three semitones. A way of

remembering the chunks themselves might be as a numeric representation of the tetrachord, i.e. a whole step, a half step and a whole step. A dorian tetrachord might be represented as 212.

Major scale

A major scale (A♭) tonality chunks like this:

1. A♭ major scale—Ionian scale (7 notes)
   A major scale = Ionian tetrachord on first and fifth degree of scale, joined by (2) an interval of two semitones.
   A♭-B♭-C-D♭ + E♭-F-G-A♭, or as numeric representation 221 (2) 221 on tonic and fifth.(ionian) (2) (ionian) = new ionian template chunk.
2. An alternative for playing the major scale is to use the Lydian (♯4) scale (7 notes), by using another combination of tetrachords. The scale is chunked like this:
   A Lydian scale = Lydian tetrachord on the first and ionian tetrachord on the fifth degree of scale.
   A♭-B♭-C-D + E♭-F-G-A♭, or as interval numbers 222 (1) 221 on tonic and fifth
   (lydian) (1) (ionian) = new lydian template chunk.

By combining some basic tetrachords in new ways, the possibilities for learning scales and modes greatly increase. The small note chunks easily transform into visual chunks on the fingerboard. Small chunks aid in flexibility, and the tetrachunks easily transform into action units from every note in the pattern. Two small tetrachord chunks for major tonality in *All the Things You Are* can be retrieved from the tonic and fifth all over the fingerboard. According to Roger Chaffin et al. (2009) the process described transforms associative chains into more content addressable memorization. Using several retrieval cues, the tetrachord, the number system and the exact scale step (1 and 5) greatly enhances memory and provides a safety net. The entire scale is in this way memorized in a more robust way, according to Chaffin, and not only learned as an associative chain linked in motoric (implicit) memory. For Chaffin, however, both are needed: the implicit associative chain formed by practise and the explicit language-based content addressable memory.

Whole-tone scale

Two chord forms are not within a major tonality on *All the Things You Are*: the first is the $C^{7\sharp5}$ concluding the B section; the second is the B diminished seventh chord in the eighth bar of the final A' section. The $C^{7\sharp5}$ chord is often played over with a symmetrical six-tone scale, produced by combining two augmented triads with no overlapping tones. Combining triads with no overlapping tones is also referred to as a *hexatonic scale*. As before, the template chunks combine from something well known, the augmented triad, to a new form, the whole-tone scale.

$C^{7\sharp5} = C^{(\sharp5)} + D^{(\sharp5)}$ = C whole-tone scale.

Moving the hexatonic scale up to G♭ + A♭ makes it an altered choice, and a secondary choice on augmented dominant sevenths going to a minor chord. $C^{7\sharp5}$ going to F minor suggests a (♭9, ♯9 and ♭6) in its tonality, which will be outlined with this G♭ and A♭ major triad:

$C^{7\sharp5}$ = G♭ + A♭ = C altered scale.

Diminished scale

I will now elaborate on the diminished scale and show some of the complexity involved in interpreting the harmonic structure of one single chord and how these structures are outlined as visual images on the fretboard.

Inherent in the dominant (diminished chords) are two triads with a semitone distance located on the sixth and seventh degree of the dominant chord. As a chunked structure, these dominant chords have some complexity and work as an extension in different directions. In Figure 6.10, the inner circle moves in minor thirds and the outer squares move in minor and major seconds. The outer squares are more flexible because of their smaller size, but more information is contained in each of the inner circle diminished dominant chords.

Representation of possibilities on an $E♭^7$ chord based on the diminished principle to create an altered sound, play major, minor, diminished and 13 forms on every minor third, interspersed with a diminished chord a half step over these forms (the ♭2 step of the scale). This means that one can use at least 20 different substitutions on a single diminished chord.

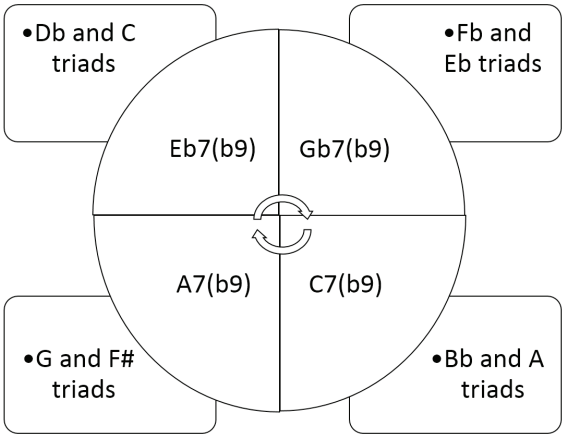


Figure 6.10 Network model of improvisational strategies on a single chord. The arrows in the middle indicate that substitutions can work in all directions. In other words, select a single chord and use the other chords as substitutions.

6.2 Fretboard patterns

The information presented above becomes more distinct when transforming the knowledge to the guitar. Through familiarization this general knowledge should become chunks on the fretboard, transforming theoretical chunks into action chunks, and all the time asking "how can I represent this knowledge in a cognitive economical way and with the flexibility and nuances of a large knowledge base?"

Jazz guitarist and educator Howard Roberts (1989) defines fretboard forms as *sonic shapes* that involve moving a fingering to different string sets to create different sounds. A crucial question is how much visualization is needed in the process of learning improvisation, Roberts states:

> We know that a large part of what guitarists learn is learned visually; musical material is often seen by guitarists as patterns or design configurations on the fingerboard. But we also know that guitarists often feel trapped by fingerboard patterns. The way to reconcile the fact that we use patterns with the fact that we find them constraining is to simply explore them much more fully and to move far beyond their normal limited application. We should also recognize that it is often our limitations of musical imagination rather than mere patterns which limit our musical

> possibilities and that with the expanded use of patterns we in fact expand those possibilities. (Roberts & Hagburg, 1989, p. 183)

From a chunking perspective, the entire fretboard opens up by having a combination of sonic shapes all over the fretboard. Some shapes that occur in this process are listed below. The diminished scale repeats itself in minor thirds.

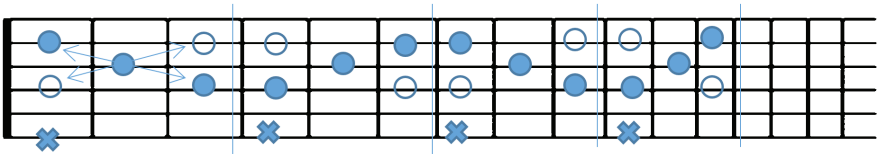


Figure 6.11 Sonic shapes. Dominant 13th (slash /) and major (reverse slash \) = X (major/dominant 13th form) in minor thirds.

In Figure 6.11 the fretboard divides evenly into four chunked areas marked by an X in the lower part of the figure, each chunk consists of three frets corresponding to a minor third. I call the three-fret X shape the major/13 form. The slash outlines a major triad, while the reverse slash outlines a 13 dominant seventh form. The X on the lower sixth string indicates possible roots. The thin horizontal lines indicate the chunk border of the X image.

This visual image is very much a product of where the focus of attention is. The gestalt psychologists, represented by Max Wertheimer, Wolfgang Köhler and Kurt Koffka, said that we chunk our experiences according to some basic principles. They claim that our perception is subjective and that the whole is more than the sum of simple stimuli–response chaining (Brock, Louw, & Hoorn, 2004). Grouping principles are according to these theorists a fundamental quality that is a primary rather than secondary quality that emerges from parts. For example, I perceive the instrument as a guitar before I define the neck, body and the strings of the same instrument. This is automatic and emergent, and one even add details to the image based on schema expectations that are not necessarily a part of what one sees (i.e. volume controls, a pick-up).

6.2.1 Gestalt principles of diminished patterns

The diminished scale pattern with additional chord shapes in Figure 6.11 is foremost seen as a complete pattern with a figure and ground according to

Gestalt psychology. For a guitarist the dots will normally represent the figure and the fretboard the ground. However, when a pattern of dots suddenly appears in another area of the guitar, one has to look at the fretboard as a figure and then locate the dots as a ground. The dots represent possible action units in the mind of a guitarist. This perception is based on the invariance of a fretboard with six strings placed horizontally over the fretboard. The different chunks that emerge in the mind of a guitarist with a combination of six strings and a fretboard are formed by gestalt principles. The most fundamental principle is the law of *pithiness*, which says that we normally organize our experience in an orderly, regular, symmetric and simple way.

As a guitarist, I use the principle of *proximity* to try to make sense of the diminished pattern in Figure 6.11. The thin arrow line defining the X shape of the chunk shows how the dots between two such lines seem to appear closer to each other as forming a chunk. This is an illusion, but the image is alive in my imagination. The illusion of a similar fret size is triggered by the principle of *symmetry*. One perceives the groupings as four similar chunks, even though the area between the frets is smaller further up on the fretboard.

Another principle is *similarity*: we tend to group similar colors, shapes and figures together. In the above example the dark circles group together, as do the white circles. The dark circles form a wave pattern going from left, up and down. The white dots are harder to perceive, even though the up and down slashes are identical, moving in the opposite direction because a dark circle interrupts the similarity of the patterns. By making a chunking border as a three-fret structure, a potentially different solution may be excluded, because we tend to group as either-or, also known as *mutual exclusion*. This mutual exclusion has been demonstrated in the Rubin Vase illusion where people either see the figure of two faces confronting each other or a vase. By focusing on the patterns of dots from the second to the fifth fret, another picture emerges, namely an ellipse form. The chunk border is also placed in the middle of a square of two fret configurations. This gives us three different images in one, in addition to the X form in the first image. All three are part of the picture, but one only forms one image at a time.

Through discrimination and familiarization the three chunks can be seen as part of one chunk. All these dots share the same strings: the second, third and fourth strings. This means eyes and fingers move on the same

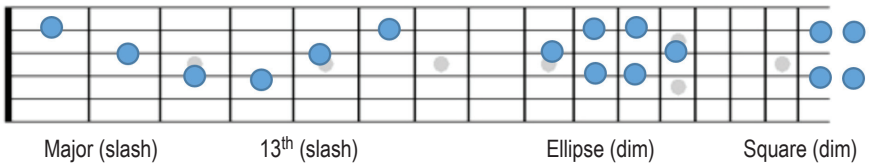


Figure 6.12 Three visual templates.

track, focusing on a defined and limited amount of strings. This is called the principle of *common fate*, meaning that we tend to group units together that go along the same path. By focusing on a limited set of strings, one eliminates the complexity of chunking all six strings in one. The shapes become less complicated and we are able to observe chunks in simple forms. The patterns created can be processed immediately within the limits of short-term retention.

6.2.2 Expertise: visual templates

An important part of chunking is the hierarchical aspect and how a pattern can grow out of an existing pattern. As mentioned earlier, chess experts seldom add a single item to an existing chunk but prefer to combine two smaller chunks to form a new template. The X shape is a combination of two slashed lines, containing a 13th dominant chunk and a major triad chunk.

The X shape can grow in number of frets and number of strings. Below in Figure 6.13 the X shape is transformed into an extended slash form and a horizontal Z shape, adding a ♭9 and ♯9 to the form. Just like the chess expert, one adds new chunks to already established patterns. Thinking of this pattern, I normally form two separate chunks, the slash and the Z form in accordance with the gestalt principle of *good continuity*, saying we are less likely to group items with sharp abrupt directional changes into one unit.

The function of the above pattern is the same as earlier, but the path is extended to form a four-string pattern. The end of one chunk is identical with the beginning of the next chunk; it is an overlap in the visual image. This can create fuzzy borders, but defining the exact location and the extent of overlap greatly helps in separating them.

When imagining patterns on the fretboard, it seems like the constraints of the hand and the possibility of placing the four fingers at once are important

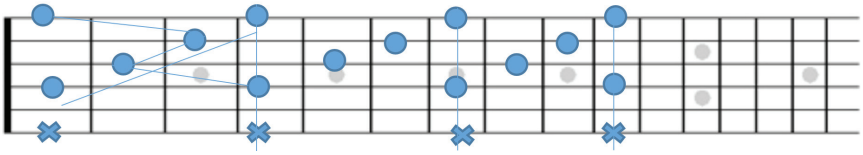


Figure 6.13 Extended slash forms. 13 ♯9 (dim) and Z form 13♭9 (dim).

elements of the chunk borders. As a guitarist, one imagines the hand's movement when one sees a configuration of dots, and if it is not possible to do the action in one move, like in a chord, one imagines the action in several steps. This is defined by the gestalt principles as the principle of *past experience* (Brock et al., 2004). When playing these shapes the sound becomes full and complete by executing them as a slash and Z form. This is also why I use them as such. Looking at the pattern again, one can construct other patterns that might be just as easy to execute, but they have not been part of the repertoire.

One can more easily identify certain patterns than others because it is "in the fingers." The finger memory might work against more creative solutions at times, as when extracting complicated patterns from the same basic image on the fretboard. Discrimination and familiarization are crucial in this process, because the patterns become more distinct in the process. One sees some patterns emerge in the process of separating and linking these shapes. The eyes normally identify a chunk from the top or bottom note (Goodrick, 1987), in this case the first or fourth string. The chunk is within the reach of the fingers, but one has to locate it horizontally, which is a working memory function. Giving it a name is a way to retrieve the form later.

More importantly, the scale is represented with a lot of chunks all over the fingerboard as illustrated in figure 6.14. In improvisation, one can utilize major, major ♯4, minor, diminished, dominant 13th and minor 13th on three

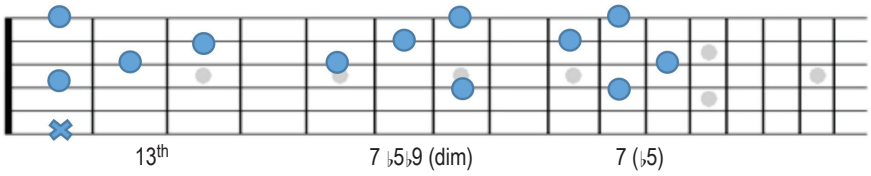


Figure 6.14 13th, diminished (dim) and lydian-dominant 7 (♭5) configuration.

strings immediately and extend this information to dominant altered forms on four strings in the same position.

Employing these structures is a combination of rule-based information, outlining the structures in relation to the dominant diminished scale, but also trial and error, suddenly hearing an exciting sound and then identifying the chord from the sound itself. The first one is based on a top-down approach; the latter emerges from a bottom-up approach.

A theoretical understanding of scale steps is crucial for all sorts of geometrical shapes formed on the guitar. Figure 6.15 depicts some of these forms based on the idea of shrinking and extending the visual form itself. These forms are idiomatic and based on the outline of the instrument itself with its standard tuning. Other instruments have other possible geometrical shapes in patterning.

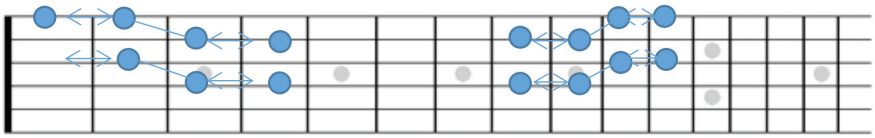


Figure 6.15 Inner chord (no arrows) 13th ♭9, outer dom. ♯9, inner chord (dim), outer chord ♯4, ♯5.

By reminding oneself of the particular sound of the different shapes, the shapes themselves open up a lot of exciting sounds. The four dots in the center of the shapes make for more traditional sound, while the outer dots make for a more modern sound. Guitarists like Bill Frisell, Mick Goodrick and John Abercrombie often use a combination of these forms. Having a clear representation of the different sounds makes for interesting moves, for instance starting with the core (inner part) and then keeping the form while moving one note at a time (obbligato contrapuntal technique) from an inner standard form (two frets) to a more modern sounding (four frets) form.

I believe some of the secrets of jazz guitar improvisation are the ability to see many formations from a simple starting point, for instance using only the third and the seventh of a chord structure to define its basic quality. Using only two notes facilitates both perception and action, in the form of a simple visual image and economy involved in finger movements.

From a simple third-seventh chord voicing, it is possible to see how four possible roots are located in minor thirds, moving horizontally up the 6th string (see Figure 6.16). In addition we have the sonic shapes that are formed from the diminished scale in the same position. In a playing situation this information might be triggered by the sound of a dominant seventh chord. The important thing is that the information should be available immediately and accessible both in the mind and in the fingers.

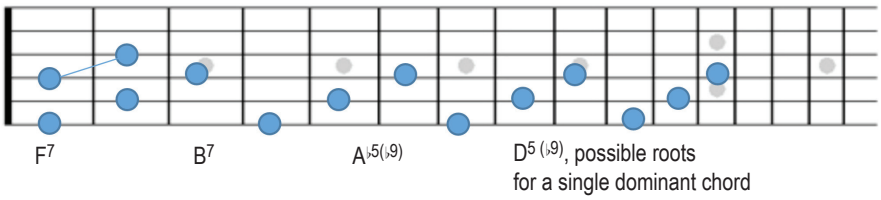


Figure 6.16 Alterations on dominant chords. The single slash between two notes might represent a dominant chord (F^7) in addition to the four other chords with all the extensions and alterations mentioned earlier in this chapter.

6.3 Improvisation and form

What is outlined in this chapter is an analysis of the many ways a standard tune can be chunked into a sequence of discrete events and organized into hierarchies. For example, one can relate to the symmetry of tonal accents in the melody (more or less steady two bar patterns all through the song) like (2 + 2) + (2 + 2), one can chunk on the basis of tonality (5 + 3) or one can chunk on the basis of a fixed collection of chords, seen in formulaic II-V-I progressions.

Context and habits define the way one relates to this multidimensional representation in time and structure. How improvisation can be made more flexible by using well-known harmonic chunks in templates has been the focus of this chapter. The many ways a single harmonic structure can be extended and altered in the form of sonic shapes based on gestalt principles has been demonstrated in the second half of the chapter and can be summarized in three levels:

1 *No chunks*: The dots found on the fretboard are processed almost separately. No patterns are created, where the seven notes in the scale have little relevance beyond being seven separate dots.

Activity is related to low transfer in long-term memory. Chunk creation is needed to reach an intermediate level.

2 *Chunk retrieval*: The dots on the fretboard are processed according to context and more knowledge about musical form. Seven notes are retrieved as, for example, four different triad configurations on a defined place along the neck. Activity is related to an increase of transfer in long-term memory. Template creation is needed to reach expert level.

3 *Template retrieval*: The dots on the entire fretboard are retrieved as a single pattern based on knowledge of harmony and frequent generating. Activity is related to fast and reliable transfer in long-term memory. This level is defined by domain-specific flexibility and intuition.

By combining my experiential knowledge with other perspectives coming from the interlocutors in the fieldwork, I hope to further illuminate the strategies used by professional jazz guitarists.

Theory studies presented in Chapters 4, 5 and 6 have found that strategies in jazz guitar improvisation are related to structure, time and form. Chapter 4 on structure dealt with WHAT material and processes are used, Chapter 5 dealt with WHEN these structures are used, and Chapter 6 has described HOW structure and time are constrained by the song form itself. The findings from these chapters have provided the background needed for developing categories for analyzing the fieldwork practice in Chapters 7 and 8.

7 The jazz guitarists' perspectives on practising and performing

The chapter describes possible strategies in jazz guitar as discussed with five professional jazz guitarists as interlocutors in informal duo settings. I approached the sessions as a learner, and we used both verbal and musical dialogue to gain further insight into strategies in jazz guitar improvisation. Much of the focus was related to improvising over standard tunes and especially the challenges related to the project's main tune *All the Things You Are*. All the guitarists played this tune, and their solos have been transcribed for further musical analysis, to be presented in Chapter 8. In this chapter the focus will be on their explicit verbalized knowledge.

The sessions

The Wilkins interview has transcriptions from two sessions in the first fieldwork, due to

1. The low volume level of the first video recording,
2. The first interview contained questions related to a specific original composition from the pilot studies. This session developed into a much longer session than planned, and the result of this session ended in too little time to cover the existing questions I had prepared.

Presenting an excerpt from my solos playing over an original composition was also a strategy used in the first interview with Lund. The excerpt was the same as with Wilkins, but in the session with Lund we managed to discuss it within a delimited amount of time. The main idea with presenting

the excerpt was to give the guitarists an idea of my playing in a group context. The musical excerpt could also be a basis for further discussion on how to interact musically as a guitarist in a larger setting. However, after the first two sessions I decided to not present it as a part of the coming sessions, since it interrupted the flow in the sessions and because it digressed somewhat from my main stylistic frame: standard jazz tunes. This also illustrates an aspect and strength of practice-led research, using experience gathered from the research process itself to sharpen the focus, adjusting the approach as one continues with the research process. The reflections coming from the five jazz guitarists are merged perspectives from the first fieldwork in 2010/11 and the second (follow-up) fieldwork in 2013.

I found that structure, which deals with what improvisers play, time related to when they play including pacing (play and rest activity); and form, or how improvisers are dealing with solo structure, content and execution, were all contained within the phases of goal-directed practise—getting it all together, and the immediacy of performance when it all does come together. When analyzing fieldwork I, I identified four phases in practise and three processes in performance. The practise phases are inspired by typical stages in expert practise as described by Chaffin et.al (2002). Overview to get the big picture, parts that include focusing on phrases and sections, joins which includes putting the parts together, and maintenance that deals with technical aspects of playing and maintenance of a repertoire. In this way, practise can be seen as a systematic activity with predictable stages and activities.

The performance processes contain intention (direction and imagination) – action (implementation) and goal (representation) and are related to primary characteristics of action as proposed by Schmidt and Lee (2005). Important to notice, these practise and performance categories are blurred and can be interchanged, containing different levels of implicit and explicit knowledge.

7.1 Practising

7.1.1 Overview

When confronted with a particular situation, people apply schematic knowledge automatically. Based on previous experience, the context is defined and schemas are retrieved to fit the current situation. The overview phase, which includes retrieval and recognition, can be seen as an *orientation phase* in three dimensions: what is this, what is my previous knowledge, and what can be done in the current situation? Schemas are networks of associations in this process.

Auditive and visual approaches

By the popularization of jazz studies at conservatories and a more theoretical approach to improvisation in general, method books and the use of visual aids have become more apparent in the practise of jazz improvisation. Different types of real books, a collection of standard (jazz) tunes, are also frequently used. Lund is skeptical to the real book in general: "The real book is not a good way of learning anything, you know. If I have never heard a standard and approach it from the real book it wouldn't mean anything to me. It's just going to be something I played badly, I wouldn't have any connection to the tune." Lund's point is that inspiration and enthusiasm for these standard tunes happen when one engages in listening and finds a version that one really likes. He continues by defining the visual approach in the real book as something that complicates transposition because one never really hears it. "Probably I would also not be able to transpose as easily, because I have never really heard it." This comment is quite interesting because I believe it hints at a tendency among younger musicians too avoid playing the songs in keys outside the standard keys found in the real book.

Wilkins is the only one of the interlocutors that frequently plays standard tunes in different keys, and this is due to his long-time associations with singers. Wilkins defines it as a challenge to approach standards in a setting with singers because they will often suggest unfamiliar keys based on their vocal range. "It's a challenge to play with singers transposing it too all sorts of keys, but that's what keeps it interesting." He continues by stating that

he transposes the entire tune in one chunk, and that he can play most tunes immediately when he knows the melody. In other words, the melody works as a mnemonic aid for the harmonies that belong to the melody, when the melody is represented in the mind the harmonies that go along are also imagined.

Rogers uses both visual and auditive approaches when learning a new standard. " I learn the melody from charts generally with standards, or I might learn it from a record, most of the time I learn it from the music. I play through it with the music a couple of times, and then I just put the music away and see what I remember. " He reflects on the effects of using a visual or auditive approach: "A lot of people say that learning a thing by ear means that you will retain something more. I think that is possible . . . I don't know if that is true with me." But in the end he concludes: "I think the best way is to learn new material by ear since you then are using your ears; it will be a kind of ear training involved." This is also in line with the approach taken by Monder, who normally listens to the song first to get an overview or, as he puts it, a "sketchily picture" of the whole arrangement or song.

Another benefit of listening and playing with a recording before looking at a lead sheet is also pointed out by Rogers: "By playing along with the record I get inspiration from the phrasing of the other players. I normally don't write it down either, but I try to understand analytically what they are doing." Rogers is foremost interested in the emotional drive from the record; he does not transcribe the music (write it down). He is inspired by the phrasing of the players on the record and tries to blend some of that energy into his own playing. Lund adds that by playing along with real records (not play-along records) allows for "concentrating on certain aspects, like imitating the rhythmic accents of the cymbal."

All the players were positive to practising with authentic recordings and assimilating some of the energy found in "real recordings." They were skeptical to learning new songs or practising at all with play-along backing tracks. As Lund says, "I think they're pretty bad, especially if you do it a lot. It makes you tune out what's going on; your own sense of time is suffering because you have everything provided; the harmonies might not be the most exciting." Lund suggests the use of a metronome instead as a basic time provider.

Abbasi thinks that play-alongs are too static and that musical interaction, which is so critical in interplay, can suffer as a result of practising too much with these: " . . . as far as play-along concerns, I have never been very much into it; it deceives the feeling of interplay and is in general very set." However, as a practise tool for acquiring an overview of a musical structure, he uses *loops* which can repeat a passage endlessly and computers which enable features like transposition, tempo and meter changes: "Sometimes when the challenge is very high, rhythmical things, changes in meter, etc., then I use it. It is priceless when you need to practise it repeatedly. It also offers the harmony, which the metronome does not offer."

Melodic, rhythmic and harmonic overview

All five jazz guitarists preferred to listen to the song first to get an aural impression of the entire song before engaging in practise. Lund describes his approach like this: "If it is a standard tune, usually it pretty much all comes from listening. I try to listen to at least a few versions and at least one where the melody is pretty close to the way it is written." He defines this as essential because one has to know what the great improvisers are doing in relation to the original melody. He mentions singers like Frank Sinatra and Ella Fitzgerald as good examples of performers to imitate. For Wilkins, it is the melody that works as performance cue for the song most of the time: "I can play most tunes immediately when I know the melody."

Melodies are closely associated with lyrics, and by listening to the lyrics Wilkins finds the structure of the song and the climax. "I try to relate to the lyrics and then I know where the climax is." According to Wilkins all lyrics have a highlight, and it is important to know where the highlight in the lyrics is. From a memory point of view he sees lyrics as one of the parts that make you remember the tune. "I think all aspects—melody, harmony, rhythm and lyrics—are interconnected in remembering the tune."

Lund says that lyrics are one of the main things he would go into in order to phrase in a more interesting way. "I'm not good on lyrics; I would probably never listen to a tune with bad melody and good lyrics." He states that his connection to the tune is normally without the lyrics. This is also the case with Rogers, who at the same time admits, "I should probably have learned more lyrics and everyone should, and that is what really makes the standards different from each other in addition to melody, even though most

of them are about love and longing to see each other again, and sometimes some deeper things."

Lund and Abbasi also suggest learning great versions of a tune. As Abbasi states, "definitely learn great versions of the song, and especially versions that are not too far from the original." He then suggests engaging in listening and playing sessions with the music. "It is the melody and the bass note I first work with, trying to hear the melody and the bass note together." My interlocutors stress an auditive approach and getting access to different "great" versions of the same tune has never been easier than today, due to streaming on the Internet, which allows for fast access to a wide variety of music with a few clicks or touches.

The second thing Abbasi relates to is the rhythm. According to Abbasi *All the Things You Are* "doesn't have much rhythm," and he then demonstrates how the melody rhythm is easier to recognize with 'Solar.' "You have to isolate the rhythm, and it is useful to play only the rhythm of the tune when improvising." He then demonstrates this principle by keeping the rhythm but playing the song in another key. "Isolating the rhythm and changing only the pitch is a compositional principle called iso-rhythm." Isolating the rhythm is, according to Abbasi, easy to do on standards because of the symmetry in section length, which is typically eight bars. As previously discussed, in aspects of time we anticipate a phrase's rhythm in chunks, and the melodic phrases are normally not over four bars in length, which is well within our working memory limit span. Improvising in this way makes one aware of the potential of rhythm as the single most important aspects of melody identification.

For Lund, identifying the harmony of a lead sheet is best done by going back to the original source, as written by the composer. He thinks that the harmonies "are not written in stone" and by going back to the original piano lead sheet, one finds different and more diverse voicings than in the real book versions, and often with more harmonic changes. "One basically finds a new chord on every beat," according to Lund. His perspective implies a concern with keeping the qualities contained in the original changes. Most importantly, one gets a unique overview; it is possible to compare the original lead sheet to later versions. Having the original chart, you know what the composer intended and have a better understanding of how different performers approach it, according to Lund.

Rogers, who think that the real book versions are sometimes too formula based, also share this view. He argues that many of the standard progressions found in the real book, like the II-V-I progressions, were never part of the original score. All the interlocutors engaged a lot in transcribing to get an idea of the balance between melody, rhythm and harmony. Lund stresses the importance of not only transcribing guitarists but also other instrumentalists and then finding the essence of what one likes. He says:

> I have transcribed a lot, and also a lot of other instruments, . . . when I have internalized the solo, I try to think what it is that I like about it: How can I get that sound, how can I have the same thing happen without having to play the same set of notes or idea the same way. I try to figure out a different way of getting the same result.

In short, the five guitarists approach learning music by using audio sources, in the beginning focusing on recordings that stay close to the composer's melody. They suggest listening to the lyrics if possible and internalizing the music by isolating the rhythm and melody. When transcribing solos they elaborate the best ideas in a personal way. They prefer to practise with real records and avoid play-along records, as they deceive the feeling of interplay. If one should use written sources, they suggests to go to the original lead sheet and not a real book versions.

7.1.2 Parts

The effect of practise has very much to do with knowing what one wants to achieve and then breaking the problem into manageable chunks, practicing small parts one at a time. In jazz this is also referred to as the *target approach* (Crook, 1991) and involves extended practise of these parts until one can play them fluently. As Monder says, "I would break it into sections of four bars at a time, first melody and then harmony, then I add four more bars and doing the same thing here; so all together I have 8 bars," By extending the chunk progressively, Monder is able to think of the entire song as one unit. "When I'm finished with the tune in this way, I just use repetition to internalize the entire song."

Monder is also referring to different ways of approaching the tune but strongly suggests that the tune has to be internalized in its basic form before adding something to it. "Once it is digested sufficiently then you can

superimpose or do whatever you want, but the structure should really be internalized properly first."

Talking about challenges in jazz guitar technique, Rogers says, "if you want to come up to a certain technical level you have to practise it constantly, all the time." He continues by stressing the target approach in practise. "Find out what is difficult on that wall and use the microscope to study the details of that complexity until they become better." Practising a part or a piece constantly over an extended period of time until it is internalized is also, as mentioned earlier, referred to as woodshedding in jazz.

Melodic, rhythmic and harmonic parts

Wilkins always starts with the melodic part: "I always start with the melody; the chords are secondary. Once you have the melody in, the rest sort of comes by itself. It might be a spot here and there, but in general most chords are defined with the melody, unless it is a really complicated piece." This is also a view shared by Monder, who chunks the song form based on four bar periods of the melody. However, the approach Monder uses depends on context:

> I play differently whether I interpret it in two or four bar chunks, or whether I interpret it like superimposing something over the whole—you know, structure. I don't see why it should be limited to a certain way of approaching it. Depending on the course or where I am in the solo, I use different approaches.

Rogers normally uses a part approach when learning solos: "I normally gravitate towards learning parts of solos. I never transpose much to other keys either. I never practise two five licks. I just practise improvising freely, and then when I have a good idea I try to develop that idea." His melodic ideas are often triggered by practicing with live recordings, imitating and reacting to the phrasing of the other players. It seems as if understanding the general idea of the phrasing analytically, i.e. whether it is based on a particular scale or chord extension, is more important than copying the lick for later use. Rogers says, "I never prepare anything as far as improvisation concern, not at least consciously." Lund also suggests a similar approach:

> I try to have no pre-mediated idea of what to play. If I can play in only one way, it's sort of going to be a cliché. It's going to sound like that, and it's going to be in the way of my own ideas. I basically try to figure out what it is I like about the idea: Is it a harmonic thing, a melodic thing, a rhythmic

> thing, and is it a certain kind of combination of intervals that I like?—making it a much bigger thing than having to play those notes.

The first thing that attracts the listener's attention are the rhythmic aspects involved in playing, and the ability to be in time, according to Lund. Fascinating rhythms have the power to grip the listener by demanding to be heard; it triggers movements in both performers and listeners. A good feeling for time is established when the same rhythm can be heard on several levels. Lund, Abbasi and Monder all mentioned the different rhythmic patterns of the drums as an inspiration when improvising, sometimes relating to the bass drum, sometimes to the hi-hat and most frequently to the drummer's cymbal patterns. To achieve better time, all of them suggested using the metronome as a practise tool, adding variety to phrasing by playing ahead on and after the main beat.

Rhythm creates patterns of affection, changing the rhythmical accents slightly is a way to quickly establish different emotional modes. Playing downbeat heavy and symmetrical phrases creates a quite different feeling than using upbeats and varied phrase lengths. To keep rhythmic and harmonic variety in phrasing, the ability to look ahead was stressed: imagine the sound. Abbasi says, " . . . I try to look ahead of where my phrases are going to end." By imagining the upcoming phrase, including the rhythmical nuances in the phrase, the music is given a quality and a direction in which the listener feels the performer's intentionality. The performer's inner time consciousness has the potential to become a collective time consciousness when it is transformed into action. When transcribing the solos in this project I became especially aware of this effect when I heard poly-rhythmical playing over a sustained period of time (see transcriptions of Monder, Abbasi and Rogers's solos, playing three against two).

Rogers suggests the importance of staying away from the comfort zone in practise: "One should force oneself to play the opposite that comes easy and natural for oneself; engage in hitting resistance in your practise. You will discover something new in that way." He suggests very simple exercises if one is to be able to play over the challenging parts, like working with a metronome in a challenging tempo but with a prolonged duration on each chord, or playing "standards with straight eight notes and with only a major third as the largest interval." As Rogers states, "use something which is challenging for you," for example "if you want to play fast you have to practise fast." By engaging in this sort of practise Rogers also suggests

"mimicking" the great musicians by transcribing solos, reading solos, or purely listening.

In describing how the music is constructed of separate parts, Rogers refers to it as rigorous: "It's like every shrew is really tight." He continues by describing the harmonic structure of standards as "pure architecture" formulas that are used over and over again in different keys. To get the feeling of how parts are joined together, Rogers practises scales and chords at the same time, using rudimentary stepwise scales and playing the bass notes or chords at the same time.

Wilkins underlines the formula concepts of standard harmony by saying, "with a new standard I sort of know it anyway; it's in the back of my mind." Wilkins remarks about standard (tunes) is a good example of schemas that are so strong that they may anticipate the actual changes; "one remembers into perception," to once again quote Jason Brown (2010). Chunked associations in long-term memory are so strong that both the mind and the body perform actions guided by the past. This is both an advantage and a handicap; large hierarchical chunks contained in the schemas are released in fractions of a second by good guesses, but not necessarily the best guesses. Berliner (1994) refers to this as "mechanical playing" in jazz improvisation; habits, more than listening, are lodestars for the improvisation.

One way to avoid flaws in performance is to really get into the harmonic foundation of a tune. Wilkins says, "What I like to do is to organize the theory of it. Find the movements of the chords and especially listen to the bass line." The movement of the bass line and the chords can be viewed in many different ways; Monder refers to the tonality of *All the Things You Are* as F minor instead of A♭ major, which is the most common way of approaching the tune.

> I think of the sections in many different ways, both separate chords and tonality. Instead of A♭ major, I think of the first five chords as F minor. I generally don't emphasize the m^7 in F minor, because it weakens the tonality in the first chord. Starting with the F minor seventh makes it sound like you are in the middle of something.

The quote above shows that even the major tonality might be questioned as the main foundation for analysis. Even though the chords will be similar in F minor and A♭ major, the leading tone E in F minor will produce a somewhat different sound. The E is of course included in the $C^{7\sharp5}$ approach chord to F minor, hinting at such a possibility. However, based on the analysis of the

solos it seems as if the other guitarists are thinking more in an Ab major tonality, which is the most common way of approaching the progression.

So far the inquiry has revealed that when the guitarists focus on parts, they use variety in phrase length, and by this adding a more dynamic dimension in their phrasing. Another way to sound more convincing is by targeting the phrasing, being able to hear the harmonic start and end tones of the phrases, including beat placement in the start and end on phrases. They suggest that rhythmical ideas can be very productive in generating different musical ideas as well.

7.1.3 Joins

When transcribing the guitarists' solos, they seem to have very clear notions about the direction of their musical ideas. New ideas are naturally generated from earlier ideas as in a continuum.[6] A typical difference between what Rinzler refers to as an intermediate level in improvisation, a cut and paste level, and the highest level of improvisation, is this natural chaining of ideas known by musicians as the joins. In Chapter 4, the joins were described as the active schema part, linking separate parts or ideas together in larger networks. It seems to me that a professional improviser is able to tell a story in such a coherent way. By illuminating the interlocutor strategies on this matter, the focus is on what enables storytelling to happen naturally in performance.

Melodic, rhythmic and harmonic joins

Monder suggests that how one spaces one's solo, varying play and rest activity, is crucial in making transitions natural. While the cut and paste improviser delivers his phrases on places where the licks or phrases sound right—placing the II-V-I lick on the corresponding II-V-I progression and rest in the modulation—Monder prefer another approach: "It is definitely more effective a line [musical phrase] to bridge or seemingly bridge to distant tonalities, as opposed to stopping your phrases and letting the modulation happen and start again afterwards." This is an important statement because it allows more flexibility in phrasing. By using the phrase to outline the tonality changes, you can start and end it on potentially many more places

6 See, for example, the transcription of Ben Monder's solo in the next chapter

in the schema. You do not have to rest due to complex modulations; rather, you define the modulation in your phrasing. This is also something I have identified when transcribing solos; chord tones are used more frequently on harmonically challenging places in the progression.

Using rhythmical subdivision, focusing on certain rhythmical units like quarter notes, eighth notes, sixteenth notes or triplets, to create joins in the musical material was often not explicitly defined in the interviews. But when analyzing the solos it is apparent that the guitarists use a rhythmical strategy in linking musical material.[7] The rhythmical groupings are often intensified during the solo, starting sparse with long note values and then gradually using more triplets and sixteenth notes. In Abbasi's words, "I sometimes intentionally create polyrhythm on regular beat material . . . It takes you away from playing in your comfort zone in four." When I analyzed Abbasi's solo, these poly-rhythmical groupings appear as important joins, especially when they go across section levels (eight bar periods). His rhythmical phrasing allows him to create a *meta section level* beyond the comfort zone in four.

Wilkins says that he has analyzed a lot of Bach chorales in order to make musical transitions or joins work in a good way. Studying the chorales makes him aware of the inherent possibilities for voice leading, and especially the common notes between different chords and tonalities. After a while he refers to this practise as more or less automatic. " . . . it's in my soul, heart and head; it's like a computer—you feed it and after a while it just reacts automatically. I guess I react to the logics of this tune; it is constructed in a way that makes it easy to remember." The logics in construction (functional harmony, AABA form, eight bar sections, standard cadences, etc.) of many standard tunes are partly based on the musical traditions of the composers who wrote them. Wilkins says, "most of the composers in the twenties and thirties had training in classical music and got many ideas from the classical composers."

In order to express continuity and development in musical build-up, Monder also practise chorales and violin studies. As with Wilkins and Lund, he uses triads to connect phrases and to extend basic harmonies. "I use triads over changes, and I practise Bach chorales and try to learn the voice leadings

7 See, for example, the transcription of Adam Roger's and Rez Abbasi's solos in the next chapter

from them." In order to have total command over the instrument and be able to express ideas anywhere on the instrument, Rogers practise arpeggios and scales all over the guitar neck. In addition he practise classical music. He says:

> I practise these scales by Andre Segovia, classical scales . . . major and minor scales, that I got from practicing classical guitar; which are; [Demonstrating] they`re going around the cycle of fifths. Then I practise Bach violin sonatas and partitas.

Summing up the joins section, it seems as if classical music is an important inspiration for all the guitarists. Lund, Wilkins, Monder and Rogers are all studying classical pieces for developing coherency in their solos. Being aware of common notes and smooth stepwise movements joining the phrases was suggested. It was also suggested to outline the modulations in playing rather than using rests. Polyrhythm was a rhythmical device suggested for creating meta-structures beyond the traditional phrasing and section level.

7.1.4 Maintenance

One aspect that critically separates experts from others is the amount of time devoted to staying on a professional level and energy devoted to developing skills further. I call this the maintenance part involved in jazz guitar playing, and this section focuses on the technical side of this expertise. As mentioned earlier, Ericsson suggests that being over-prepared, both physically and mentally, is the most effective tool against performance anxiety and other issues related to a successful performance. My interlocutors are all high profile professionals, and their way of dealing with accumulated stress by having developed purposeful physical habits will be the focus in this section.

Motor control: right hand

In our sessions we normally started playing right away and this gave rise to questions directed by instrumental concerns. This was especially evident in the first fieldwork where I asked questions on technique related to jazz guitar playing, illuminating idiomatic (instrument-related) knowledge.

Four of five guitarists in this study *anchored* their right hand in some way, using one or several fingers or the palm to provide a foundation when

picking the strings. The exception was Monder, who plays with a free-floating right hand, inspired by a classical guitar approach. Their anchoring differed somewhat: Two of the guitarist (Wilkins and Rogers) used their little finger for anchoring, while Lund and Abbasi used the right-hand palm for support when picking. The goal is much the same, to give the right hand support for movement, especially when the picking frequency is increasing, as when dealing with higher tempos. As described by Rogers, "I anchor my pinky and play with the side of the pick; I get a bigger and fatter sound. I always practise in all sorts of ways, so I am not limited to a certain style." He defines his picking practise as, "I practise all up strokes, all down strokes, and hammer ons and pull offs." Then he continues by stating that this is internalized knowledge: "I don't really think about my picking, not before students start to asking me questions."

To get a sense of the dynamics of the music, all the interlocutors used different sorts of articulations in their picking. Wilkins refers to this as slurs and sweeping: "I anchor my picking. I also use a lot of slurs, sweeping, try to get the up and down stroke to be the same."

As with Rogers, he works with different ways of initiating the movement: "I start with both up and down strokes. Often I start with the up stroke." The last part of this statement—"often I start with the up stroke"—is a way to practise motor control that develops flexibility by going against the normal way of executing picking patterns on the guitar, playing with a down stroke first.

Flexibility of right-hand movements were also related to whether they were soloing (mainly playing a single string) or comping (using chords), with their right-hand position shifted from anchored to a more free floating right hand when comping. According to the situation at hand, it seems as the guitarists had prepared the movements by placing their hand in position well before playing the phrase. As mentioned before, Godøy (2010) refers to this as coarticulation, a type of pattern recognition and fusion of micro-level actions and sounds into meso level. According to such a view the position and shape of the hands in the present are greatly influenced by what has happened before and the anticipations of what is going to happen next. This coarticulation is highly effective for increasing response speed and thus crucial for understanding the body's fast reaction patterns in jazz improvisation.

Motor control: Left hand

I was interested in finding out whether the guitarists' left-hand finger movements are position-based or more linear, horizontally based, playing up and down on one or a few strings. I became interested in horizontal playing after reading jazz guitarist Mick Goodrick's book *The Advancing Guitarist* (Goodrick, 1987), where he defines the advantages of approaching the guitar in a more horizontal way, similar to many traditional string instrument techniques found in Eastern countries like India (sitar) and the Middle East (oud). In such horizontal playing there is a direct relationship between interval distance and movement in space.

Feeling the interval, one has to move the hand according to the size of it. Lund says, " . . . you know when you play up and down on one or two strings, you tend to play closer intervals; you can play arpeggios and stuff like that, but you get a much more sense of the size of the interval, more like a trumpet player feels it." He demonstrates the horizontal movement of a large interval on one string: " . . . this is a world apart . . . that's part of what I like about it." Lund describes a movement of the left hand where the notes are perceived as dots on a straight line using only one single string. Referring to the earlier discussion on sonic guitar shapes, this is also the simplest way to see notes on the guitar according to the gestalt principle of common fate.

Playing "like a trumpeter player feels it" hints at the physical effort in producing larger intervals and the tendency to concentrate on closer intervals when playing up and down on one string. Lund says, "You also tend to play more closer intervals; it's more seconds, more sing-song melody [demonstrating]. It's a more foci type of melodic playing, like Charlie Haden . . . and it's more about . . . picking each note carefully [demonstrating]." In my own playing I have found the importance of "picking each note carefully," concentrating on articulation and dynamics as easier when I do not have to concentrate on left- and right-hand synchronization involving several strings.

Applying a horizontal approach involves a new way of visualizing the instrument, challenging oneself to find new ideas. In Lund's words, "I think it is a great exercise to get new ideas, start seeing the harmonies this way [demonstrating up and down movement on the guitar neck]. You get rid of all sorts of phrases you tend to play for no reason. You can't play it . . . it's sort of 'out of the window'." The action trajectory that involves an

anticipatory image of the sound on one string is based on targeting the action in a quite different way than getting the sound by changing the fingering in a position. The easiness of which mechanical finger patterns are formed in certain positions on the guitar is what Lund refers to as being "trapped in the present." Lund's statement of internalized finger patterns as realized before any conscious image of sound is also shown in many experiments on anticipation in motor control.

Related to scale playing, Lund says that "another thing with scales is that they tend to be fingerings and positions that you apply to certain places along the neck, and all of a sudden you're trapped in the present where you follow that stuff around the neck." He continues, "more or less you are repeating certain ideas because of this, without necessarily wanting to do so [demonstrating] . . . oh Aeolian . . . what is the fingering? I used to think like that, and that was a big problem for me." This hints at the problem of having internalized motor schemas for fingering patterns that trigger faster than your conscious thought.

Guitarists spend thousands of hours learning scale patterns, coupling a stimuli—for example a certain chord—with a certain action on the guitar. The problem with position-based actions is that they tend to be played in a stereotypical fashion, for instance from root to root in certain positions, because they are learned this way. The body remembers and makes movements based on habit, indicating that "as you practise you perform." Lund reflects on these matters from his own educational perspective comparing Juilliard School of Music with Berklee College of Music;

> . . . at Juilliard there was not much emphasis on the chord scale thing, which for me at that time was cool because I already was frustrated about this approach from Berklee, but at the outset this was very helpful; it is a vocabulary. It's something obviously missing when we're thinking in the chord-scale category or tonality. You should really hear each sound and develop your ability to hear it in a varied way.

In this quote Lund refers to an auditive approach based on accurate recall of the music, transforming what you really hear before applying finger patterns mechanically on the fretboard. The importance of flexible fingering that could automatically transform an auditory image is crucial. Abbasi believes that playing, hearing and visualizing are all interconnected. Stressing that it is not enough to hear it if you do not know where to play it, he says:

> I studied with John Abercrombie years ago and he said, if you're not able to know where to play it on your instrument, it doesn't help to hear it. This means visually imply it in your playing, and after a while it might be flowing, for instance playing a B major triad on a C major seventh chord will be a part of your hearing, conceptualizing and visualizing. All three are interconnected.

Monder tries to combine different vertical (across) and horizontal (up and down on the neck) approaches when playing harmonies on the guitar, but stresses: " . . . simply going up and down is kind of boring, so I try to vary the chord structure in different ways, moving the voices inside the chord, etc. But I guess the first step is to go up and down."

After studying the guitarists' hand movements in detail on the video, I found that the guitarists rely on a flexible right hand according to the need of the situation, with anchoring being most common in solo playing and a free floating right-hand being most common when comping. When guitarists combine horizontal (playing up and down on one or two strings) with vertical (position-based) movements, they seem to chunk larger parts of the fretboard, including several strings, and move these patterns freely around. The horizontal approach dominated for idiomatic reasons, like playing slides and certain expressive and dynamic motives that contained sequences based on partly pre-learned patterns on one or two strings. This was especially evident in Abbasi's playing, for example when using the Indian sitar slides.

Internalizing repertoire

What enables musicians to perform with little or no practise ahead at a jam session or a gig? Some musicians suggests that this is possible by internalizing a common repertoire, for example knowing standard tunes so well that one does not need to prepare when this repertoire is used on the bandstand. For many aspiring jazz musicians this repertoire works as an entrance into a larger society of jazz musicians. Knowing the repertoire, you can go to a jam session almost everywhere and have the means to communicate. Making this repertoire vibrant and alive seems to involve repetition, generating the musical material frequently. It involves making a large knowledgebase more nuanced and support the development of new strategies for easier retrieval. This includes developing more varied representations of the knowledge, represented by musical roadmaps, etc. Lund says:

> Earlier I used to go over the real book and learn a bunch of tunes. When I was going to pick up the tune later I sort of remembered the tune but not quite. What was the bridge, etc.? I played the melody wrong, and then I found out I had to learn it from the record, as we talked about before. This is a hard way to learn, but once you do, you remember it; the tune is yours.

Lund suggests an approach to practicing material that resonates with a bottom-up approach, starting with a random single tone and then developing from this single tone. The structure emerges little by little: " . . . I also sometimes just start with a random single tone and play the tune from beginning, building it up from nothing, playing the melody super straight and then adding the bass note." Lund suggests adding different chord tones in the bass and playing the melody on different places on the fretboard, which ensures the involvement of more than just finger memory. He suggests that the basic form is really internalized, knowing exactly when the bass changes before adding something to the basic structure. "Then I can later add things like second voice of chords, etc. On every chord I play I try to learn all possible voicings and inversions." Lund internalizes the repertoire by building up motor actions for every possible situation that can occur depending on musical input.

Monder suggests repetition as the main ingredient in maintaining the repertoire: " . . . just use repetition to internalize the entire song . . . I return to things when I want to have it back in my repertoire, and simply play it as much as possible." Then he suggests the same thing as Lund, stressing the importance of internalizing the changes before doing elaborations on them. Monder also suggests improvising by singing over the harmonic structure, sometimes also referred to as scat singing. Scat singing involves using the voice to imitate an instrument, which is an approximate imitation based on a generalized schema of how the music should sound. He prefers to spend time on transcribing his singing rather than transcribing his own guitar solos:

> I accomplish about 5 percent of the things that I want in life; so transcribing my own solos is pretty far down on the list. . . . I can relate to transcribing singing, I did an exercise with a friend where I—we alternated by playing—singing choruses. Trying to have them merged—I definitely think this is a great exercise. The mind is different in singing and playing modus, but the aim is to have no separation between my voice and my instrument.

All the guitarists in this study suggested learning the material to the degree that the chance for doing something wrong is minimal. For difficult material

they woodshed the difficult parts. For easy material Monder suggests that "Normally I don't spend much time on it, especially if it is easy. It's actually better to not prepare that much on material like this." He suggests a fresh approach because it might be easier to surprise oneself when there are no preconceived ideas blocking true inspiration.

Wilkins suggests a vocal approach; " . . . sing along, learn the tunes, sing the solos." Monder who sings an idea and tries to replicate it on the instrument also uses the vocal approach. He says " . . . it's possibly the best ear training you can do, since you also connect ear training to the actual execution of the instrument. For further maintenance of both technique and repertoire, he suggests to "work with the guitar regularly, overcome the blockage that stopping you, force something and try to make it in a way that resonates with you." He also suggests listening to other instruments than guitar: "I think it is dangerous to get too much inspiration from the instrument itself; it is easy to repeat yourself." This is a notion also mentioned by the other guitarists; they listen and transcribe other instruments, mainly saxophone, trumpet and piano. They are inspired by the fluency in physical output and the fact that wind players have to breathe, making their phrasing more organic. Roger's says, "I think my technique is really inspired by saxophone players; sax players are normally more fluent than guitar players."

All the guitarists suggest staying away from the comfort zone in practise, and one way of doing this is to imagine the music away from the instrument itself. Abbasi says:

> I sometimes try to visualize the guitar when I go to sleep, and hope it penetrates the ideas better, but especially when I really want to have something internalized on the guitar I visualize it; who knows whatever comes out. Just imagine how Olympic athletes do it; they imagine the whole run ahead of the start, so why not us?

This resembles the energy that chess masters also make in maintaining former chess games vividly in the mind and applying parts of them whenever needed in a new chess game.

Besides imagining the music, Abbasi maintains or remembers material by repeating the bass, melody and iso-rhythm exercise done in the overview phase. He suggests that transposition is crucial for memory: "Another thing is to transpose it to another key if you really want to learn it well. I myself am happy with playing it in one or two keys, but if you are going to play with singers you probably have to play it in many different keys."

The inquiry into maintenance has found that in order to internalize a musical repertoire, the guitarists suggested singing everything that one is trying to play (the singing mind) and play everything from a random single tone, gradually adding harmony and rhythm (in many keys). To strengthen the ear-hand connection they suggested staying away from the instrument and instead visualizing the music, engaging in transcribing and listening to other instruments.

7.2 Performing

Focusing deliberately on one aspect at a time is useful when practicing improvisation, but in jazz performance deliberate practise becomes a more collective, situated and tentative activity relying on rules and roles in the interplay context. As previously mentioned, performance itself may be seen as a valuable learning or practising experience. While the sections on practise have focused mostly on structure and form, this chapter will deal more with aspects of time.

7.2.1 Intention

Melodic, rhythmic and harmonic approaches

Pacing, i.e. balancing play and rest activity, is important when improvising, making both performer and listener aware of what has been played and what is to come next. Reflecting on pacing in his solo, Rogers states, "I try to leave space in my solos, so that I can listen to what I hear, so that I'm always hearing things in my head while I'm playing, and trying to realizing them on the guitar." This is also something that Lund is concerned about: "Spaces are crucial; if you just continue to play it gets tough to listen to. The ideas don't disappear if one takes a break. It still lingers in the mind. Having spaces give the ideas more weight and opens up for interplay in a whole new way." He also connects the pacing in the solo to a dynamic dimension: "If I play all the time it tends to be very flat."

Lund is hinting at the tendency of some players to just play and not connect the playing to something larger. According to Lund it is better to " . . . develop one or two ideas properly instead of just running changes." Rogers says:

> The way you play reflects your personality, your sound, your compositions; it's a reflection of your soul, your inner self. The strong musicians do often have a very strong pervasive vibe to their music. If there is nothing behind the notes, then it is not very interesting. After a while I lose interest.

In order to create interest Monder uses the expression "Sculpture phrases with space around them." This is also something that does not necessarily come automatically. It is more a strategy that he needs to adhere to: "Maybe what I have to remind myself of is to leave space. If something suddenly strikes me in the middle of playing, it's usually like "Stop playing!" By reminding himself that there is "plenty of time to play all the notes in the world," he also leaves space to react to his own ideas and others' ideas. Rogers also mention this: "When you leave space in music, you leave space for something to react, and you have a dialogue. You open up space for somebody to react." At the same time, he stresses that pauses should be used with taste, as "silences are a very heavy thing in music . . . breaks have to be natural or else they is meaningless." Abbasi confirms the importance of pacing and using it in a way that relates to what is happening in the moment: "Yeah, spaces are always a good thing. The thing is to not be so obvious about it." In the same way as Rogers, he stresses the need to use phrasing in a way that sounds natural and organic in context.

Lund suggest that in performance it is not about making too many decisions; it is more about being in a state where you are able to receive ideas, being able to respond to what is happening in the context. "It's just listening to the other people I'm playing with. It's not deciding to do one thing or another." Lund aims for an egoless kind of energy on stage, implying a focus on the music and not on him. Abbasi confirms that moments of transcendence, where he feels that he is just a part of something bigger, are important, but he admits that this state of mind has to be supplemented with more conscious decision at times: "I sometimes intentionally create polyrhythm on regular beat material. This gives you another way of phrasing, and creates new ideas. It takes you away from playing in your comfort zone in four." He then suggests that the energy and drive from doing this polyrhythmic improvising makes you listen even more intensely to your fellow musicians. "In performance it is also good to know to play the five [against four] rhythm without knowing exactly where it ends, because you just then have to relate to what is going on in the rest of the band."

Harmony is closely connected to melody and rhythm in performance. While rhythmical and melodic aspects are often in the foreground in the shaping of a melodic line, the associated harmonies have to be heard and conceived instantaneously. How harmonic parts are perceived in a larger structure is often based on what is happening in the performance. Lund normally gravitates toward thinking on each chord, but the target notes are all internalized; he does not have to think about the important notes. Harmonically he uses a lot of triads in his playing, which also makes the thinking easier. It represents a template way of thinking: Instead of thinking of seven separate notes in a scale, he combines two basic triads. "If I can just play the bottom part of the harmony and vary the patterns and rhythm it can sound like this, [demonstrates] and if I can be just as specific with the top triads of the chord it gives a lot of possibilities." Lund says, continuing: "What I would do is basically to take part by part and check out all the possibilities on each separate chord. " He then demonstrates how this can be done, by taking a single note (G) and linking all the major triads that have this G tone and listening for the sound produced over an Fm^7 chord. Then he adds another tone (C), and uses the same principle around that tone. Finally he combines the triads that contain both G and C. This is a strategy that he uses to internalize new sounds.

Abbasi also hints at the same principle by suggesting, "well I certainly see patterns and shapes, I know it is a major and I see the shape, whether it is an extension or inside, for instance playing E major triad on C major. One tries to weave an extended tonality, and that will result in an extended chunk of a C major tonality."

7.2.2 Action

Abbasi thinks that listening in interplay involves a choice of moving in the direction of the thing you listen to, or it might suggest doing something else. Abbasi says, "I like when somebody listens without necessarily following me." Abbasi is especially concerned about the rhythmic accent of the ride cymbal, and is referring especially to this when he states, "I want players who can feed me with accents. I need something to react to, something is going on that we can react to each other phrasing. It is almost like a sort of telepathy." "The best kind of rhythm section is the kind that is balanced . . . they can give you support; yet they can let you go too." He then elaborates on

the importance of being flexible related to beat. "Like it's all free it's a drag, if it's all right on the beat it's a drag, so it's like in the middle . . . and I like to play like that too."

Abbasi suggests that improvisation can be seen as a musical dialogue, sometimes acting and sometimes reacting, sometimes framing a musical question and sometimes answering the musical question. Lund is also very much aware of the negotiation aspect of improvisation:

> If I decide what I'm going to play in the third chorus that might not be at all what is happening in the rest of the band. Maybe the music is going in a totally different direction; maybe the drummer's start sets up a whole different thing, so it's not connected to what they're doing. So basically I'm trying to focus as much as possible on what they're doing, having what I'm playing being more a reaction to that, but sometimes you instigate ideas, and "what about this?" . . . the drummer might hint at something which makes me do this, or the bass player opens up a special note that leads to something new harmonically. . . . Even though it is technically my solo, they're as much part of it as I am.

The implicit and explicit dimension

Wilkins also talks about the importance of not having any pre-mediated or explicit ideas in mind before performing. He refers to this kind of playing as "I think it would be very dull to listen to." However, he listens very carefully to the setting and admits that in the back of his mind there are some strategies telling him when to build up intensity in a chorus structure: "If you peak at a certain place in your solo it should be at the last chorus." He refers to it as a non-conscious thing: "There is a part of me back in my mind which takes care of this; I won't deny it. It just happens, when it's good and when it's right." His reflections correspond to Lund's description of the uncertainty of planning alone for a certain direction in improvisation: Wilkins says: "The thing is, when you play together with someone else you have to think like one person; when you play solo you can have climaxes everywhere [laughs]."

Monder does sometimes have a clear intention about making certain moves in performance: "Sometimes I think about introducing a subject and then introducing a counter subject and kind of developing these two ideas in parallel in different register to make a contrast." But he at the same time admits that the intellectual has to be kept away most of the time in order to really live in the moment: "Be aware of turning it off; shift your attention

entirely to whatever is going on in the sound. And maybe even away from your own sound and maybe focus on the sound of the other persons who are playing." Monder believes this is best established by focusing on something outside oneself:

> Maybe focus on the cymbal of the drummer, generally more toward what the drummer is doing. Or just focus on a different element of what I'm doing—timbre, etc. Also, just follow the living of your playing, letting what you play determining the next, instead of superimposing something new, letting things unfold in a logical way.

He admits that this might be difficult when there are other impulses in the band. But he thinks that a balance might be achieved: "But there is room for both. To me it's a matter of balance."

Monder sometimes feels that ideas are harder to execute when he is stressed: "If I'm feeling uncomfortable or nervous or stiff or something, then there are no ideas and there is just no execution of anything." When he is relaxed he is more open to ideas. "If I feel good and feel relaxed . . . feel like I`m physically playing well, the ideas come without too much of a problem." This is also something that Rogers is concerned about: "Sometimes my fingers are talking to my head, and sometimes vice versa; it changes from night to night." Why it changes from "night to night" is often related to performance context and personal preparation ahead of the actual performance. As Rogers says, "I try to be rested and have some food, although not too much. In my mind I clear out different things before going to the gig, so that I am ready to perform, trying to avoid emotionally distressing situations. Usually when I start to perform I'm finished with it, whatever has happened before."

7.2.3 Goal

"Knowing exactly where to go" might indicate a focused attention to solo structure. Monder is skeptical of being too involved in choosing a direction, a strategy or storyline for the solo. "I don't really believe in that. To start thinking like that you limit yourself." He then suggests it is better to have ideas that relate to a natural flow in the moment and suggests "It might even be more appropriate to start with a peak sometimes related to what is going on, like when the energy is really high, there are many different storylines." Lund agrees on this point and says that related to improvisation,

> I think there are a lot of good types of solos. There are certain solos that I like for a certain reason, but to me a great improviser is one who is truly improvising. I think there are a lot of great players who are not necessarily amazing improvisers. They just have their own vocabulary and they sound great doing that. But if you would see them night after night after night, it wouldn't be that different. Or they are comfortable in a certain kind of space, and that's where they're going to stay. Whereas, you know, people like Wayne Shorter, he is not just looking at a comfortable place to stay, and he is really listening to find something different, listening to the others, . . . or Herbie Hancock. But, you know, everyone is different.

Having your own vocabulary is not enough, according to Lund; you have to use it in a way that challenge yourself, using your skills in a way that takes you away from your comfort zone. It's about courage and trust in your own ideas, choosing a direction that is not necessarily safe.

Abbasi is also concerned about the openness in approaching improvisational direction. He refers to Billy Higgins who prefers to be in the moment instead of thinking ahead, planning the moment. " . . . your imagination is telling you what the future holds. If you are planning for the B section while being in the A section you are not totally involved in the moment." The ability to be in the moment is also expressed with listening to everything in the context, not only your own solo moment, by listening to all the other aspects of the music as well. According to Abbasi this outlines the difference between being a soloist and the one who is thinking compositionally, meaning composing and playing at the same time. As Abbasi says,

> [When it is] a kind of storytelling the climax is often referring to a gradual build-up of intensity earlier in the solo. But most important is to listen to the totality of what is going on. If the player improvising before me ends in a climax, I have to relate to that climax and build on it. Then later taking it down or whatever, the story is actually a set of separate stories tied together by the improviser's soloing on that particular tune. That is really the key!

Lund elaborates on this point by defining his own solo strategy like this: "I just have to listen. I don't know what you are going to do, and it has to relate to what happens in the moment. I have to know what happens in the interplay in order to know what to do." Then he adds that the content of possible strategies is very schema-based, or general: "What is the range? Should it be a higher register or should it be a lower register? It has to be connected to the overall sound." The ability to keep the intellectual away in the moment is to have properly internalized the material, according to Lund.

A personal voice

Listening to recordings of own playing involves a reflection on action. Rogers is critical of his own playing at times and frequently experiences the urge to change his approach to playing: "Sometimes I really like to change everything about my approach, but it's not possible; you develop a way of playing that is a part of you." Rogers has been a professional player in New York City for many years, and when he reflects on his career and other musicians' careers, he thinks that very much of being successful is about how one is as a person:

> Being a top musician is a very multifaceted thing: your brain, how you feel about yourself, about the music, about performing in front of people. The great improvisers I have worked with I think are made better improvisers and musicians if they really don't care, if they're not trying to prove anything, and they are very relaxed all the time. This has a lot to do with emotional and psychological security. In the end of the day, if you have saxophonist A, B, C, etc. and all of them have extraordinary technique, what is going to separate them will be the above-mentioned points. Your ability to react to people has to do with who you are, and especially in improvised music. Since you are constantly expressing yourself, it expresses your personality.

How one relates to an audience is definitely also a part of that experience. Rogers says, "somebody might be half asleep sitting in front of you; you don't want that person to sit right in front of you, but you react, and that colors the music." As a performer one has to relate to an audience. In Rogers's words, "I think everything we processes will be expressed in a way, and when someone has a battle with themselves on stage, struggling, that creates something. Fighting with technique, etc. . . . comes across when one is performing; people sense it." Reflecting on his own experiences, he says:

> Sometimes I really don't feel like standing up in front of people, but in the end of the day I do like performing, talking to people from stage, almost like a party. I notice that more with my own band; it used to be kind of nerve wracking earlier for me, but now I really enjoy it, talking to people.

Wilkins says "everything releases with a good sound." Wilkins indicates that if you like the sound of your instrument, it's easier to communicate with the audience. This is also reflected in Rogers's statement above when he talks about performing; "everything we process will be expressed in a way." Lund's and Monder's reflections about many possible directions when improvising—not looking for a safe place when performing and listening in context—is also supported by Abbasi, who sees improvisation as a set

of separate stories tied together by the improvisers. Summing it all up, the guitarists suggest developing, as an improviser, a "personal voice" that is flexible and sensitive to context, not looking for a safe place to stay.

7.2.4 Performers' perspectives on furthering improvisational skills

In this section I will elaborate on comments given by the guitarists on my own skills as a jazz guitarist. As a learner, I was interested in comments from my interlocutors and in the diversity in which they commented on my playing and gave suggestions for further improvement. Their comments were also crucial in developing new and more nuanced categories in this practice-led study.

Melodic, rhythmic and harmonic approaches

Abbasi commented on the dynamics and logical unfolding of the improvised line itself: "Find a way to stay away from the downbeats. Not that you are playing downbeats all the time, but it sounded like you were counting small phrases instead of longer phrases." He then demonstrates his thoughts and finally suggests that I "incorporate more chord tones and play longer and more varied phrase length." Lund also suggested more varied phrase length: "Nice, cool! There's a little bit throughout composition, use more space. Use less symmetrical phrasing, like predictable four bar phrases, where ideas are resolved in predictable places . . . Target your notes, and the audience and fellow players can hear it." Being able to look ahead for the upcoming notes was also something that Rogers appreciated when he heard it in my playing: "The really nice thing in your playing is when you target your notes."

All of the guitarists emphasized technique as a necessity for expressing ideas fluently, and they also found rhythm to be essential in this respect. Lund said, "When you are playing with people, the first thing people look for or listen for is the time, you know, the rhythm. They want to be able to relate too what you are doing." Lund also found my playing a "little bit downbeat heavy" and suggested that I bounce around the beat, and remember to not stay too long in one place rhythmically. He asked me to think more rhythmically when playing and suggested that by doing so, new melodic ideas could emerge: "I think if you just think purely melodically you

can neglect the rhythm a bit . . . I think the rhythm can be really helpful for creating different kinds of melodies and stuff."

He suggested that relaxation is an important part in switching between simple and double time rhythms. "Well I think a big part of it is just really to be relaxed; I think a lot of times . . . if you're going along and playing eight notes or something and then you think, 'okay now I'm going double time' and you tense up, and you play too fast or the sound goes and you tense up in your arms." One way to avoid tension is to be flexible. According to Lund, "just feel that beat being many different things [demonstrating] . . . When you can feel it you can play it . . . When you can feel a certain period of time, time feels more open, from point A to B, it is going to be set, but between that everything can happen."

One way to achieve this feeling of time is by practicing with a metronome in a very slow tempo, e.g. 40 beats per minute for an entire chorus. Lund says, "You have such a huge space of time. Just a tiny little bit ahead or after you immediately notice. You must take more responsibility." Then he continues by suggesting another exercise:

> I put it on 80 beats per minute now. We are still going to be playing in four, but I'm going to have the metronome playing the dotted quarter notes. Then I am going to play only quarter notes and chord tones for the entire chorus . . . I have to provide the one myself.

He demonstrates the principle and continues by saying, "if I lose my way, then everything falls apart," suggesting that he has to take responsibility for time by hearing a pulse that is going partly against the metronome.

Abbasi stressed the importance of simplifying the amount of notes to get to the essence of the rhythm. "Rhythmically I think it is a good exercise too play only one note and accenting it in different ways. After you have restricted yourself in different ways, you will be able to play in many different ways." He suggests that I should vary the accent: "Basically what I hear in your playing is a rhythmical habit, and maybe try to vary the accent more. Maybe you hear an accent somewhere?" This is also something that Rogers commented on by mimicking my solo accents in his comping behind me. "I took an idea that you played and kept it going and elaborated on that rhythmically." I was playing an accent using three against four and this was something Rogers made me aware of "in action" by imitating my accents. I responded by using the previously mentioned phrase from Schon "thinking on my feet" to vary my accent somewhat more.

Wilkins suggested that I needed to become more dynamic in my playing: "You need to add more dynamics into your playing; if you look at a graph, your playing would be like this—flat." He didn't exactly say how but suggested that I played it once more while emphasizing the dynamics, and he was then pleased with my playing, saying "that was nice." Reflecting on his comment I had an image of a simple flat dynamic line in my head, which was easy to correct. This shows how mentioning a simple thing like this can have an effect in a pedagogical situation. As mentioned before in relation to motor behavior, the suggestions should be simple, according to Schmidt, for instance, "incorporate more dynamics into your playing."

When I demonstrated chromaticism, Lund viewed it as a cover up and defined it as neck-friendly chromaticism involving finger patterns that are easy to execute on the fingerboard or neck, but that relies more on pre-learned fingering patterns than really hearing:

> I don't think it will ever sound good if you just do it for covering up. I think the further you stay from the chord, the better you have to sell the idea. If you just play a bunch of notes without knowing where it comes from or where it's going, to me it doesn't sound very successful.

Then he continues by suggesting the importance of having an intention with the phrase: "Sometimes you use chromaticism and then you ended up like this, and it is sort of you resolved [the phrase] but you didn't." Lund thinks that this might be due to a lack of harmonic overview: "The more solid the chord stuff and chord tones, etc., the more freedom you have to resolve it properly."

The main point in his suggestions is that improvising a line involves a direction toward something: "If you're just playing it for no particular reason or there's no deeper harmony or voice leading involved, then it just sound like you . . . it doesn't sound like you are hearing what you are doing." Then he suggest an aim for the phrase: "If you are going to use Pat Metheny or chromatic runs, then you have to know that this sort of tension will be released [here] in the next two chords." He finds this especially evident in the double time phrasing: "You play a lot of really nice melodic ideas, but your double time phrasing sounds like another language, like Pat phrases." Rogers states "harmonically it seems like you coming up to a wall" and suggested that the harmonic content also would sound better by imagining the logical unfolding of a composition in playing: "Try to think that you are writing a new tune when you improvise."

Maintenance

Rogers's main concern was my technique: "You have nice melodic ideas and nice phrasing and everything, [but] it sounds like you need to practise more so that you are more fluid." Rogers himself has a very good technique and states, ". . . if you don't keep playing all the time your technique goes down." Abbasi also hears this technical deficiency in my playing: "One thing and a good thing that I notice is that you are nice to comp behind, because you are pretty rhythmic, at least accent wise. You do punch on something, and it is nice to play around that." He then reflects further on the issue and concludes: "You play really well . . . Sometimes I hear something laidback in the beat, but not in the good way. You are kind of struggling with some technical stuff that you got to work on. Try to play with consistent eight notes, longer lines."

The technical side of the execution was also a point for Monder when he felt that I was rushing a little bit and not quite relaxing when I was soloing, almost like sitting a little "on the edge." Monder says, "Your sound feels a little bit un-edged; just relax, think more about swinging your eight notes. You sound a little bit intense. Intensity is good, but relaxation is also good." He suggested that I should transcribe solos to get the feeling of continuity in my playing. "I heard you following certain ideas, which is good, but maybe you do it a little bit too symmetrical, not subtle enough; you ramble around a little bit too hard. But other than that, you have nice lines, and you have the right instincts."

To avoid this 'rambling around a too hard,' not exactly expressing ideas, Lund suggests that I should wait for the ideas to come and incorporate more space: "In general give yourself more time, especially in the beginning. Develop the intensity as you're getting into the story or solo." He also suggests that a reflection on action afterwards is helpful in this process: "Record yourself, and think of all the decisions and consequences of the choices you make; how do you vary and contrast your playing, high and low, slow and fast playing, peak points, etc."

The jazz guitarists' perspectives

This chapter shows the guitarists' perspectives on own playing and has a lot of suggestions related to a practical context. Having stressed the explicit dimension in this chapter, I have found that the guitarists have a profound

understanding of a large number of internalized concepts of musical sound, along with a corresponding array of precise physical movements. It seems that the guitarists use strategies that are frequently associated with expertise, getting an overview and basic understanding of what is at issue before elaborating further.

In the practise stage they stresses discipline and accuracy, and because of this, they develop great skills in the areas associated with the restrictions. They break down musical challenges into more manageable ones before moving on to others musical challenges and doing the same kind of chunking in these areas. Isolating harmony, melody and rhythm, and looking at the possibilities offered within a limited area was suggested as a practise tool but not as a performance tool.

All the guitarists pointed to the importance of circumventing thinking and analysis in practise, in favor of hearing and intuition in performance. Hearing and intuition are better for the demands of real-time processing, since analytical thinking is too slow to deal with all the potential decisions that have to be taken in fractions of a second during improvisation. To enable this in performance, their comments can be summarized as follows:

1 Trust your mind by having internalized the theoretical challenges ahead of performance,
2 Trust your ears by having accurate aural images of how theoretical concepts should sound like in performance,
3 Trust your instrumental skills to generate these aural images instantaneously.

Jazz guitar expertise seems to build on the same extensive work as many other field of expertise. Slow laborious work and thinking in practise enables fast thinking and actions in performance. However, quite often what people say and what they actually play does not always correlate. The next chapter is devoted to transcription to see the match between words and deeds.

8 Musical analysis

This chapter contains five transcriptions of *All the Things You Are*. As described in Chapter 6, this tune contains many of the cadences and formulas used in standard jazz, both in sharp keys and flat keys. Furthermore, it exemplifies the respective improvisers' style in a way considered particularly valuable for this research project.

Doing the musical analysis with the practitioners in the field, with the professional jazz guitarists looking critically through the analysis and leaving comments on the usefulness of both the analysis and findings, is one way of allowing the practice to lead the research. The musical analysis answers the research questions in a way that the verbal dialogue is incapable of doing, and vice versa. As already noted, the interviews contain explicit information while the musical analysis focuses on implicit information, which may be tacit even for the performer himself. Illuminating this implicit information, I use time, structure and form as the main categories in the musical analysis.

The time aspect is related to pacing or play/rest activity. Phrase length and content, rhythmic starts and endings on phrases seen as offbeat versus downbeat placement, will be analyzed. Structure pertains to the material used like harmonic structures, tension tones, consonance (inside chunks) and dissonance (outside chunks). Form analyses deals with tension areas, cadence areas, peak points, interplay and solo characteristics.

8.1 Musical transcriptions in a modal matrix

A transcription is a way of notating the actual music, but it will never be able to capture all the details on a micro level. Details like small bends, micro timing, dynamics, and beat placement are features of an improviser's style. Notating all these details will easily make the notation confusing and hard to comprehend. As such, notation favors guitarists who do not use much ornamentation in their phrasing. The guitarists in this project belongs to this category, using relatively little ornamentation, at least when they improvised in this setting.

All the guitarists employ subtle variations associated with swing, particularly the triplet swing feeling. I have notated this on the top of the transcriptions, indicating that even eights should be played with light swing. A difference between traditional swing and more modern swing, as played in this context, is the tendency to play the triplets a little bit behind the beat and with a feeling closer to the even eight. The tempo is also specified in the top section of the transcription. Underneath each guitarist's solo, I have transcribed my comping as well, showing how I interacted musically with each of these guitarists on these occasions.

A musical transcription will not always give the reader much information about the phenomenological aspect of the music. It defines the musical notes but not the experience of the musical product. However, transcriptions can reveal quite a lot about the strategies involved in harmonic choices, and this will be the focus of the present analysis. No suggestions of tunes were given ahead of the interviews. All the standard tunes were played without lead sheets and were played more or less on the spot, defining only the key and the tempo ahead of the actual playing.

Comments from the players refined my categories after the second fieldwork and made me as a learner and researcher aware of aspects I had overlooked. Lund's comment on my playing illustrate this well:

> Nice, cool! There's a little bit throughout the composition; use more space. Use less symmetrical phrasing, like predictable four bar phrases, where ideas are resolved in predictable places. You play a lot of really nice melodic ideas, but your double time phrasing sounds like another language, like Pat [*Metheny*] phrases. In general give yourself more time, especially in the beginning, develop the intensity as you get into the story or solo. Record yourself; think of all the decisions and consequences of the choices you

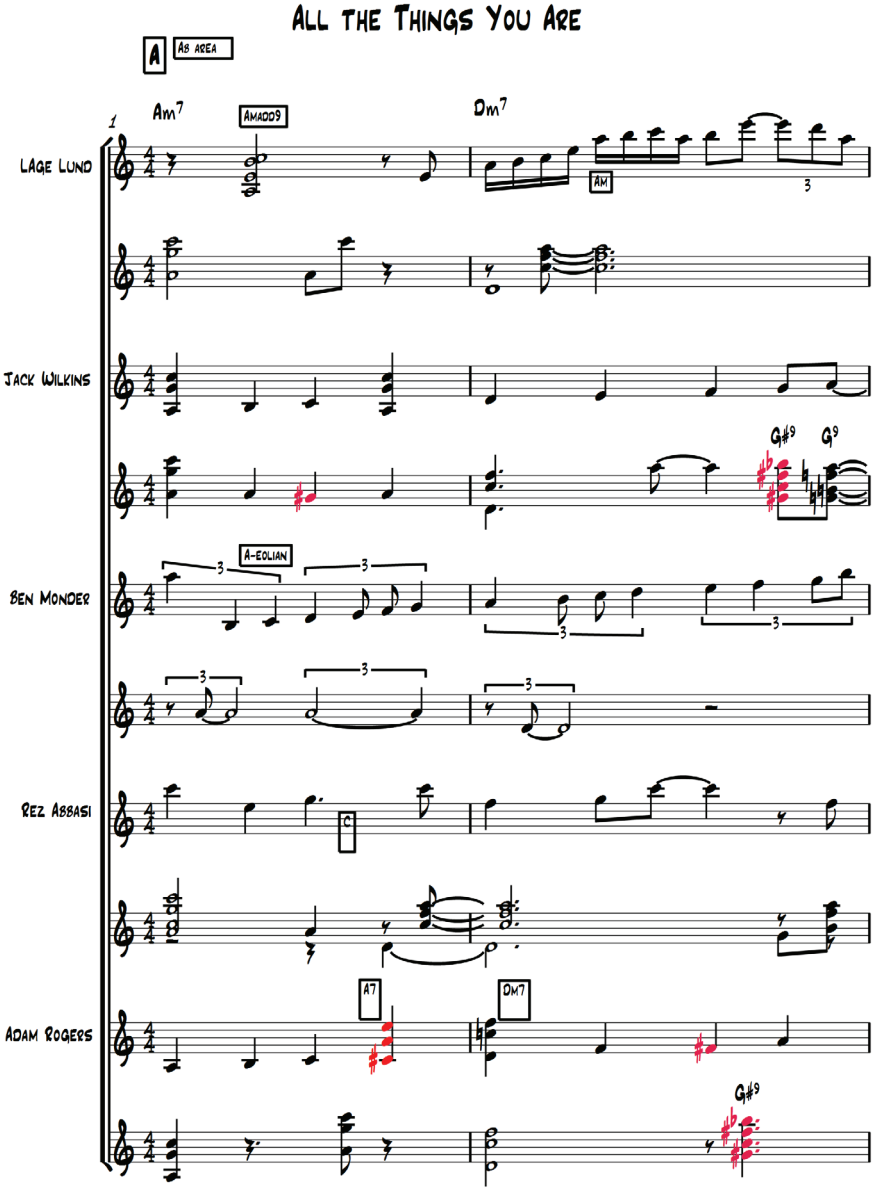
make; how do you vary and contrast your playing, high or low, slow and fast playing, peak points, etc.?

Comments like these dealing with time, structure and form were experienced both embodied and intellectually. I will describe them in more detail after presenting the modal matrix (page 194 – 212). Linking main categories in fieldwork with theory chapters underlines the importance of theory's vital link to practice and vice versa.

One of the strategies that experts use, regardless of profession, is the need for an overview, defining the rough outline and tendencies in a material before checking out the details part by part (Ericsson, 2009). In my project, I give this overview in the modal matrix before providing a deeper analysis of each jazz guitarist's solo.

The modal matrix defines structure, time and form in one synoptic image. Scanning each vertical column reveals the guitarists' individual approach.[8] The modal matrix presents the five guitarists' solos on the first chorus of *All the Things You Are*. All original keys have been reduced to mainly a C major/A minor modality. The E♭^{o7} chord is a transition chord in this tonality, and on the E$^{7\sharp5}$, a C major scale is a secondary choice of scale, defining a sharp nine quality with the tone G on top of the major third (G♯) of E$^{7\sharp5}$. The aim is to compare more efficiently by having all ideas reduced to the same modality to reveal the essence in their strategies. As mentioned earlier, tension notes are indicated with red notes, including chords that have tension notes that are outside the main tonality. (In Appendix 4, a tension schema shows all the tension notes found in the modal matrix). Chunks are labeled in boxes. In the modal matrix, box A in the upper left corner of the matrix indicates that it is the first tonal area in the form (from bars 1 to 5), and on the right side of this box is a box named A♭ area, which indicates that the tonal area in the original score is A♭ in the same five bars (1 to 5).

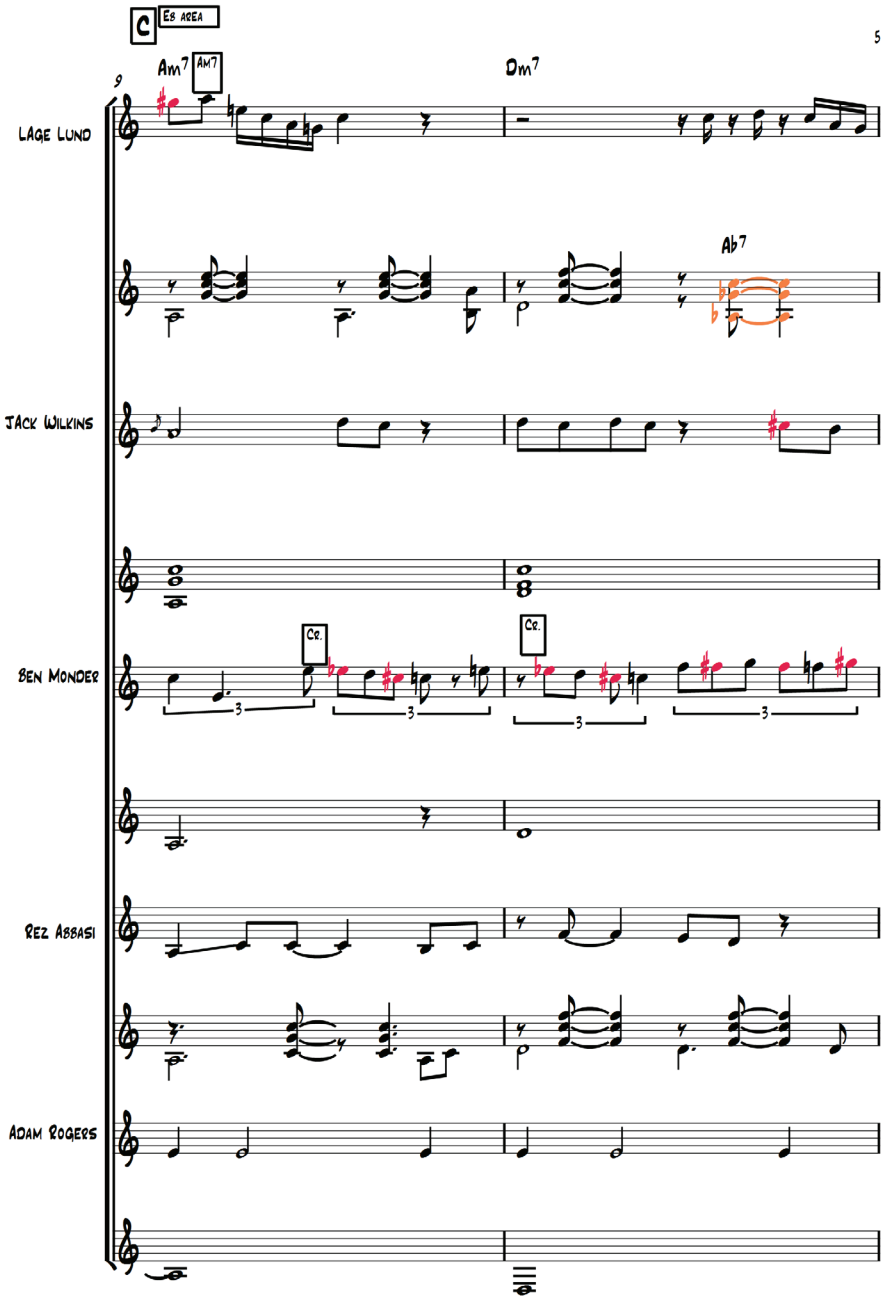
8 The modal matrix can also be used to compare different choruses by the same guitarist, placing the different choruses vertically below each other, or to compare solo transcriptions of the same tune recorded at different times in a career, placing the different transcriptions vertically below each other.

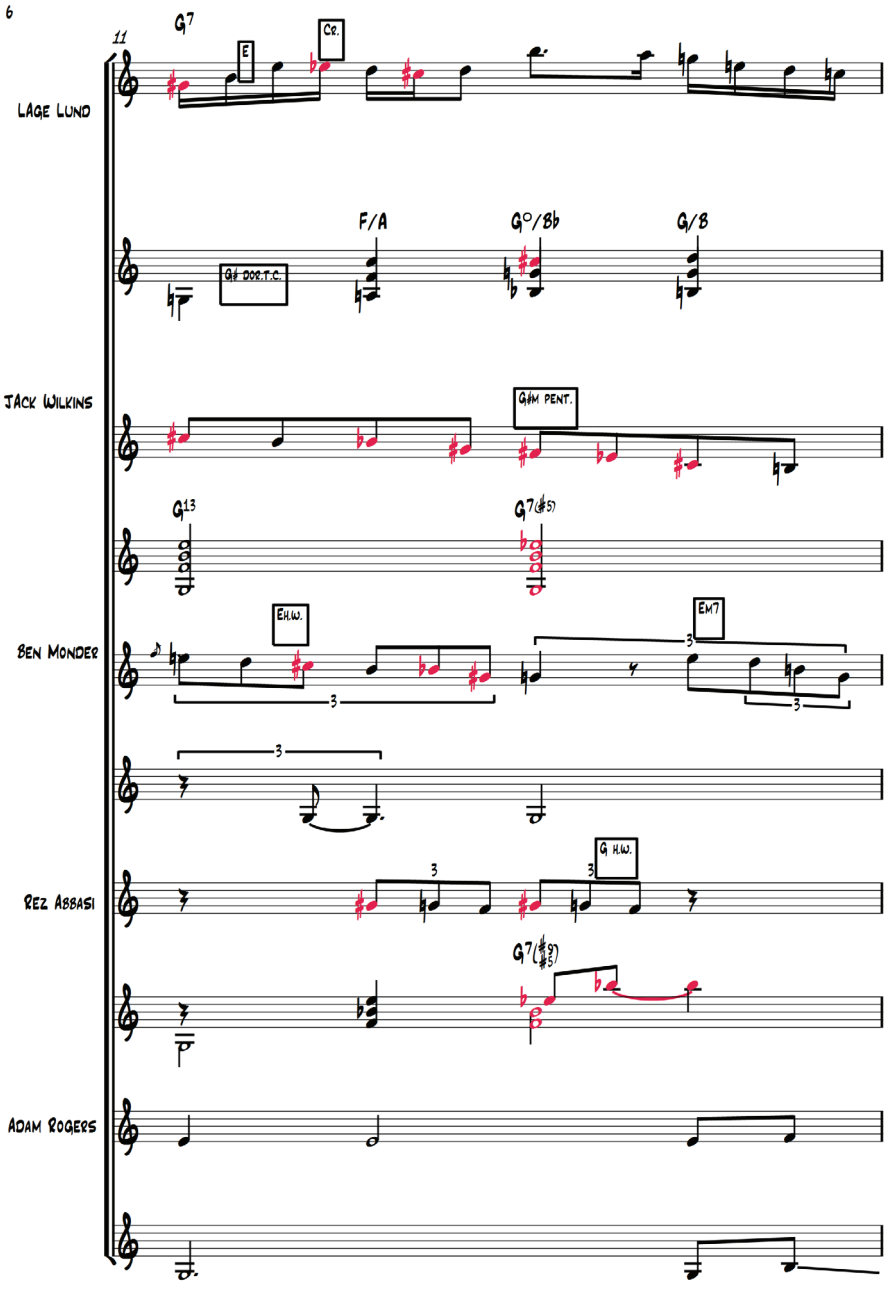

All the Things You Are
A
Ab area
1
Am7
Amadd9
Dm7
Am
Lage Lund
Jack Wilkins
G#9
G9
A-eolian
Ben Monder
Rez Abbasi
C
A7
Dm7
Adam Rogers
G#9

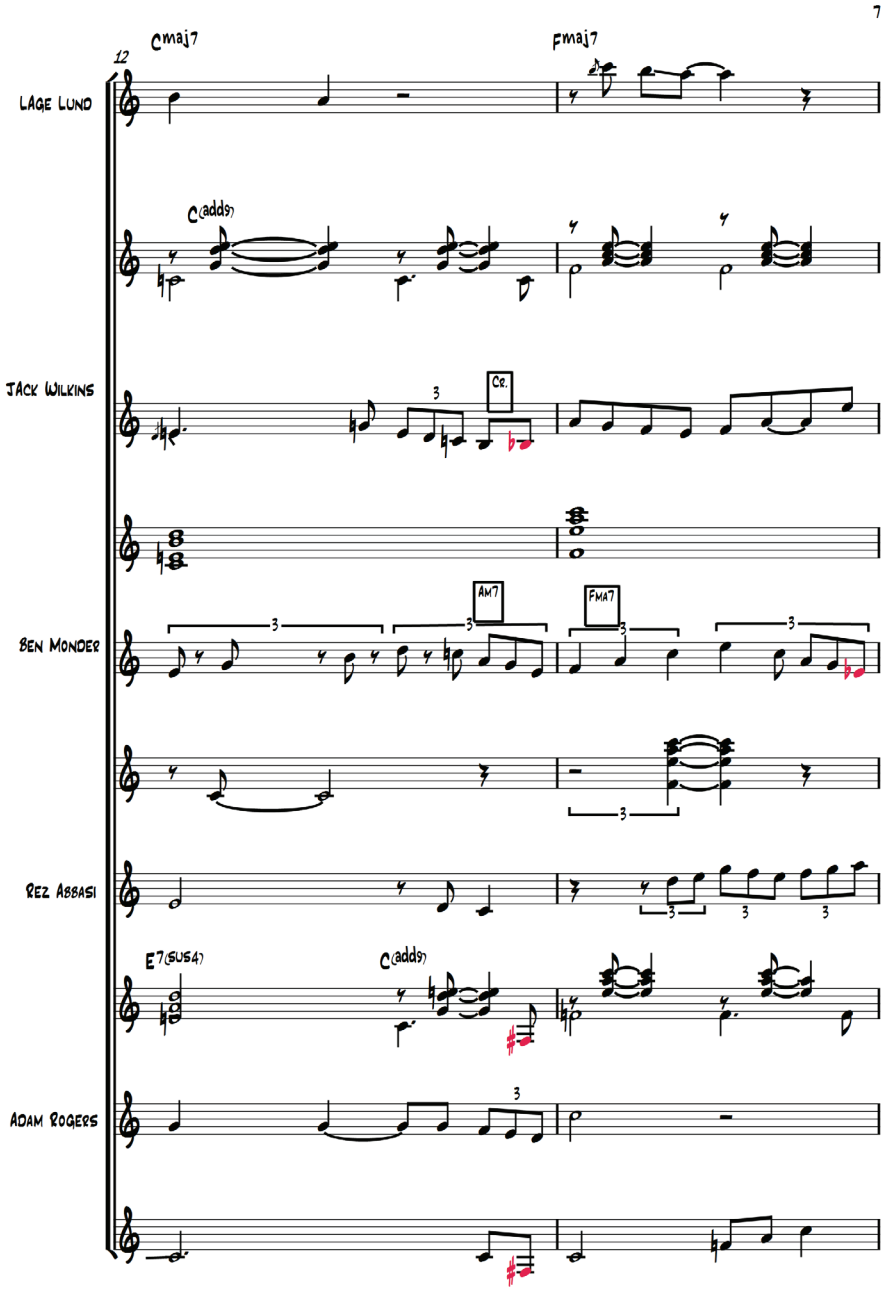

2
3
G7
Cmaj7
CMA9
LAGE LUND
G7(♭9)
C⁶/₉
JACK WILKINS
AM-PENT
C♯7(♭5)
C⁶/₉
F♯maj7
BEN MONDER
A-PHRYGRIAN
REZ ABBASI
C♯7(♭5)
C/E
ADAM ROGERS

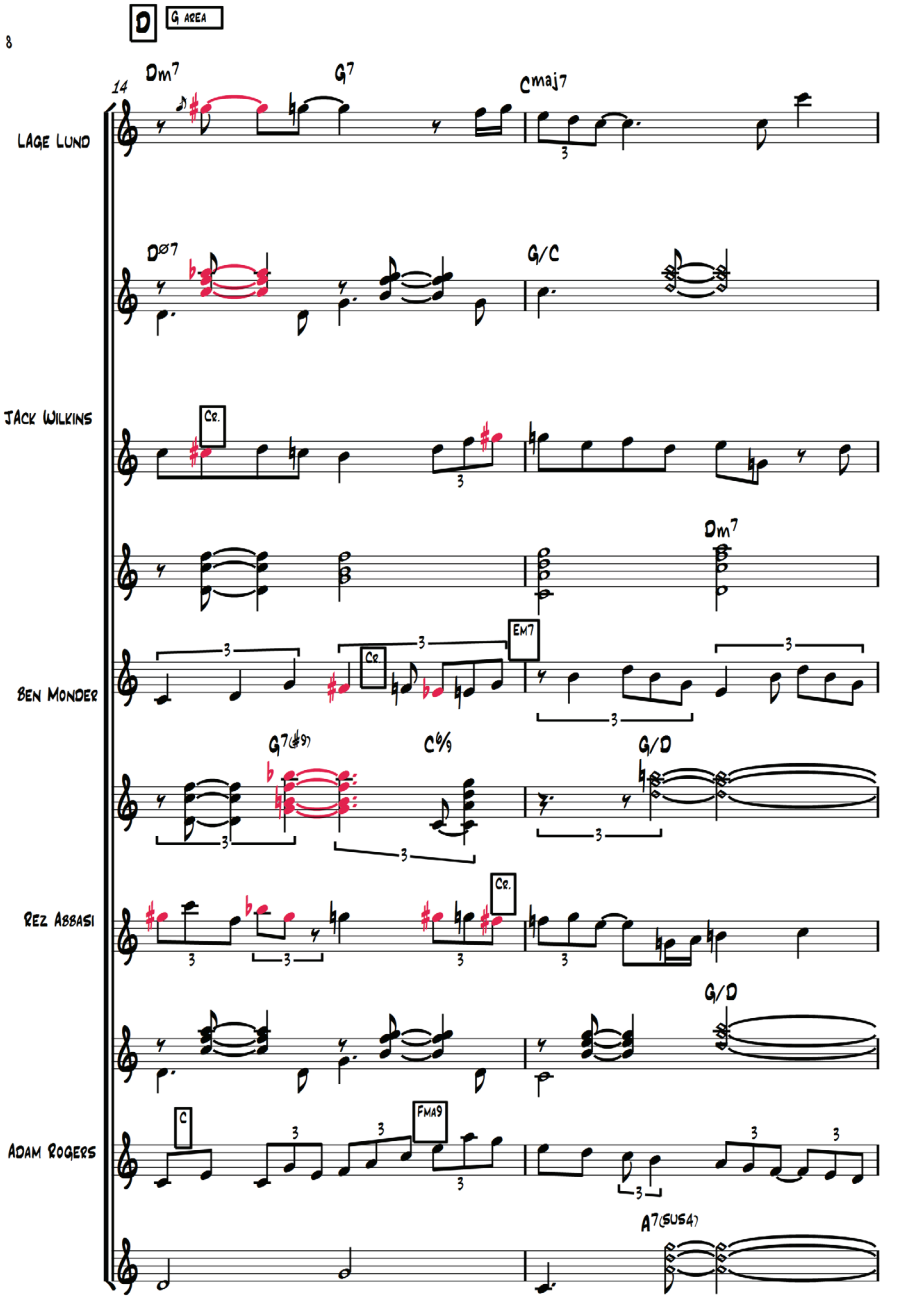

B
C AREA
Fmaj7
Dm7
G7
LAGE LUND
Dø7
JACK WILKINS
CR.
CR.
BEN MONDER
A-EOLIAN
CR.
REZ ABBASI
Dø7
ADAM ROGERS
DM7 (#4)

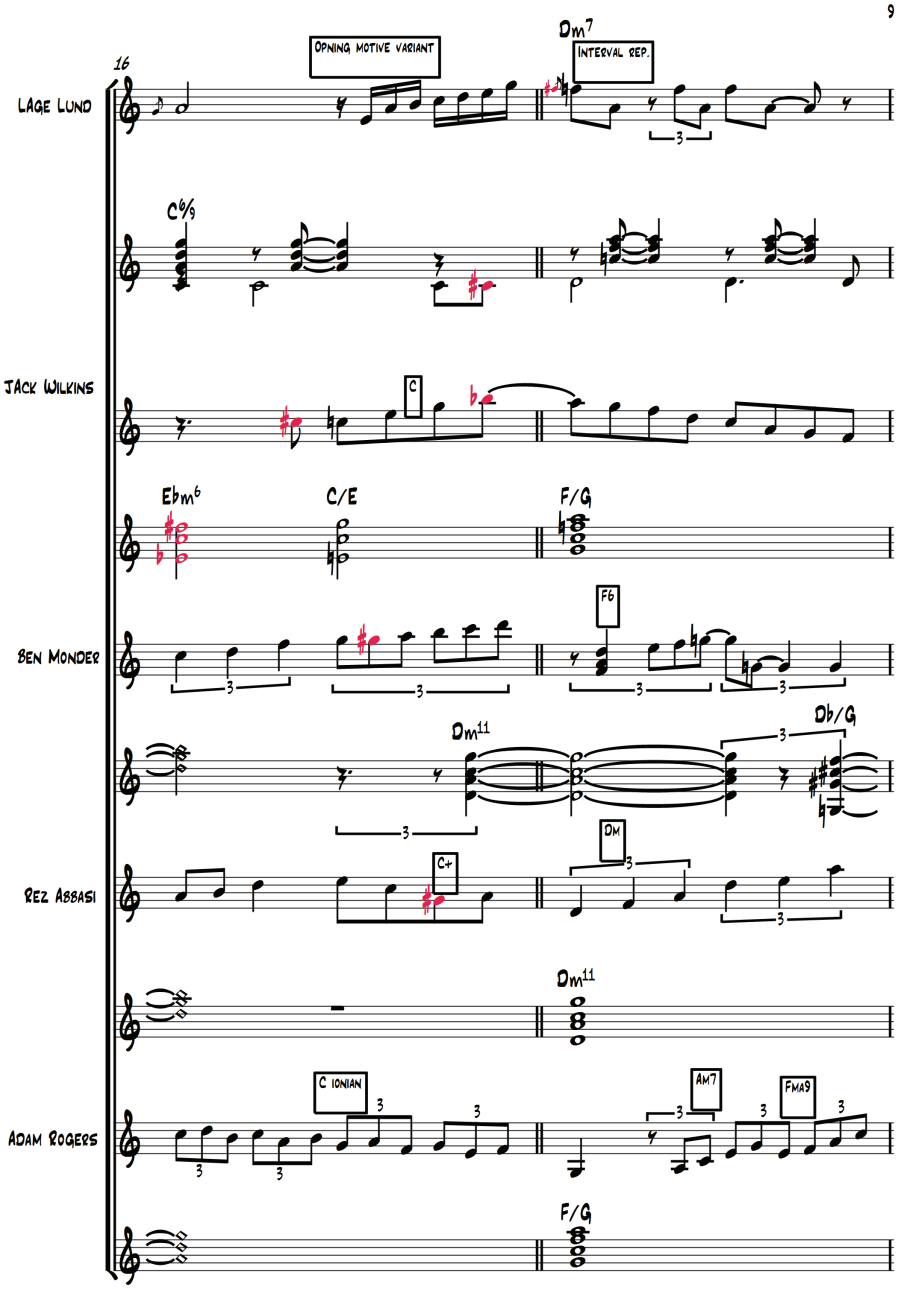

4
7
Cmaj7
E
Fm
Em7
Cm
Lage Lund
Jack Wilkins
Dm7
Ebm6
C/E
C
Ben Monder
Rez Abbasi
Adam Rogers
E7(sus4)

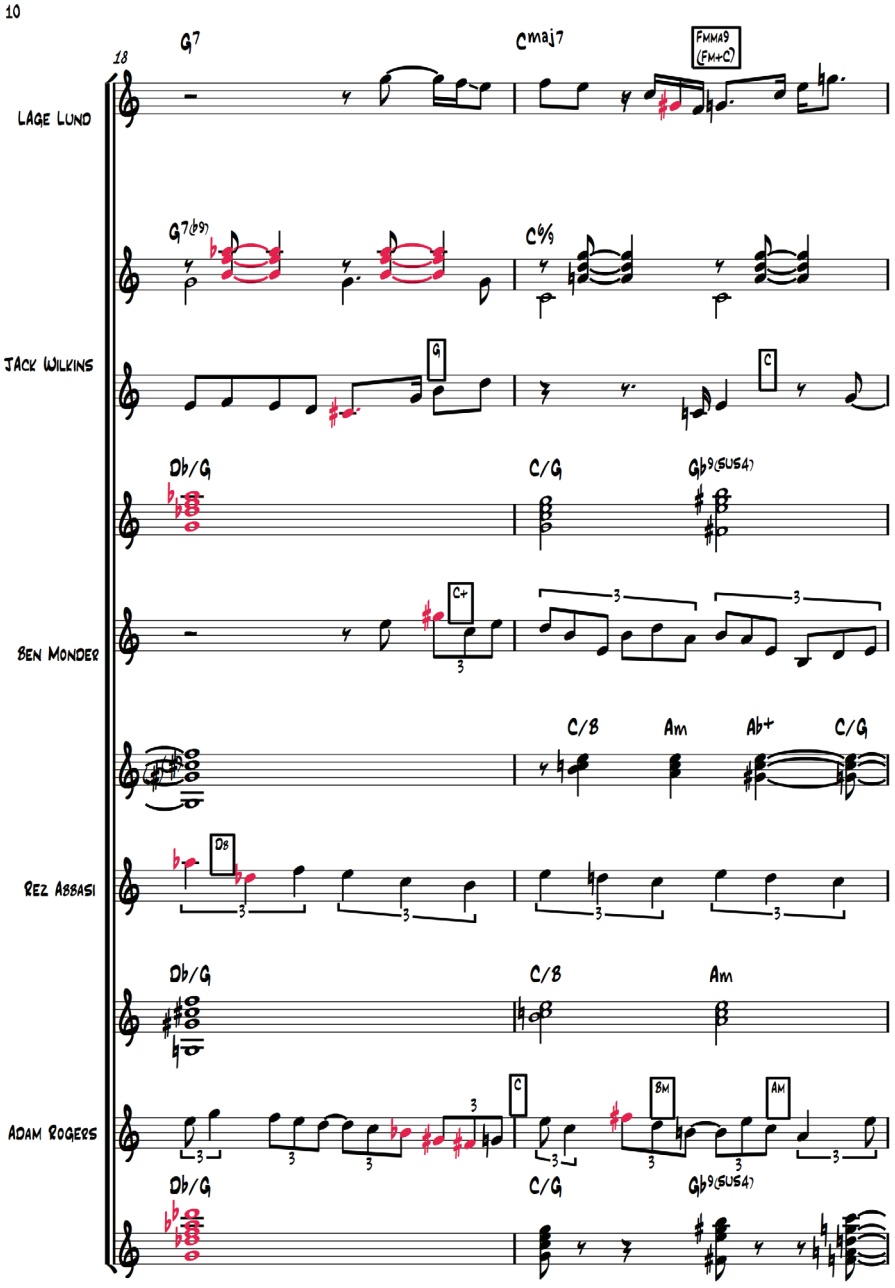

C
Es area
9
5
Am7
Am7
Dm7
Ab7
Lage Lund
Jack Wilkins
Ben Monder
Cg.
Cg.
3
Rez Abbasi
Adam Rogers

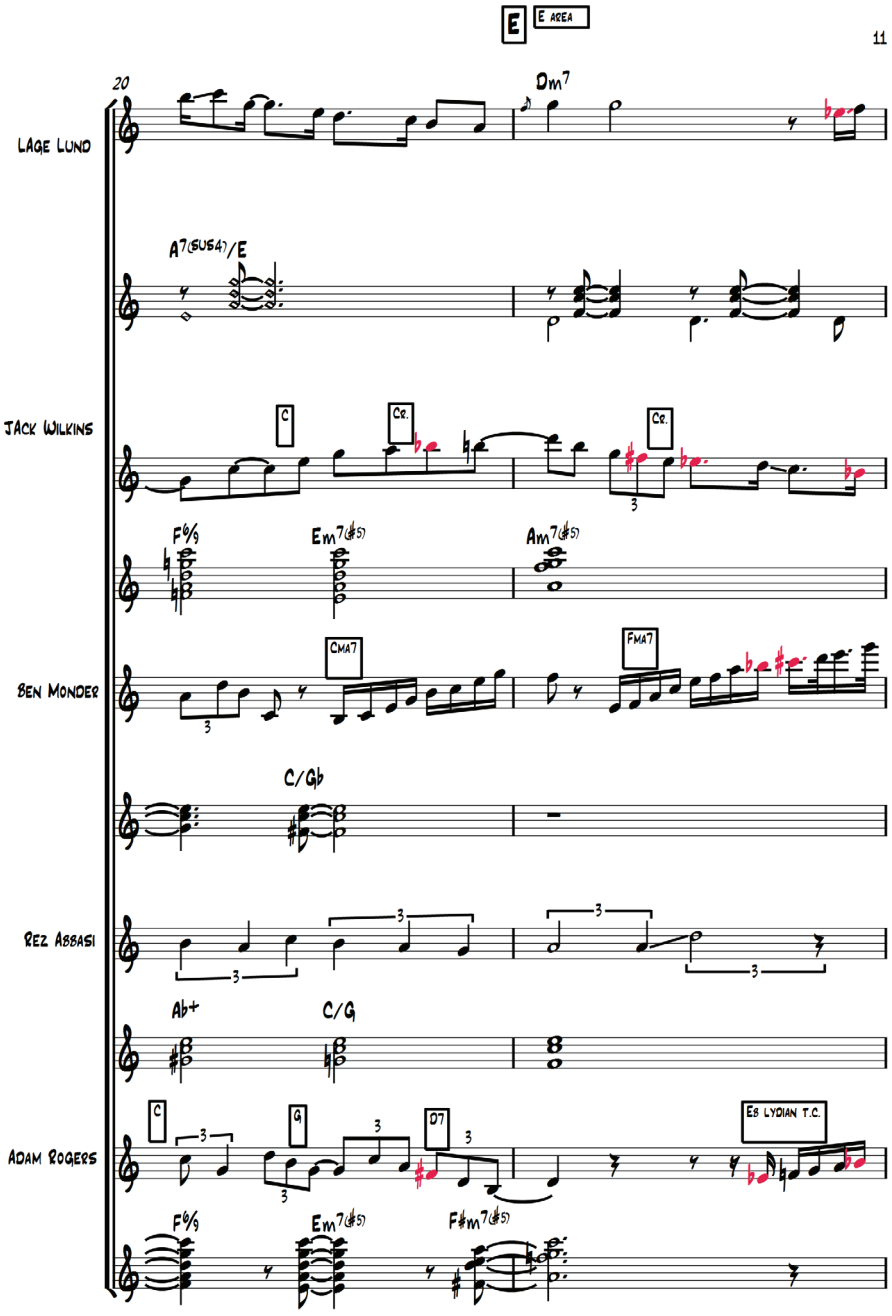

6
11
G7
E
Cc.
LAGE LUND
F/A
G°/Bb
G/B
G# DOR.T.C.
JACK WILKINS
G#M PENT.
G13
G7(#5)
BEN MONDER
Eh.w.
EM7
3
REZ ABBASI
G h.w.
G7(#5)
ADAM ROGERS

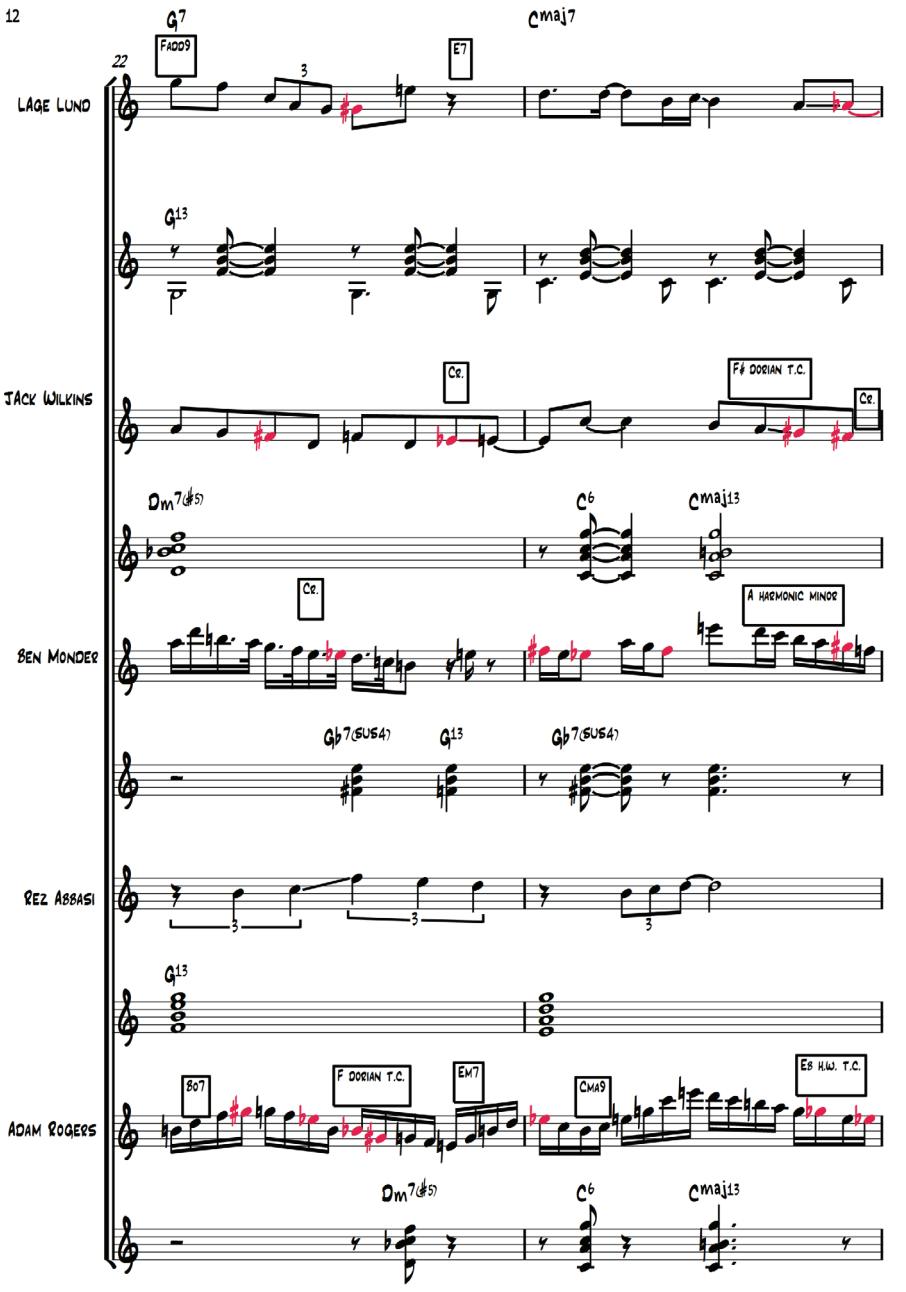

7
12
Cmaj7
Fmaj7
LAGE LUND
C(add9)
JACK WILKINS
Cr.
AM7
FMA7
BEN MONDER
REZ ABBASI
E7(SUS4)
C(add9)
ADAM ROGERS

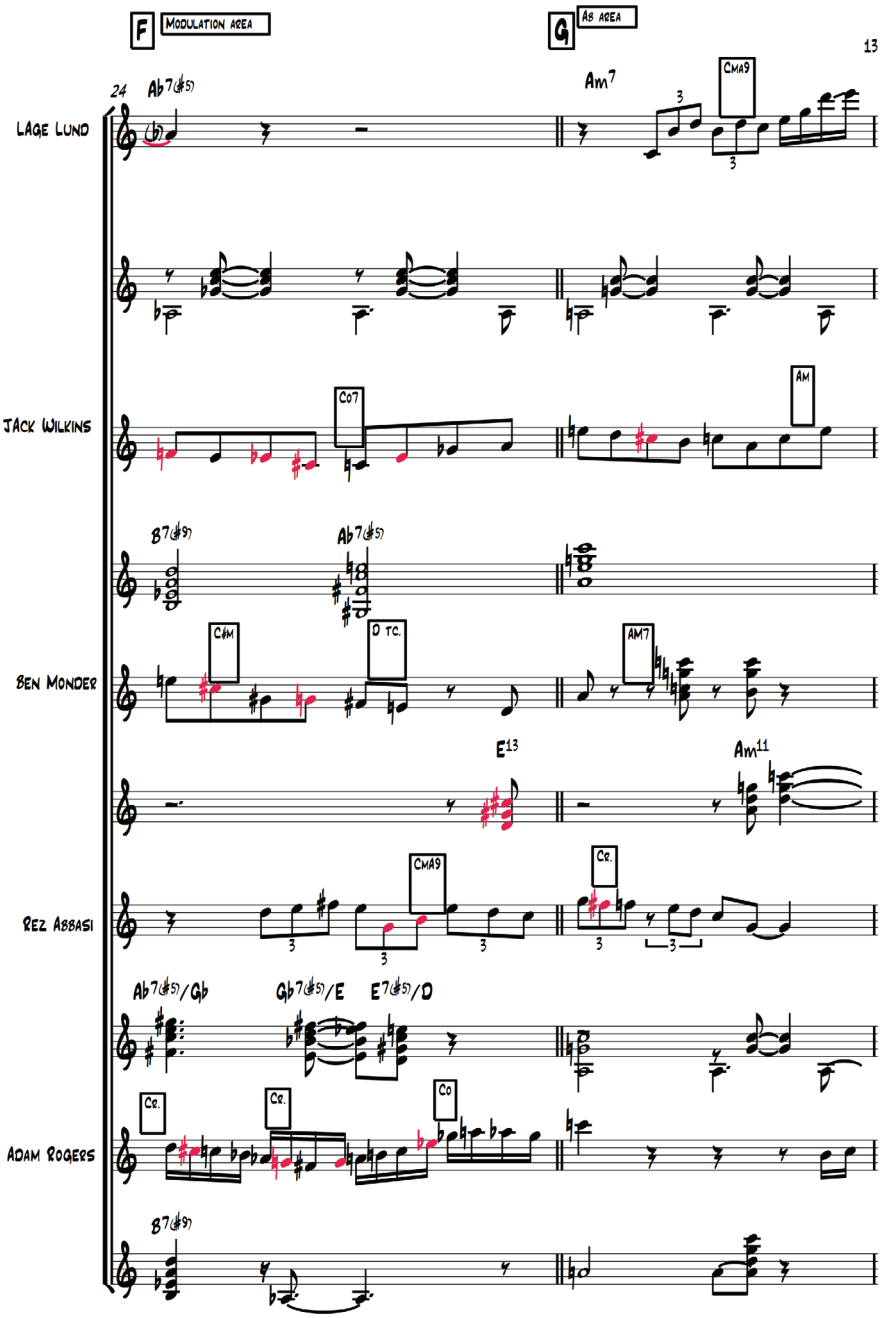

D
G AREA
8
14
Dm7
G7
Cmaj7
LAGE LUND
Dø7
G/C
JACK WILKINS
Cc.
Dm7
Cc
Em7
BEN MONDER
G7(♭9)
C6/9
G/D
Cc.
REZ ABBASI
G/D
C
Fma9
ADAM ROGERS
A7(sus4)

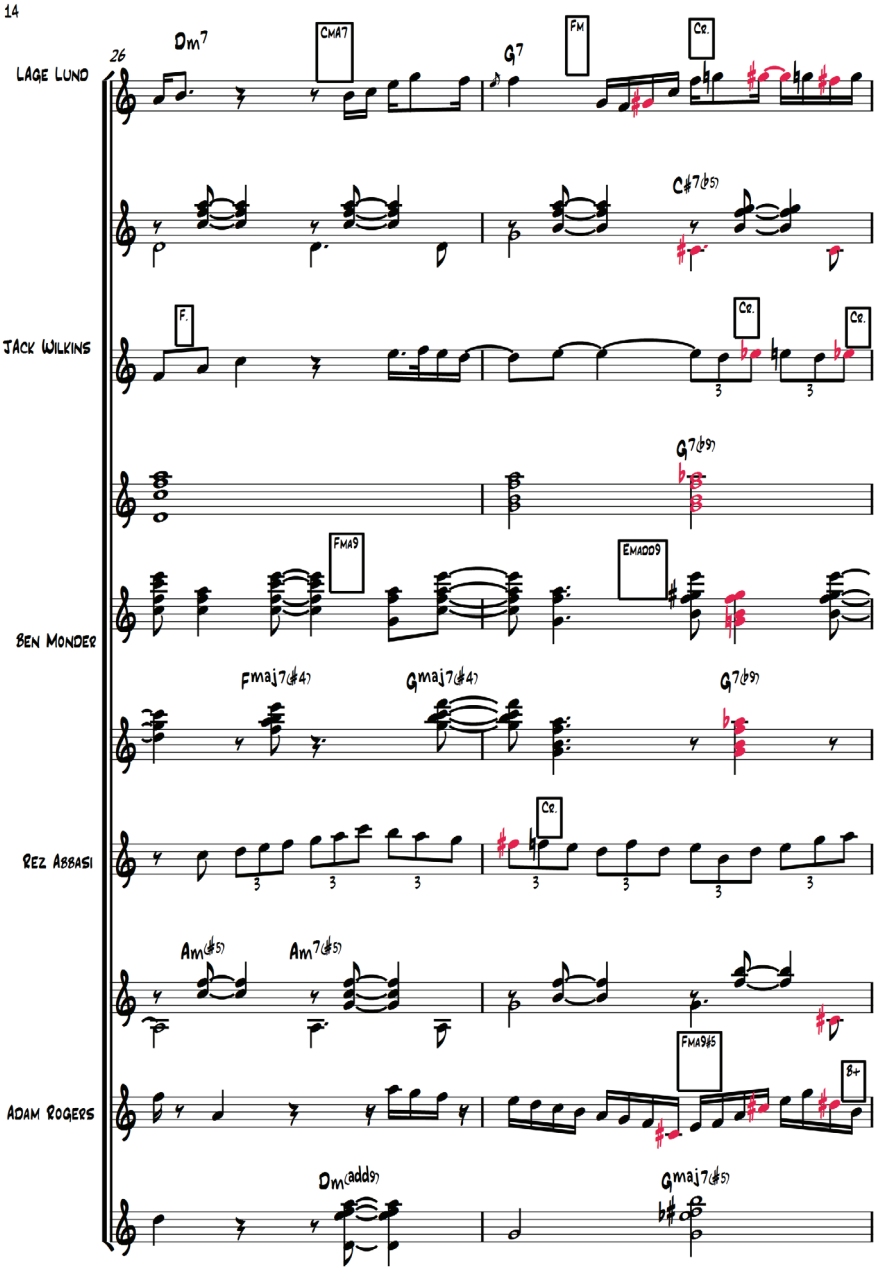

9
16
Dm7
OPNING MOTIVE VARIANT
INTERVAL REP.
LAGE LUND
C6/9
JACK WILKINS
C
Ebm6
C/E
F/G
F6
BEN MONDER
Dm11
Db/G
DM
C+
REZ ABBASI
Dm11
C IONIAN
AM7
FMA9
ADAM ROGERS
F/G


10
18
LAGE LUND
JACK WILKINS
BEN MONDER
REZ ABBASI
ADAM ROGERS
G7
Cmaj7
FMMA9
(FM+C)
G7(b9)
C6/9
G
C
Db/G
C/G
Gb9(SUS4)
C+
C/8
Am
Ab+
D8
BM
AM


E
E AREA
11
20
Dm7
LAGE LUND
A7(SUS4)/E
JACK WILKINS
C
Cz.
Cz.
F6/9
Em7(♭5)
Am7(♭5)
BEN MONDER
CMA7
FMA7
C/Gb
REZ ABBASI
Ab+
C/G
ADAM ROGERS
C
G
D7
Eb LYDIAN T.C.
F6/9
Em7(♭5)
F♯m7(♭5)

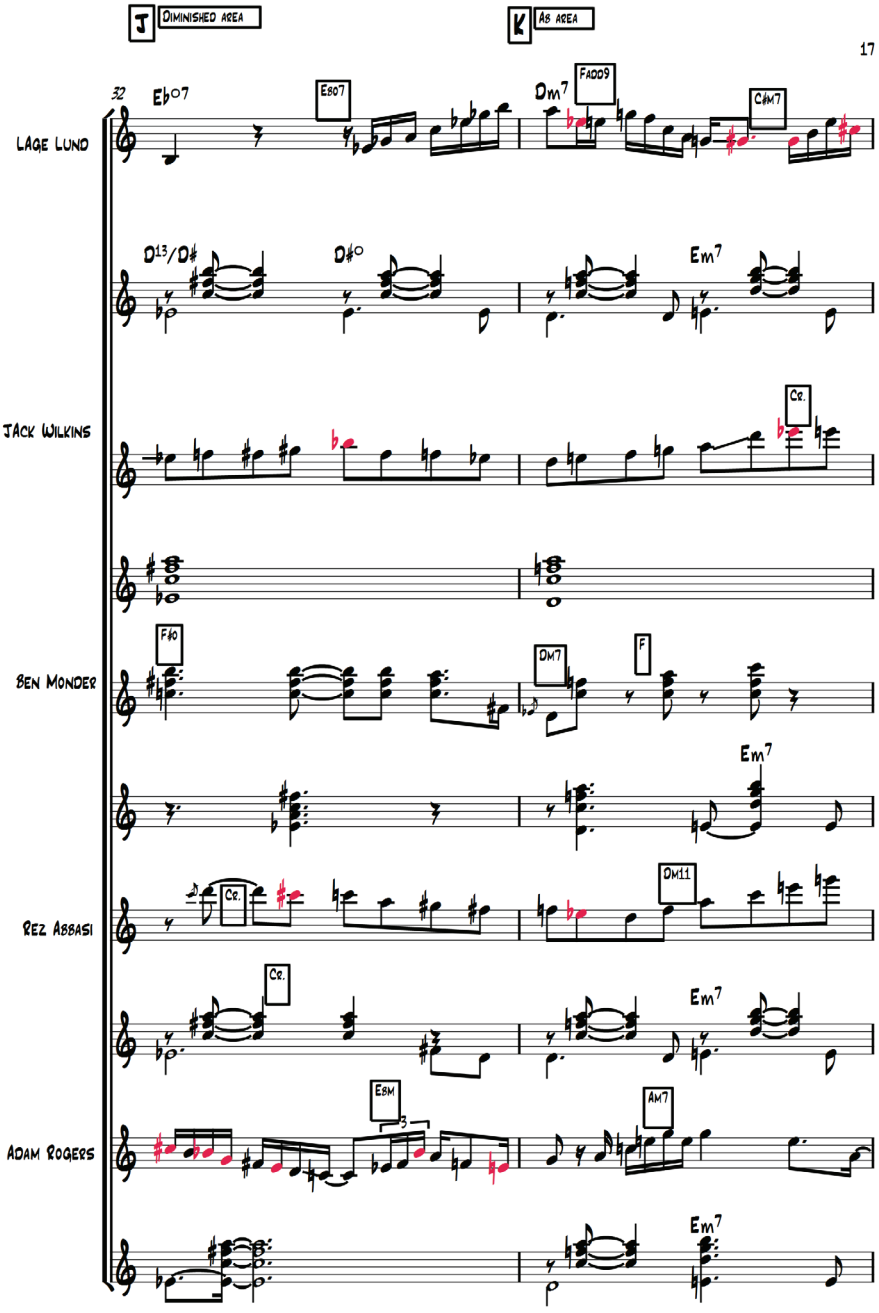

12
22
G7
FADD9
E7
Cmaj7
LAGE LUND
G13
JACK WILKINS
Cr.
F# DORIAN T.C.
Dm7(♭5)
C6
Cmaj13
BEN MONDER
A HARMONIC MINOR
Gb7(SUS4)
G13
REZ ABBASI
B07
F DORIAN T.C.
EM7
CMA9
E8 H.W. T.C.
ADAM ROGERS

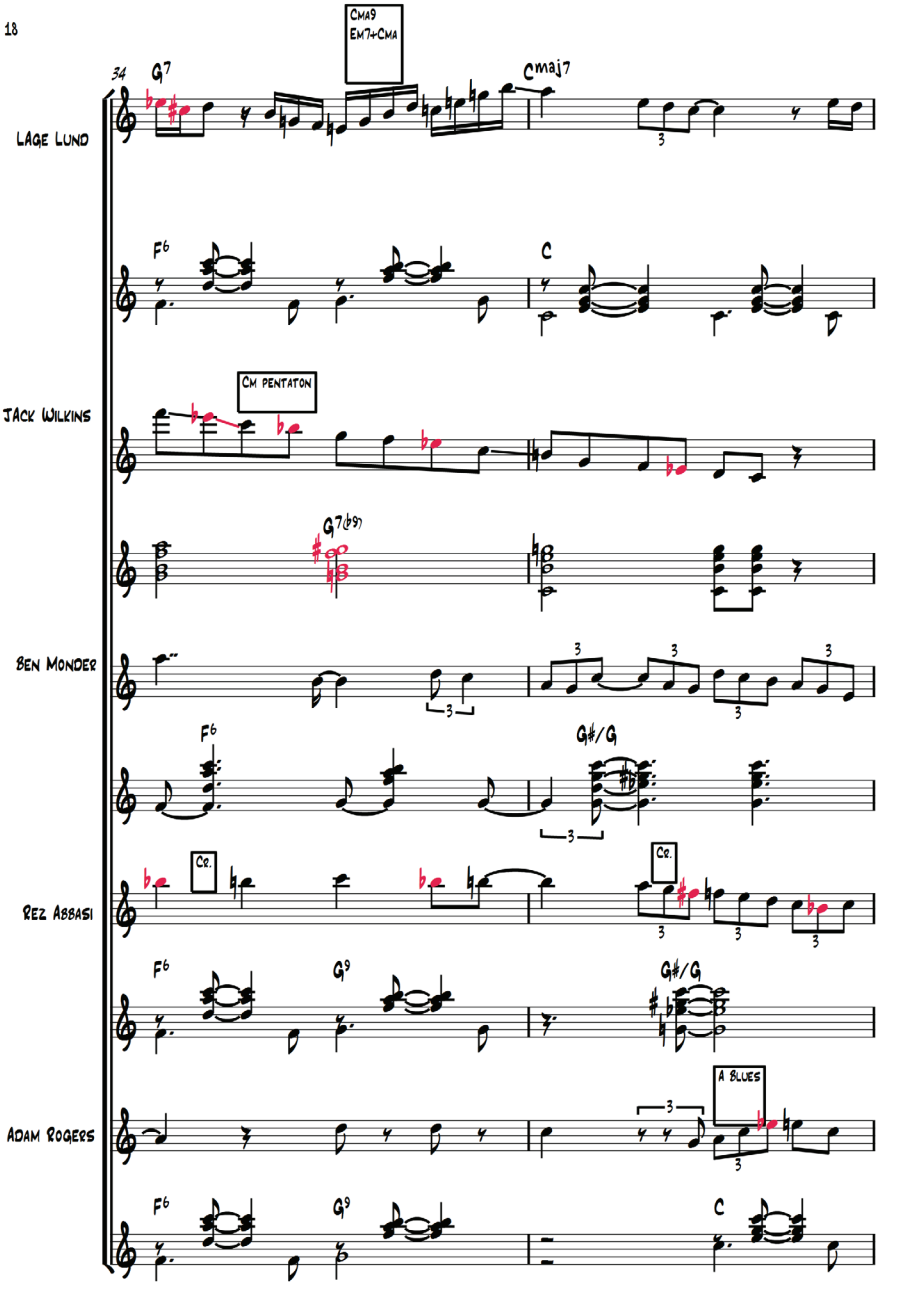

F
MODULATION AREA
G
Ab AREA
13
24
LAGE LUND
JACK WILKINS
BEN MONDER
REZ ABBASI
ADAM ROGERS
Ab7(♯5)
Am7
CMA9
Co7
Am
B7(♯9)
Ab7(♯5)
C#m
D TC.
AM7
E13
Am11
CMA9
Cc.
Ab7(♯5)/Gb
Gb7(♯5)/E
E7(♯5)/D
Cc.
Cc.
Co
B7(♯9)

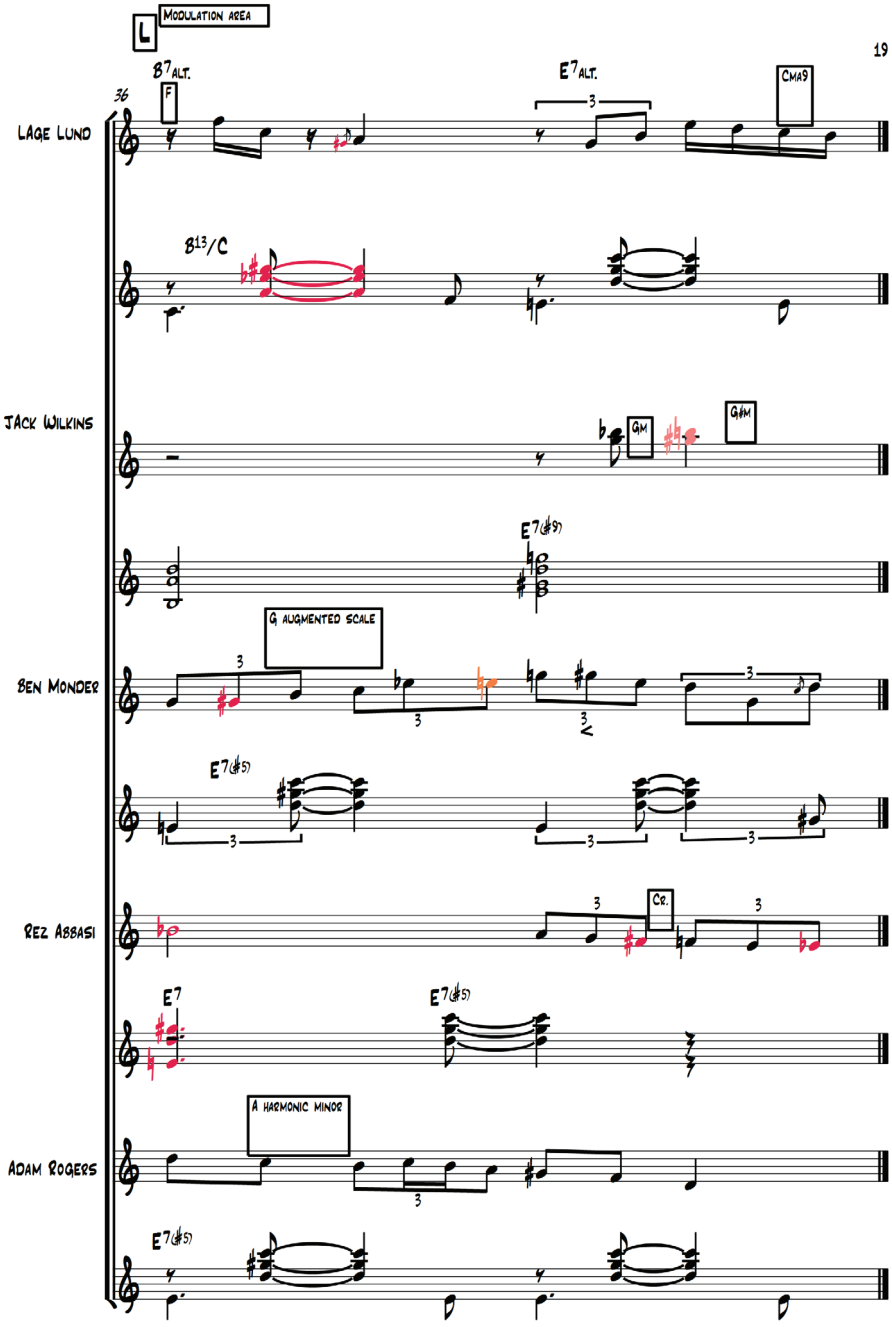

14
26
LAGE LUND
JACK WILKINS
BEN MONDER
REZ ABBASI
ADAM ROGERS
Dm7
CMA7
G7
FM
Cz.
C♯7(♭5)
F.
G7(♭9)
FMA9
EMADD9
Fmaj7(♯4)
Gmaj7(♯4)
Am(♯5)
Am7(♯5)
FMA9♯5
8+
Dm(add9)
Gmaj7(♯5)


28
15
Cmaj7
CMA9
Fmaj7
DM9
C6/9
C6
LAGE LUND
JACK WILKINS
Cr.
BEN MONDER
C/F
G11
REZ ABBASI
EO7
AM7
AM
ADAM ROGERS
Cmaj7(#5)
A7(SUS4)


H
B AREA
I
A8 AREA
16
30
Dm7
Em7
EM7
LAGE LUND
JACK WILKINS
BEN MONDER
F#7SUS
G7SUS
DM7
FMA7
G
EM7
REZ ABBASI
EM
Cg.
ADAM ROGERS
FMA9
Cg.
Cg.
EM7
Cg.


J
Diminished area
K
Ab area
17
32
Eb°7
Eb07
Dm7
FAdd9
C#m7
D13/D#
D#°
Em7
Lage Lund
Jack Wilkins
Cr.
Ben Monder
F#ø
DM7
F
Em7
Rez Abbasi
Cr.
DM11
Cr.
Em7
Adam Rogers
Esm
3
AM7
Em7


18
34
G7
Cma9
Em7-Cma
Cmaj7
Lage Lund
F6
C
Cm pentaton
Jack Wilkins
G7(b9)
Ben Monder
F6
G♯/G
Cc.
Cc.
Rez Abbasi
F6
G9
G♯/G
A Blues
Adam Rogers
F6
G9
C


L
MODULATION AREA
19
36
F
B7 ALT.
E7 ALT.
CMA9
LAGE LUND
B13/C
JACK WILKINS
GM
G#M
E7(#9)
G AUGMENTED SCALE
BEN MONDER
E7(#5)
CR.
REZ ABBASI
E7
E7(#5)
A HARMONIC MINOR
ADAM ROGERS
E7(#5)

8.1.1 Time

Time refers to pacing or play/rest activity within the 36 bars form, focusing on WHEN the guitarists are playing. Play/rest activity says something about the solo's direction; rests enable re-orientation in the solo, processing what is being played and preparing for the next music to come. Rest activity also allows space for interaction between us as players. The aspect of time will have three sub-categories, matching three of the four categories used in Chapter 7.

- Overview: the distribution of phrases, length and type of phrases,
- Parts: the rhythmic and harmonic start and end points of phrases,
- Joins: rest and intervals used in chaining the phrases

Phrase length: Watching and listening to the video several times was the basis for determining the phrase length. Chunking a phrase is a subjective process, but based on a feeling of completeness. For me the musical phrase became the main structural entity. How we hear a musical phrase length might be very different from what we see. This is also the case in speech, where spoken sentences often do not match the (formal) written language punctuation. In some cases, the phrase length could have been chunked differently, especially when the transcription illuminates pitches that were more in the background, or heard as a part of a comping figure—i.e. the start of Wilkins's and Rogers's solos.

In my analysis, I have focused on the important rhythmical and harmonic onset and offsets of phrases, or start and end. My criteria for choosing phrase length for analysis, is that everything converges on this level, including, time, structure and form.

Phrase combinations: These show the variety in phrase length, and how they combine phrasing in larger macro patterns. The patterns range from few and almost rigid combinations to new combinations continuously.

Section phrasing: Section phrasing normally refers to phrasing defined by eight bar periods in musical form often defined as sections (AABA'). Strong cadences are often found in the two last bars of such formal units. These cadences are also the places where chunks and schemas are supposed to reinforce each other the most. Schemas offering a familiar (harmonic) context and chunks (phrases) can be used as generic templates, largely

assembled from premade melodic shapes. Phrase endings are then supposed to be found in strong cadences in bars 7–8, 15–16, and 35–36 of *All the Things You Are* (the final A' section is extended to 12 bars). Section phrasing shows how phrases combine on a section level, and then combined to match the entire song form on a macro level.

Rhythm: Important features of a musical phrase are the downbeats and offbeat accents. The strongest downbeats are on 1 and a weaker one on the third beat in a 4/4 meter. The offbeats are then on 2 and 4. However, it is also possible to define the basic pulse 1, 2, 3, 4 as downbeat and the 1 and, 2 and, 3 and, 4 and as offbeat or upbeat, as used in this thesis.

Start: Defines the importance of a downbeat initiated phrase and an upbeat initiated phrase. These two approaches give a very different feel, shifting between two rhythmical paradigms, the classical downbeat paradigm and the swing upbeat paradigm.

End: This is normally on an upbeat in jazz. The upbeat ensures continuity in the forward movement and enables continuity in the line.

Harmonic start and ends: The way a phrase starts harmonically gives a certain quality to the phrase on a micro level, heard in fractions of a second. While the start tone lingers in the mind, the actual end of the phrase is often targeted in the conceptual mind. The hand moves in reaching a harmonic destination, confronted with physical limits (instrumental range or bodily constraints in real time). The hand might negotiate another solution based on embodied cognition and end on another tone.

Interval joins: Patterns of intervals used in the joins, end tone of a phrase and start tone of next phrase. Ascending and descending intervals, descending intervals are underlined to make it distinct from ascending intervals.

Rests: Define what happens between end and start notes in the phrases, i.e. the pacing between phrases. As mentioned previously, it is held that after formal units and after longer rests ideas are more novel (Lehmann & Goldhahn, 2009).

Time characteristics: Define the overall phrasing, the prototype patterns and the interesting deviation from the standard schema.

8.1.2 Structure

Structure is about what sort of musical material is used, which in this analysis includes harmonic, rhythmic and melodic patterns. The focus in this thesis is on harmonic chunks, seen as inside (consonant) and outside (dissonant) patterns. Harmonic chunks (labeled in boxes in the matrix) range from intervals (two tones) to scale structures (seven tones):

- Inside (tonality) and outside (tonality) chunks from modal matrix: overview,
- Templates: harmonic combinations of several chunks,
- Distribution of tension notes on major, minor and dominant chords.

Rhythmic chunks are defined in terms of rhythmic subdivisions, mainly dealing with patterns of triplets and sixteenth notes passages. Melodic chunks are defined in terms of range, most common notes and frequency of repeated notes.

Harmonic chunk levels are separated in an inside schema and an outside schema (red color). The outside schema contains chunks that have tension, red dissonant notes, in their structures.

Tension notes are based on deviations from the original chord changes as defined in Chapter 6, and then on the actual chord changes in the final stages of analysis found in the category form, illuminating the most interesting tension chunks in the outside scheme and discussing how these were created in interplay. The modal matrix gives an immediate access to other actual interplay tension connections by looking at the red color distribution in solo and comping.

Three of the chords in the modal matrix are outside strict C major tonality: $E♭^{o7}$ (treated as a transition chord in C major), $E^{7(♯5)}$ and $B^{7(alt)}$ (treated as secondary choices in C major/A minor and often thought of as a II-V progression to A minor).

Several abbreviations and signs are used in the modal matrix. *Cr.* means chromatic; tones in parenthesis behind the chromatic abbreviation denote the range of the chromatic figure. The chromatic figure is never beyond five notes, a major third. When capital letters in parentheses, for example *(C-A)*, are written, it means that the interval is a descending chromatic interval from C to A. *Tc.* means tetrachord. *Pent* is an abbreviation for pentatonic.

Rhythmic chunks: Chunks are triplets and 16th note groupings that enable meta-structures to arise beyond section level.

Melodic chunks: Defines melodic contours used in the solo: how the melodic contour changes throughout the solo, with particular focus on contour shifts in relation to formal cadences and sections. Melody analysis is based on improvisation in original key A♭.

Pitch range: These chunks are bottom and top pitches used throughout the entire solo, illuminating possible macro strategies, but also physical limits of the instrument itself. This is particularly evident concerning range—one cannot play higher than the frets on the specific guitar used on the occasion.

Note repetition: Whether the guitarists use the same notes in their solos or if they emphasize different notes is illuminated by the number of times the most frequent notes are used and where they are placed in the pitch. By looking at the tone repetition it is possible to say something about the guitarist's preferred range and preferred pitches, but also about tonal keys and idiomatic, instrument-related approaches. For instance, tone repetitions tend to occur more often in natural and sharp keys with guitarists, emphasizing the open strings.

8.1.3 Form

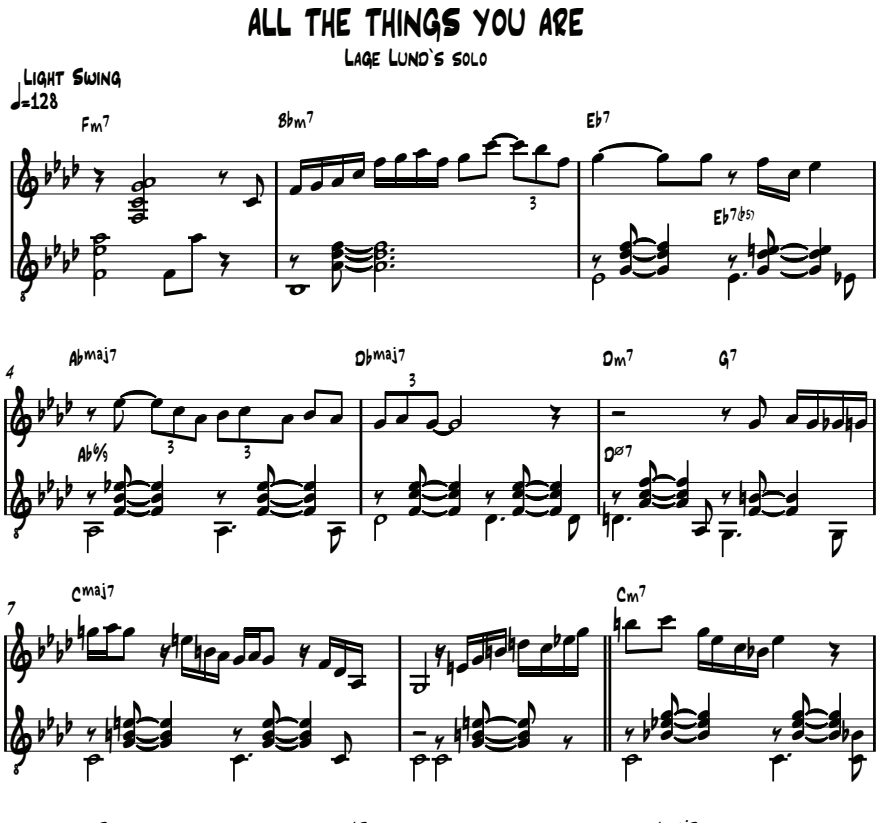
The form descriptions illustrate how all these parameters are used in relation to the tonal areas defined in the modal matrix. The red areas are the bars with most tension structures. The form description includes the most interesting features of the solo as unfolded in time, including peak, interplay, tension note distribution in dominant areas and the solo's general characteristics.

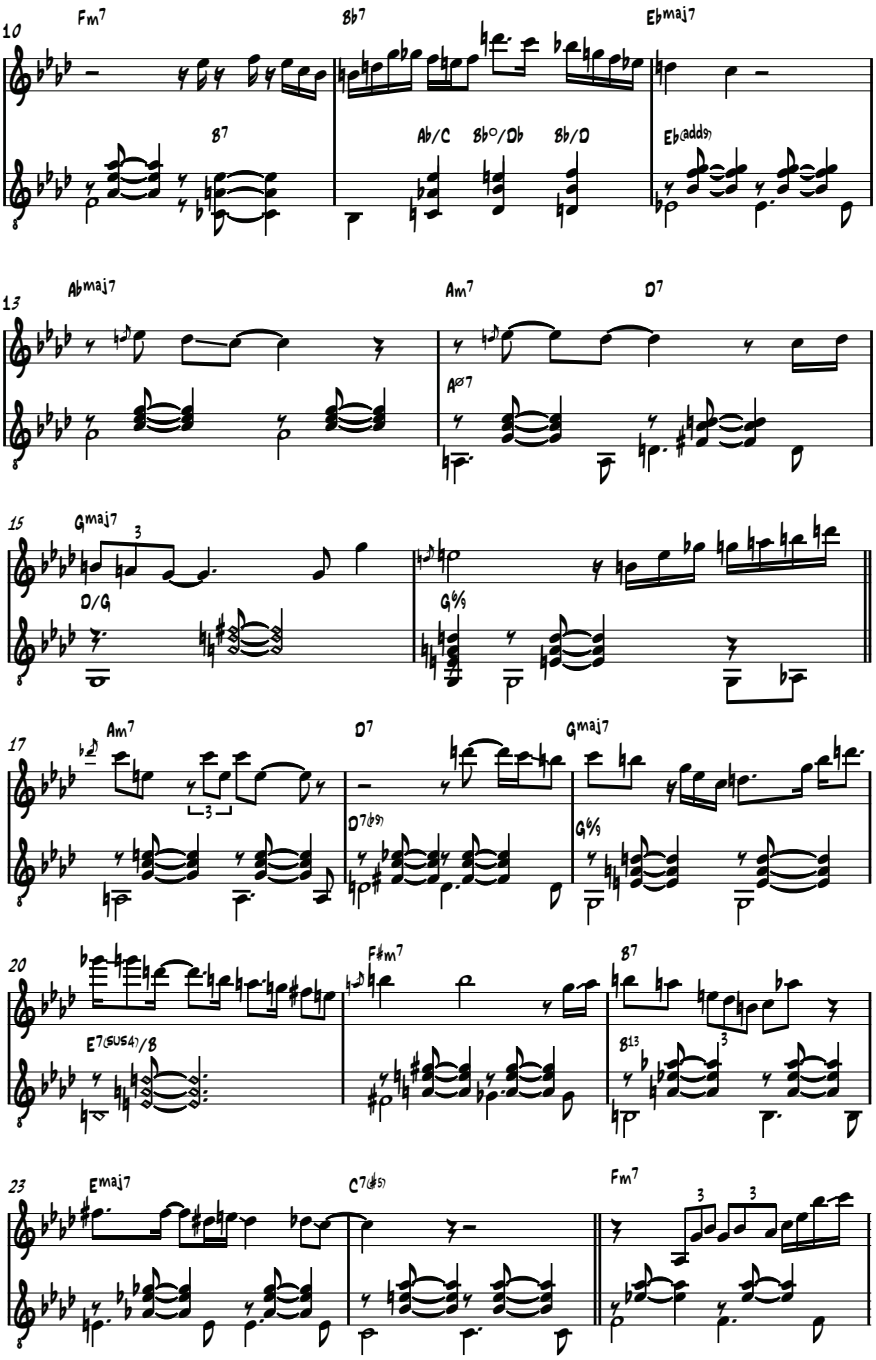
Tonal areas divide into ten sections in the form schema (outlined in the left column). Red harmonic tension areas are given most attention in the form, as it seems as this tension also creates other interesting melodic and rhythmic aspects. When a phrase ends in the last two bars of a formal end, it is cadence or section based; when a phrase neglects the formal sections, it means cross-sectional phrasing. *Pent* is an abbreviation pentatonic, and *h.w.* is an abbreviation for half-whole-tone scale

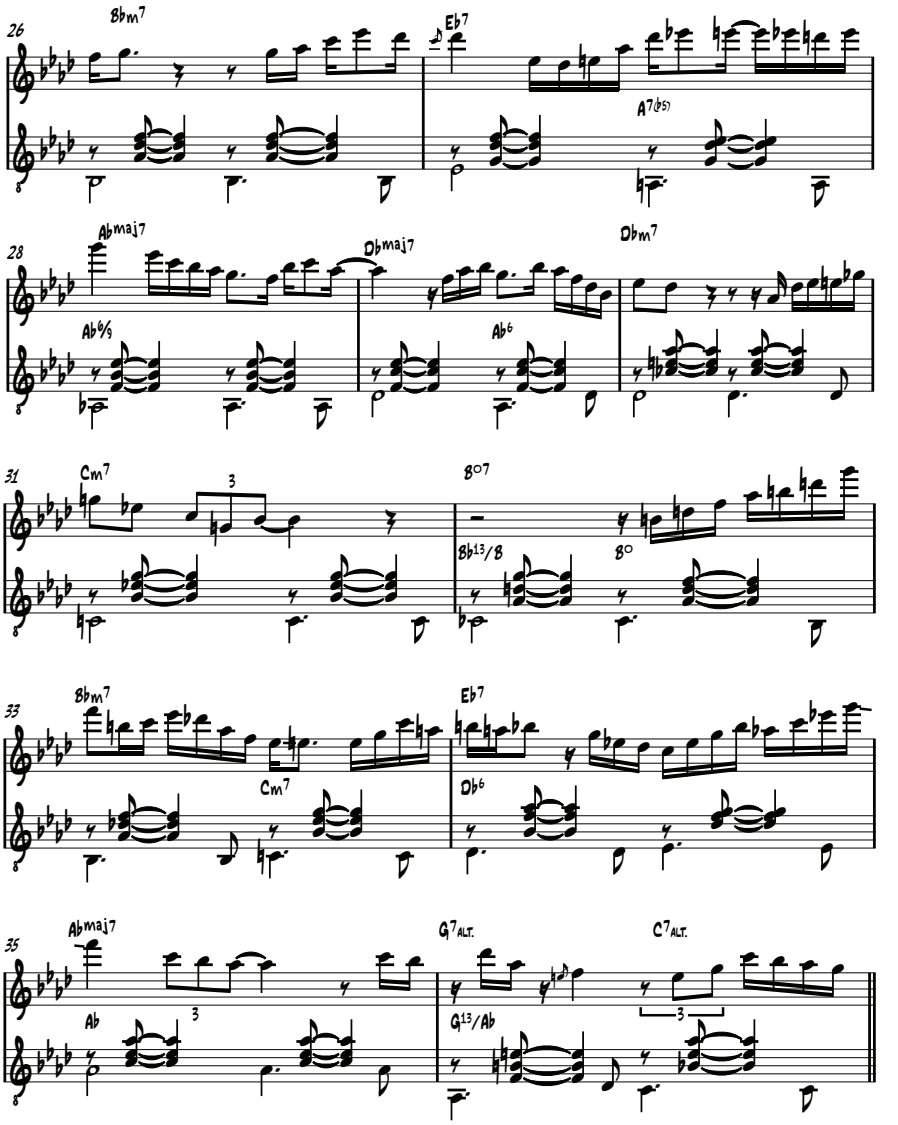
8.2 The five jazz guitarists' solos

In the analysis, both the recordings and the transformation (transposition) of their solos (seen in the modal matrix) are crucial. The analysis of the guitarists starts with my transcription of their solo as heard on the video. The order of guitarist matches the way they were approached in the first fieldwork, starting with Lund's solo, then moving on to Wilkins, Monder, Abbasi, and finally Rogers. The guitarists' solos are placed on top stave and my comping is placed in the stave below.

8.2.1 Lage Lund




10
Fm7
Bb7
Ebmaj7
B7
Ab/C
Bb°/Db
Bb/D
Eb(add9)
13
Abmaj7
Am7
D7
A∅7
15
Gmaj7
3
D/G
G%
17
Am7
D7
Gmaj7
3
D7(b9)
G%
20
F♯m7
B7
E7(sus4)/B
B13
3
23
Emaj7
C7(♯5)
Fm7
3
3



Time: pacing the solo

Phrase length: Lund's solo contains 13 phrases and has a phrase length ranging from one bar to almost four bars. His phrasing length divides in three segments: five long phrases, three medium and five short phrases. His average phrase length is 2.20, which is medium phrasing.

Phrase combinations: He never repeats a phrase length twice and the most common groupings between phrases are long phrases followed by a short phrase. These (l-s) groupings appear three times starting in measures 13, 26 and 32.

Section phrasing: Phrases are connected to sections and motivic content using this division: A1 part (l-m) group, A2 (s-m-l) group, B part (s-l-m) group, and finally A' part as (s-l-s-l-s) group.

Rhythm: First seven phrases start on an upbeat, then two downbeats and four upbeats. Upbeat phrases are over five times as frequent as downbeat phrasing with a 1½ ratio in favor of upbeat phrasing. Endings are placed on one upbeat, four downbeats and eight upbeats, which gives a ¾ ratio in favor of upbeat phrasing.

Harmony: Chord tones and scale tone are used as follows on start note in phrases: 5, 1, 3, b7, 5, 3, 4, ♭9, ♭3, 6, 5, 1, 3—1⅔ in favor of chord tones in starting phrases. Chord tones and scale tones are used as follows on end (target) note in phrases: ♯4, 5, ♭3, 6, 6, 5, 4, 1, 6, 1, ♭7, 1, 5—⅘ in favor of chord tones in ending phrases.

Rests: He uses rests in a very effective way, "breathing" in and between phrases. Looking at the video it is also possible to hear that his instrument is slightly out of tune and that he tunes the instrument between phrases. It is hard to say whether this affects the intended musical meaning. He gave no comments on this issue when looking through and watching the video in the follow up fieldwork. Altogether, his rests (pauses) add up to six bars of his solo.

Interval joins: The 12 intervals that join ideas or phrases in Lund's solo are 1, ♭6, 1, ♭3, 4, 7, 3, 10, 1, 4, ♭2, 3. The tonic and third are the most common intervals, three times each. The tonic repetitions are the most interesting because they outline a continuation or prolongation of the idea even though it is a new phrase. In the first A part, the first two phrases are tied together by the same pitch (tonic repetition), and even within the phrases the pitch repetition ensures continuity. In the second half the same thing happens again: pitch repetition between phrase 3 and 4. Phrase 5 repeats the last three pitches from phrase 4.

Phrasing Characteristics: Lund varies the length of the phrases throughout the solo. Beginning and endings of his phrasing is much upbeat phrasing, which gives a forward feeling. Harmonically, he relies much on chord tones

for his harmonic foundation. The most important start and end tones outline a triad, which correlates very well with his emphasis on triad structures in the interview. His extended use of rests give the ideas more weight, and the frequent use of pitch repetition make the phrases more chained on a macro level.

Structure: material used

C^{maj}	C^{maj9}, 4	E, Fm, 7	Em^{7}, Cm, 8	Fm+C= Fm^{9}, 9
Dm^{7}	Am, 2	C^{maj7}, 26	F^{add9}, C♯m^{7}, 33	
E♭^{o7}	E♭^{o7}, 32			
Em^{7}	Em^{9}, 31			
$E^{7(♯5)}$	C^{maj9}, 24			
F^{maj}	Dm^{9}, 29			
G^{7}	E, Cr. (C♯- E), 11	F^{add9}, 22	Fm, Cr. (F♯-G♯), 27	Em^{7}+ C^{maj}= C^{maj9}, 34
Am^{7}	Am^{add9}, 1	Am^{7}, 7	C^{maj9}, 25	
$B^{7(alt)}$	F, 36			

Table 8.1 Lage Lund, harmonic chunks in the modal matrix. The chords in the left column are the chords used in the modal matrix. The chords to the right of the bold chords are extensions and alterations (alterations marked with red color). Measure numbers indicate when the different chunks are used. For instance, in C^{maj9}, 4 means it is a C^{maj9} harmonic chunk found in the fourth measure.

He uses many chord tones seen as four and five note structures, see Table 8.1. The ninth structure is the most used, seen as major and minor nine chords, but also as major and minor triads with an added ninth. Chromatic patterns are on the tonic and the fifth of the dominant chord. C♯m^{7} sideslip over a Dm^{7} is the most dissonant one of the four note tension structures. He never uses five, six or seven note scales in their entity.

On major seventh chords he uses the ♯5 as the most used tension note (five times). The other tension notes on major seventh chords are the ♭9 and the ♯9, used once. On the dominant chords, he uses the ♭9 five times and the ♭5, ♯5 and major seventh twice. On the minor chords, he uses ♭5 three times, and ♭9 and major seventh once each.

He creates extended chord forms by combining four note structures and combining triads with four note structures. Most interesting is his use of

triads: E, Fm and Cm on C major which produces a $C^{maj\sharp5}$, $C^{maj11\sharp5}$, and a $C^{maj\sharp9}$ chord, and the tritone substitute F on B^7 which produces a B altered chord.

Rhythm: He is using 16th notes as his main rhythmic unit in measures 2 and 16, and in two larger segments from bar 6 to 11. Then he uses three larger 16th note segments from 4 to 11, from 26 to 30, and from 32 to 34. He uses triplet based phrasing only in bars 4 and five. Sixteenth note groupings sums up to eight bars in his solo and triplets sums up to two and a half bar. Ten out of thirteen phrases starts with 16th note pick up notes.

His use of sixteenth notes is not as long chains but rather as interspersed groups between other rhythmical values, eight notes and triplets. By using the 16th notes in this way, he never fully establishes a double time feel. Lund is the only one of the guitarists using sixteenth note runs in the first half of the tune.

Melody: His phrasing has a dramatic contour; many phrases are over two octaves in range and shifts between different rhythmical sub-groupings within the same phrase. His most common melodic figure are ascending 16th note runs used in the beginning of phrases.

His melodic range is from F2 to G5 found in one occurrence each. The range is then three octaves and a major second. His average pitch and median pitch is an F4. Lund's solo contains a repetition of the notes contained in a C minor as the most used: G4 used 27 times, E♭4 23 times and C5 20 times.

Melodically he uses tone repetition as his most characteristic phrasing device, continuing the thought in the same range. He deploys rests as an effective device to separate phrases.

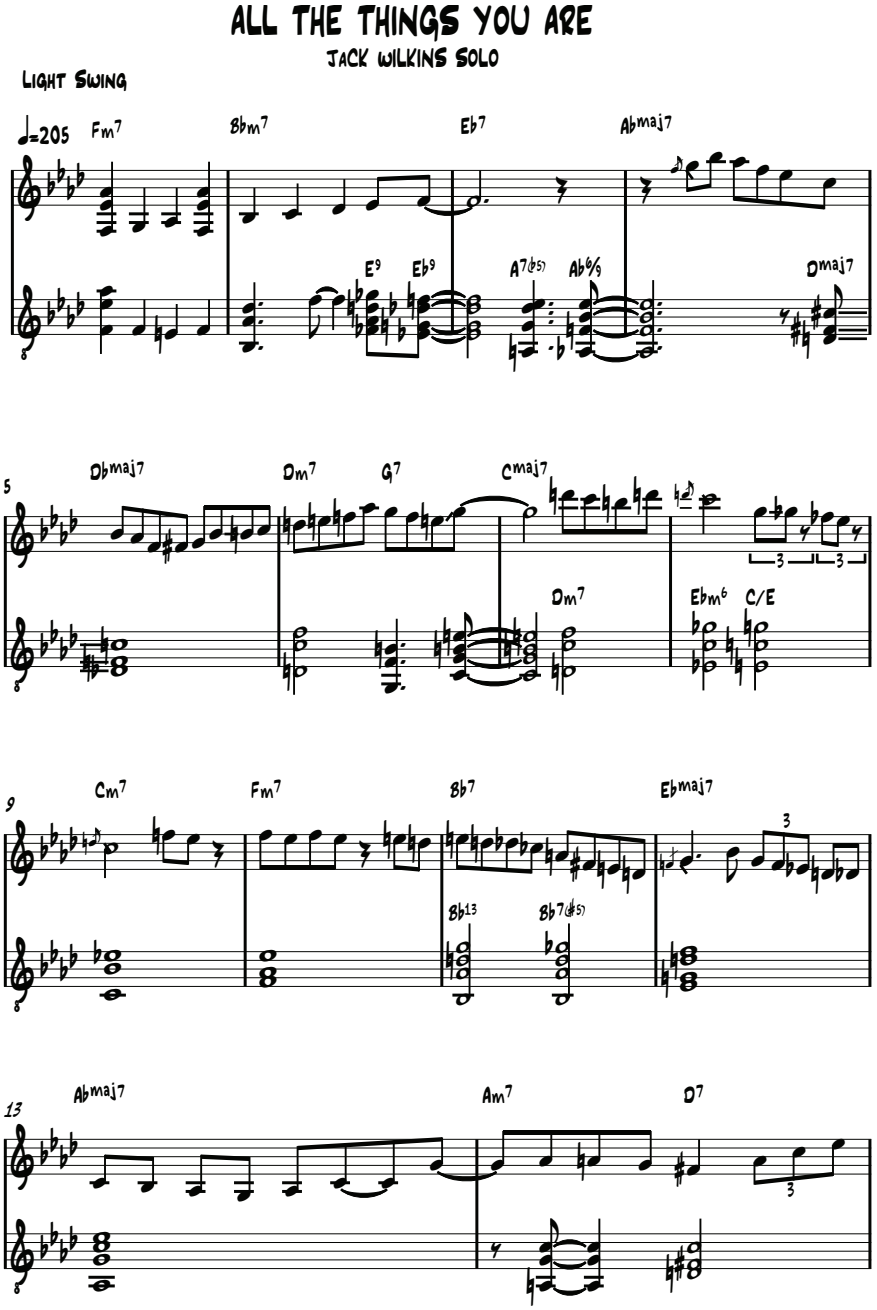
Structure characteristics: Lund uses many five-note structures emphasizing the ninth in both major and minor. He combines triads to form larger templates, inside structures as major and minor nine, and alterations as ♯5 on major seventh chords and ♭9 on dominant chords. He mixes many different rhythmic units in the same phrase, upbeat oriented and playing much on top of the beat that creates more tension than the laid-back beat used by many modern guitarists today.

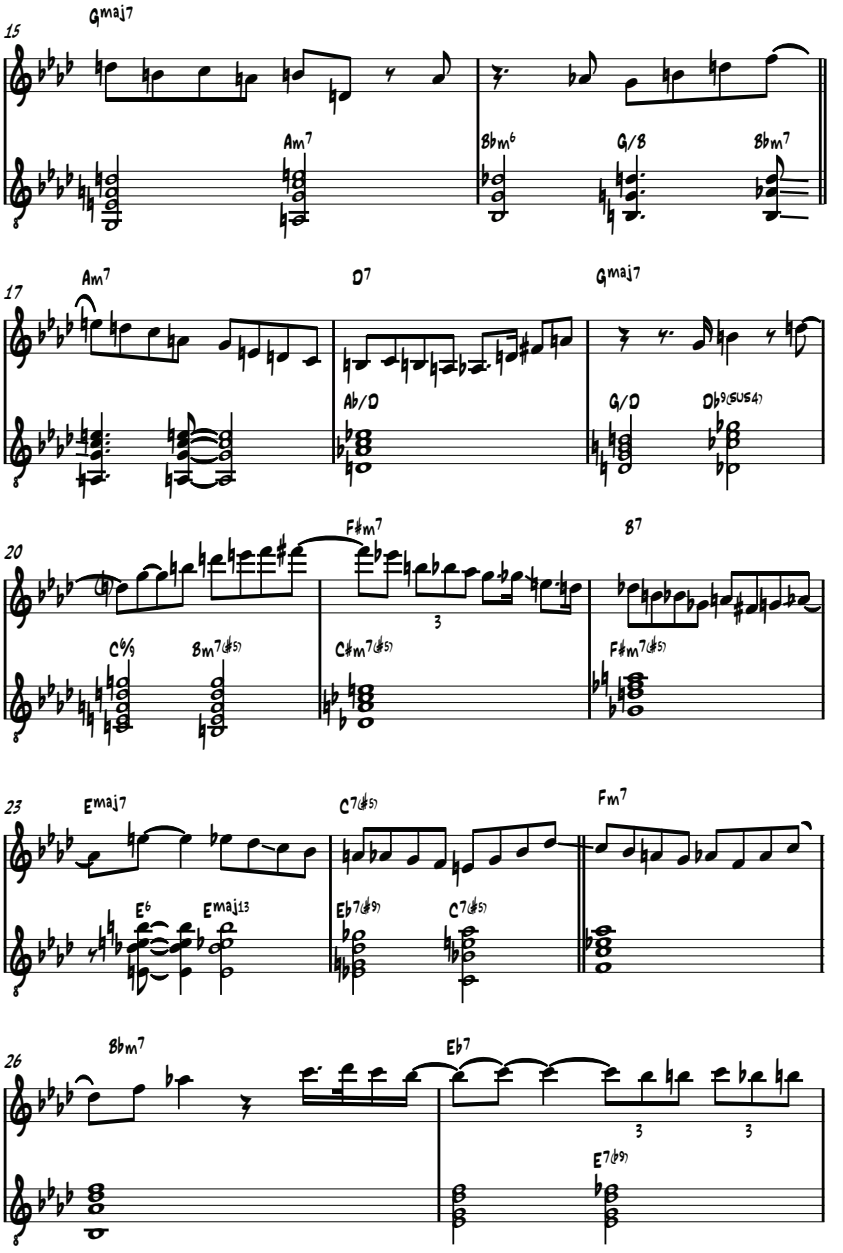
Form: solo structure, content and execution

A♭ area (I–5)	Rhythmic phrasing, half note, quarter, eighth and sixteenth notes included. Dramatic—two octaves range in the opening phrase, making a clear statement in the opening.	0
C area (6–8)	Chromatic upper and lower neighbor tones around G in three octaves, interspersed with an E and an F minor triad over G^7 and C^{maj}.	8
E♭ area (9–13)	Starting with a template in bar 8 Em^7+Cm before ending it with an Am^7 in bar 9. In bar 11 an E triad is used against G^7, ending with a chromatic movement.	4
G area (14–20)	Interval repetition and "bluesy" phrasing. In bar 19 (C^{maj}) an Fm^{maj9} template is used, consisting of Fm and C.	2
E area (21–23)	F^{add9} and $E^{(7)}$ are used over G^7.	3
Transition (24)	The sharp 5 (G♯) is from C^{maj}, becomes the 1 in $A♭^{7♯5}$.	0
A♭ area (25–29)	Large interval leaps. In bar 27 an Fm^{add9} is used against a G^7, moving from G and ending in a chromatic movement around G an octave over.	3
B area (30)	Rhythmic phrasing.	0
A♭ area (31)	Em^7 arpeggio played against an Em^7 chord.	0
B° area (32)	$E♭^{o7}$ arpeggio played against an E♭° chord.	
A♭ area (33–35)	In bar 33 a F^{add9} and $C♯m^9$ are used over Dm^7. G^7 Em^7+C^{maj}=C^{maj9} is used over G^7.	6
Transition (36)	F descending triad is used over B^7 altered, and E ascending triad is used as a part of $C^{maj9♯5}$ over E^7 altered, smooth sequencing.	0
	Sum of tension notes	26
Tension notes distribution	46% of his tension notes are on dominant chords, where we expect tension use. Dominant areas are found in 11 of 36 bars outlining roughly 30% of the harmonies.	
Peak of solo	Bar 32 (6 outside tones, 16th notes, rhythmic variety, attack and highest note), in the end of bar 32 the solo descends from this climax and Lund rounds of the chorus in a nice way.	
Interplay	Tight, C area bar 6, G area bar 14. Easy to comp, but my hands make a reverse action in the middle of a chunk in bar 8.	
Characteristics	Chromatics around 2 and 5 step (D–G) in C modality, E major and F minor triads over G^7 chords, rhythmic diversity, large range in phrasing (vertical).	

Table 8.2 Lage Lund, form. Based on modal matrix in C major. The left column in the table denotes the different tonal areas given with measure indications in parenthesis; the red areas indicate where tensions are used most frequently. The right column indicates the number of tension notes used in the area. The lower rows of the table indicate different qualities of the solo, including the most significant characteristics listed at the bottom

8.2.2 Jack Wilkins

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Gmaj7
Am7
Bbm6
G/B
Bbm7
17
Am7
D7
Gmaj7
Ab/D
G/D
Db9(sus4)
20
F#m7
B7
C6/9
Bm7(b5)
C#m7(b5)
F#m7(b5)
3
23
Emaj7
C7(b5)
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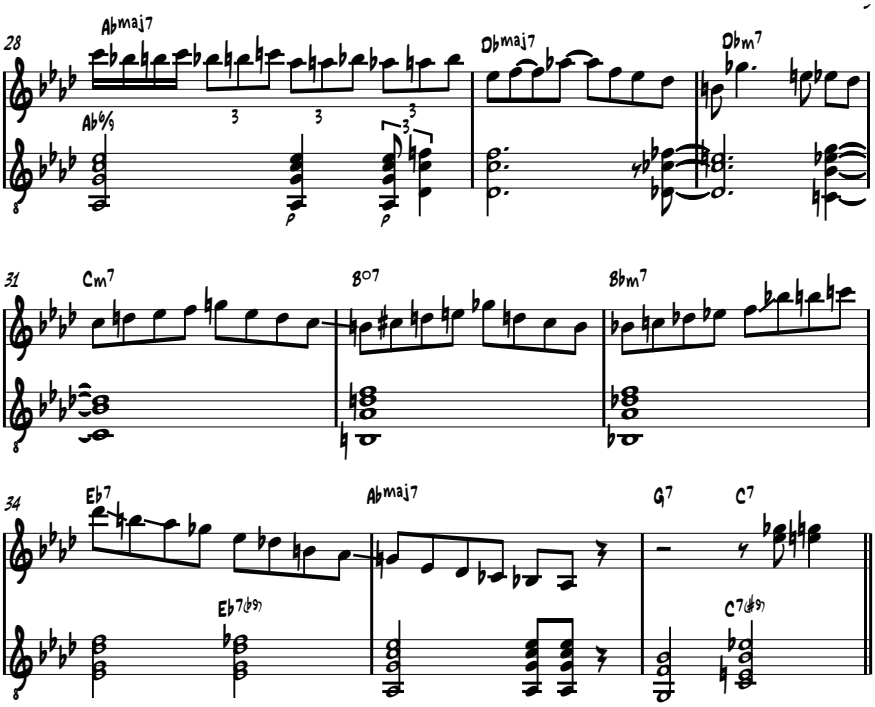
E7(b9)
3
3



Time: pacing the solo

Phrase length: Wilkins's solo contains seven phrases and has a phrase length ranging from two bars (measure 7) to almost seven bars (measures 9 and 29). The pick-up phrase in bar 36 is not included in this chorus. His phrasing length divides in two segments of length: six long phrases between four and seven bars and one medium phrase of two bars. His average phrasing length is four and a half bars. His long phrases are partly due to a little bit faster tempo than with the other four guitarists.

Phrase combinations: He has a flowing way of playing, which makes phrases connect in an associative way almost as a continuum. This also fits well with the way he speaks about improvisation in the interviews—as a long line. He combines the first long phrase with a medium two bar phrase, then the longest phrases 3 and 7 which last between six and seven bars are interspersed with three shorter phrases of around four bars.

Section phrasing: He starts with a scale figure in the first bars before introducing the first phrase in the end of bar 2, with only two notes. These notes are short introductory statements that rest before ending in the second half of the phrase. The next phrase is the only medium phrase he uses, before making a solo that is defined by long floating be-bop lines from the second A part and throughout the form. Chunks of phrases are based on sections: A1 section (l-m) group, A2 section (l), B section (L-L) and A` section (l-l).

Rhythm: The two first phrases begin with a downbeat; the next four are upbeat, then 1 downbeat. This gives a ⅔ in favor of upbeat phrasing. The phrases endings are all upbeats, which is typical of the swing tradition.

Harmony: His phrasing is scale tone based, and the fourth and ninth as the most common in starting the phrases, twice each. Chord tones are used twice, in phrases 5 and 6. As with Lund, he uses one tension note as starting note and that is in bar 16, phrase 4. The ♭9 is resolved chromatically down to one on the next downbeat. He ends his phrases three times on the tonic and twice on the ninth. As in the start, he deploys a ♭9 once. This time the b9 is also resolved down a half step to the five on the Fm^7 in measure 25. In bars 20 and 24 the line just continues, but with a new idea using passing notes to bridge the phrases ♭7 on major and ♭9 on ♯5 chord.

Rests: He spaces his solos with few rests of any length. His first rest (2 beats) is inside the first phrase, as already mentioned. The second rest (1.75 beats) is in the same way, making a temporary stop in an idea before continuing the idea in the same direction. The next phrase comes as the bridge goes into its second half. The idea starts on the upbeat of four that is considered the most swinging beat in jazz; the idea is new but the rhythmic flow continues. He ends his solo with a long rest (3.05) before introducing the double-stop notes coming in the pick-up phrase to chorus two. He rests for about three bars in the entire solo, and this includes all his rests.

Interval joins: The six intervals used between the seven phrases are 5, 4, ♭2, ♭3, ♭2 and 5. The flatted second interval is then the most used interval for chaining phrases. The interval is in both cases resolved down a half step to a chord tone, coming from a ♭9 degree of the chord. The ♭2 interval is used to join the bridge to the A parts.

Phrasing characteristics: Wilkins uses few phrases and long lines; two phrases are almost seven bars in bars 9 and 29. He chains his ideas by using

eight note lines interspersed with triplets, and then using small intervals to join the phrases. He varies between downbeats and upbeats in the start but ends all his phrases on upbeats. He uses few rests, and new ideas often start in the middle of a rhythmic flow, bridging ideas in a continuous line.

Structure: material used

C^{maj}	Am pent, 4	Cr.(C-A), 12	C 19-20	Cr.(A-B), 20	Cr.(A-B), 20	Cr.(E-D), 21	Cr.(C-E), 28
Dm^{7}	Cr(C-D), 14	Dm pent, 17		Cr.(E-D), 21	F, 26	Cr.(D-F), 33	
E♭^{o7}	E♭ dor.tc. 32						
Em^{7}	E dor. tc. 33						
E$^{7(♯5)}$	Cr.(F-E♭), 24	C^{o7}, 24	Gm+G♯m, 36				
F^{maj}	Cr(A-B) (D-E), 5						
G^{7}	G♯ dor.tc., 11	G♯m pent, 11	D^{o} 14	G, 18	Cr.(D-E), 22, 27		Cm pent, 34
Am^{7}	Am						
B$^{7(alt)}$							

Table 8.3 Jack Wilkins. Harmonic chunks in the modal matrix.

He uses many small chromatic figures, ascending and descending 3-4 note chromatic runs. The high number of tension notes in his solo is very much a result of these ten chromatic figures found in the solo. The effect of using tension notes in this figural way is not as dramatic as when superimposing chord structures on the existing harmonies. The C^{o7} used on E^{7} (♯5) makes a very strong dissonance by outlining the major seventh on the dominant chord. The major seventh degree is also used over G^{7} by using the G♯ minor pentatonic scale. The remaining tension chunks (D^{o} and Cm pentatonic on G^{7} and Gm on E$^{7♯5}$) outline an altered scale.

His chromatic figures make an unusual tension note distribution, especially on major seventh chords in which he is using ♯9 four times and ♭9 three times. These tension notes are mainly chromatic figures on the tonic of the chord, going up and down. He uses the ♭7 three times on the major chord, stressing the be-bop dominant scale, which produces an ambient major chord quality. The more common alterations on the major seventh chord, ♭5 (lydian), is used twice and the more modern sound ♯5 (lydian augmented) is used once. On the dominant chord he favors the ♯5, which is used six times,

the other altered tones ♭5 and ♯9 are used three times each, while the ♭9 is used twice. On minor chords he uses major third and seventh twice, and the alteration ♭5 and ♯5 once.

He produces only one harmonic template in his solo: In bar 36 he plays a Gm triad (no 5) going to a G♯m triad (no 5) over $E^{7♯5}$. This harmonic template can be analyzed as an $E^{7♭5♯9}$ chord.

Rhythm. He uses mainly eight note lines throughout the solo with the exception of bars 27 and 28, which are triplet based. He uses ten eight note triplets and only two sixteenth notes groupings in this chorus, making three bars altogether. Pauses (three bars) and these rhythmical groupings (three bars) then outline one sixth of his chorus. He surrounds the first triplets (bar 8) with half notes, and the second with quarter and eighth notes. His only 16th note grouping is surrounded by quarter note rests before and eight notes afterwards.

Melody. His melodic contour can be seen as wave formations, the melody going up and down with few abrupt shifts. In the second half of the B part, the melody moves to its highest contour. The average pitch used in the solo is C4, while the median pitch is D♭4. The highest pitch in his solo is two occurrences of F♯5 and the lowest is two occurrences of F2. His total range is then three octaves and a semitone. He focuses his phrases around three pitches: E♭4 used 15 times, G3 used 14 times and D4 used 14 times. These three pitches outline an E♭ major seventh chord (no 5th) chunk. The E♭ flat notes are found in flat keys, and G and D can be found in all keys except E.

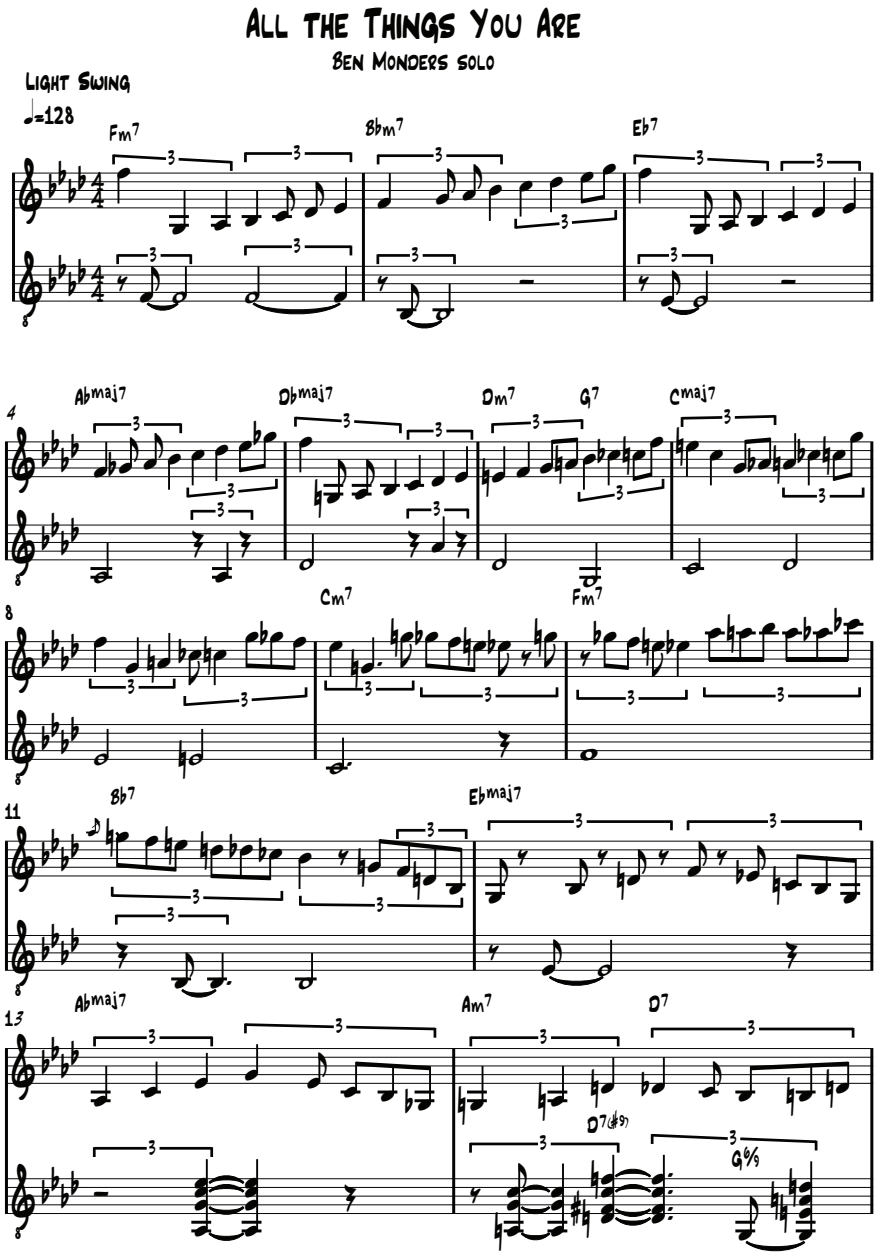
Structure characteristics. His ideas chains by long flowing eight note lines. He uses few rests and many phrases start with little or no preparation. He mainly relies on chromatic ascending and descending figures as his main feature to establish harmonic tension. However, the most dissonant structure is a G♯m pentatonic scale used over a Dm^7-G^7 progression. He produces most tension notes by lowering and sharpening the ninth on major seventh chords, and the fifth on dominant chords. Minor seventh chord tensions appear via a major third and major seventh.

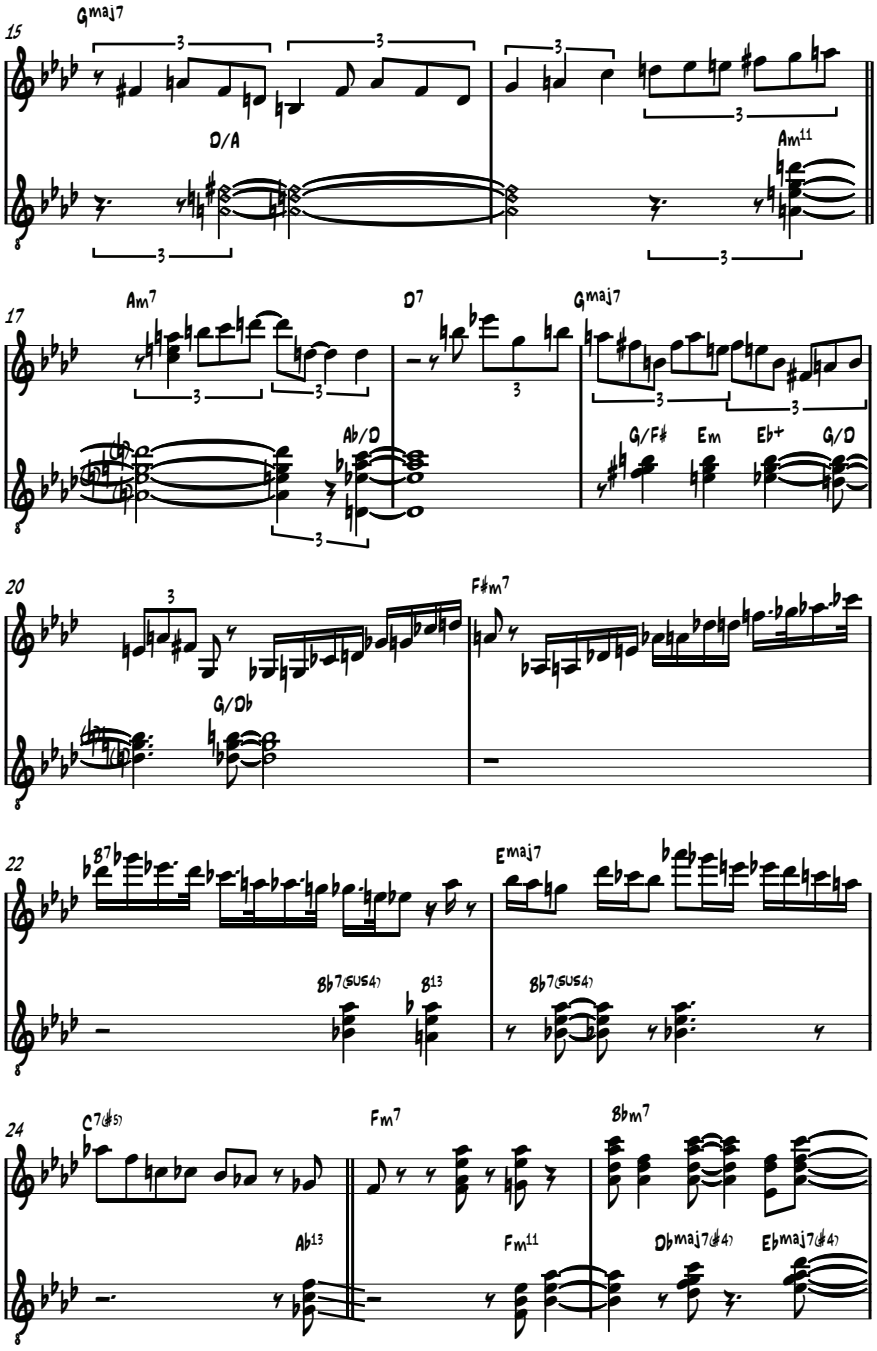
Form: solo structure, content and execution

A♭ area (I–5)	Eight note movements, blues feeling, adding a, b9 and 9 to the A blues over Fma in bar 5	2
C area (6–8)	E♭ h.w. tc. used over C^{maj} in bar 8	3
E♭ area (9–13)	Major second sequencing (D-C), (C♯-B) and (B♭-A♭) ending with a G♯m pentatonic over Dm^7-G^7 in bars 10–11.	8
G area (14–20)	Chromatics up to root (Dm^7) and D^o over G^7 in bar 14. C major bebop scale over C^{maj} in bar 20. F♯ dorian tc. over C^{maj} in bar 23.	7
E area (21–23)	Over Dm^7-G^7 (21–22) a G triad is continued in a descending bebop melodic minor scale movement, ending in a bluesy 6th interval.	3
Transition (24)	Chromatics 6 to 5, then a C^{o7} on the $A^{7\sharp5}$, diminished on augmented.	3
A♭ area (25–29)	Chromatic triplets from D and C on G^7-C^{maj} (27–28).	7
B area (30)		0
A♭ area (31)	1–5 ascending/descending E minor scale on Em^7 chord.	2
B^o area (32)	1–5 ascending/descending E♭ minor scale on $E♭^o$ chord.	1
A♭ area (33–35)	1–5 ascending D minor scale, then D-F ascending chromatics on Dm^7, then Cm pentatonic scale on G^7 in bars 33 and 34.	5
Transition (36)	Gm and G♯m on E^7 (Alt)	1
	Sum of tension notes	42
Tension notes distribution	50% of his tension notes are used in the dominant areas. The dominant areas outline 11 of 36 bars, roughly 30% of the harmonies.	
Peak of solo	Bars 32 to 34: bluesy ascending movement, many outside tones, high pitch, nice contour of the line.	
Interplay	Tight in E♭ area, bar 11; G area, bars 16, 18; transition area, bar 24. Starting to comp with my fingers then using the pick from bars 5. In bar 28 the triplet patterns in the solo makes me ahead of the beat in the two next bars. The highest tempo of all the solos (183 bpm).	
Characteristics	Much sequencing, 10–11, 31–33. Be-bop triplets 12–14, ascending chromatics 27–28, blues feeling 5–6 and 32–34.	

Table 8.4 Jack Wilkins. Form; based on modal matrix in C major

8.2.3 Ben Monder

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D/A
Am11
17
Am7
D7
Gmaj7
Ab/D
G/F♯
Em
Eb+
G/D
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F♯m7
G/Db
22
B7
Emaj7
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B13
Bb7(SUS4)
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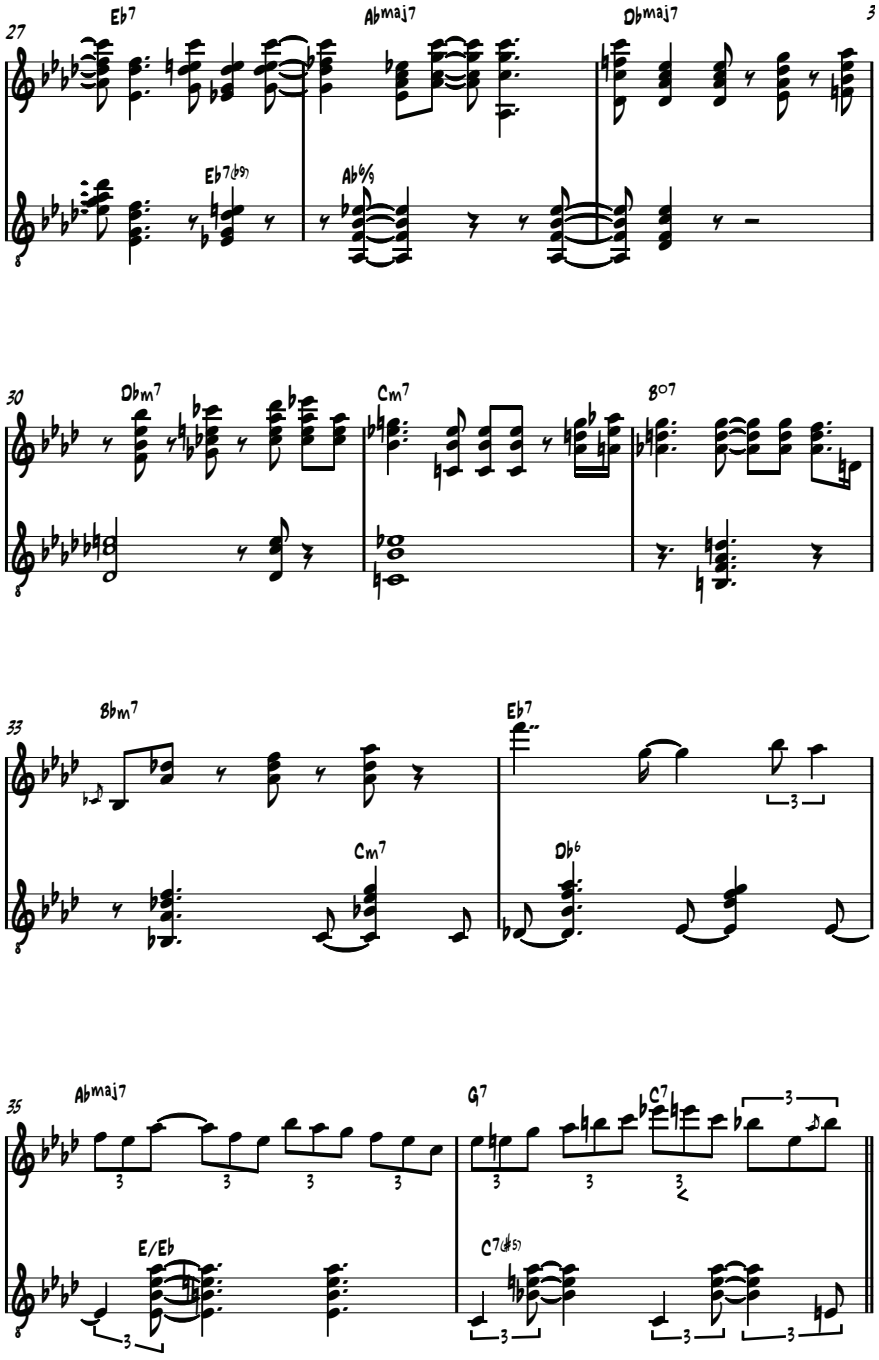

27
Eb7
Abmaj7
Dbmaj7
3
Eb7(b9)
Ab6/9
30
Dbm7
Cm7
B°7
33
Bbm7
Eb7
Cm7
Db6
35
Abmaj7
G7
C7
E/Eb
C7(#5)

Time: pacing the solo

Phrase length: Monder's solo contains 13 phrases and has a phrase length ranging from almost two bars (phrase 9 in measure 18) to above five bars (phrase 12 in measure 29). His phrasing length contains two segments of length: ten medium phrases, nine phrases at around two bars and one phrase at around three bars. Three phrases are long phrases at around five bars. His average phrasing length is two and a half bars (2.56).

Phrase combinations: He maintains one type of phrase length over sustained periods of time: medium phrasing in the first 20 bars, then long phrasing in 13 bars, ending with three bars of medium length phrasing. The phrase combination follows a classical contour of storytelling. He starts by following an idea, then changing some features of the idea, in the middle intensifying the story, introducing longer phrase lengths, and in the end going for the peak point and resolving it before the end.

Section phrasing: The most frequent pattern is medium phrases of two bar durations. The two bar phrases contain two basic motives that are combined and varied throughout the first A section. In the fifth phrase of the second A section he repeats three descending lines with variation before ending the phrase and concluding the section with arch phrasing contour in bar 15. He anticipates the B part by phrasing over the section in bars 16 and 17. After some pentatonic lines, he doubles the phrase length in the second half of the B section. This phrase in bar 20 contains a free rhythmic feeling, including over the time phrasing which gives quite another feeling than the phrases before. In the last A' part he introduces chord solo playing as his approach, and continues chord playing until solo string playing is once again introduced in the final medium phrase. His phrasing in the entire chorus is, then, A1 section, 4 medium phrases; A2 section, 3 medium phrases; B section, 2 medium and 1 long phrase; and A' section, two long and one medium phrase.

Rhythm: The first four phrases start with a downbeat; the next three are upbeat; then he moves to one downbeat, one upbeat, and one downbeat; he finally ends with three downbeats. This gives a ¾ in favor of downbeat phrasing. The shifting between downbeats and upbeats elicits a restless feeling. He ends all of his phrases with an upbeat.

Harmony: Chord tones are the most usual as start points in the phrases, using 1, 3, 5, and 7 twice each. Scale tones are only used three times: 6^{th} on phrases 6 and 9 and 9^{th} on phrase 2. He deploys two tension notes as

starting notes: a sharp 5 in phrase 7 and a ♭5 in phrase 11. He ends his phrases four times on the 1 and ♭7, twice on the third and once on 6 and 4. In phrase 2, the ♭7 is used against a major 7 and is a strong dissonance, but the strong contour of the line makes the harmonic tension less prevalent.

Rests: He spaces his solo with almost no rests. The only rest of any duration in the solo is in bar 18 between the 8th and 9th phrase, where he rests for two and a half beats. The phrase after the rest is special and different from the other phrases as it contains more pentatonic quartal harmony.

Interval joins: The twelve intervals between his phrases are 2, ♭2, ♭2, 5, ♭3, 2, 4, 6, ♭2, ♭2, 1 and ♭3. The descending ♭2 interval is used four times, the descending 2 interval and ascending ♭3 interval twice. He joins his phrases with the same small intervals as he uses inside the phrases, mainly stepwise movement. The six ascending intervals join range from 1 to 6.

Phrasing characteristics. The phrase combination follows a classical contour of storytelling: start by following an idea, change some features of the idea, in the middle intensify the story, introduce longer phrase lengths, in the end go for the peak point and resolve it before the final end. His solo is very much based on rhythmic macro chunking, pacing the solo with different rhythmical values over time. Summing up, the first A part is all downbeats, then he changes the phrasing pattern to upbeat phrasing in the next A section. The B part is a variation of beat placement down-up-downbeat before he concludes with a series of downbeats in the final A part.

Structure: material used

C^{maj}	A Phryg, 4 C^{maj}, 20	C, Cr.(G-A), 7 Ah.m., 23	Cr.(G-E), 8	Em^7, Am^7, 12	Em^7, 15	Cr.(G-A),16
Dm^7	Cr(C-E♭), 9 $F^{\sharp 7sus}$, G^{7sus}, Dm^7, F^{maj}, 30	Cr.(F-G), 10	F^{maj}, 21 Dm^7, F, 33	F^{maj9}, 26		
$E♭^{o7}$	D^{13}, $F♯^{o}$, 32					
Em^7	G, Em^7, D^{13}, 31					
$E^{7(♯5)}$	C♯m, D tc., 24	G^{aug}. 36				
F^{maj}	A eolian, 5	F^{maj}, 13	F^{maj}, C/F, G^{11}, 29			
G^7	Cr(A-C), 6	E h.w., Em^7, 11	Cr.(F-G), 14	C^{+}, 18	Cr.(D-F), 22	Em^{add9}, 27
Am^7	A eol., 1	Cr.(E-C), 9	Am^7, 25			
$B^{7(alt)}$	G^{aug}. 36					

Table 8.5 Ben Monder. Harmonic chunks in the modal matrix.

He uses nine chromatic ascending and descending figures ranging from two to five notes that produce the majority of tension notes in his solo. He is the only guitarist that uses stepwise movement of entire scales in his solo. The C^{+} (augmented triad) creates a nice tension on the G^{7}, producing a $G^{13\flat9}$ structure. The Em^{add9} produces a strong tension: major on dominant chord. This is also the case with G^{+} on $E^{7(\sharp5)}$.

He resorts to the traditional tension notes ♯4 and ♯5 three times on major seventh chords. The more dissonant ♭7 is also used three times and appears as a really tense note more than a passing note, for instance in measure 4. On the dominant chord, he has ♯5 as his favorite note, used three times. The other tension notes are ♭5, ♭9, ♯9 and major seventh. On minor chords, he uses the major third three times, and the ♭9 and major seventh twice. The more common ♭5 and ♯5 are used only once each.

He uses several templates in his solo: Of the more interesting ones is the D^{13} combined with an F♯o over E♭^{o} producing an inside template (the F♯^{o} contains the same notes as E♭^{o7}), and the D^{13} combined with Em^{7} produces an outside template on Em^{7} in the key of C. Of the more dissonant templates he uses is the F♯^{7sus} structure over Dm^{7}, leading smoothly to the G^{7sus} coming right after. The major third and major seventh of F♯^{7sus} resolve into the fourth and tonic of Dm^{7} by the use of G^{7sus}.

Rhythm. Monder's phrasing is characterized by rhythmic subgroupings. The first nine medium phrases outline basically one rhythmic idea, namely playing against the time in three against two divisions (quarter note triplets) and even further divisions of that. Then in the second half of the B section he uses a 16th note-based phrase playing "over the time," freeing himself from the ongoing pulse. Phrases 11 and 12 are based on phrasing polyrhythmically against the time in three against four patterns using chords. The last phrase continues with triplet-based single tone improvisation.

He uses triplet-based improvisation, eighth and quarter note triplets, for 28 bars. Sixteenth notes are used for the total amount of three bars, and pauses for two bars. The medium phrases contain rhythmic displacements, with a chunked continuous pattern of quarter triplets and a continuous subgrouping of these triplets. He does in fact never use a straight 3 + 3 division in an entire bar. The division of these quarter note triplets has many sub groupings, including rhythmic templates of 3 + 4, 4 + 3, 4 + 4 and 3 + 5 combinations in the first A part. He then complicates the rhythmic templates

even further in the second A part by using 4 + 6, 6 + 5, 3 + 5, 4 + 4 and 3 + 6 combinations. The other major way of phrasing against the time is when he uses a repetitious three pattern 1 and 2 and 3 against 4 in the beginning of the last A part.

Melody. His first melodic phrase starts with a dramatic descending interval of almost two octaves, moving stepwise up to the high pitch area again. This pattern repeats twice. Then the melodic contour goes in a wave shape with an octave as its range. The most dramatic melodic contour happens in phrase 10 with the sixteenth note runs going from the bottom to the top of the instrument in over the time phrasing. His chord melody style is very distinct and melodic, hinting at the melody in the end of his solo before rounding it nicely off with triplets in the end.

He plays the low G♭2 twice in his solo and the highest note G♯5 once. This range of three octaves and a whole tone is in the above-mentioned phrase 10. The average pitch is C4, and the median pitch in his solo is D♭4. A♭3 is used 27 times, A♭4 is used 25 times, and G4 is used 24 times. Monder's high number of tone repetitions is partly due to a lot of chord playing in his solo.

Rhythmic displacement is his main improvisational tool, shifting between downbeats and upbeat phrasing of these melodic motives. Coupled with very little pausing, this gives a restless feeling to the melody. He joins his phrases several times by changing the melodic direction, as seen in the beginning. At other times, he continues the melodic direction in a new phrase with a pick up part before changing it after these pick up notes, clearly demonstrated in the second A part.

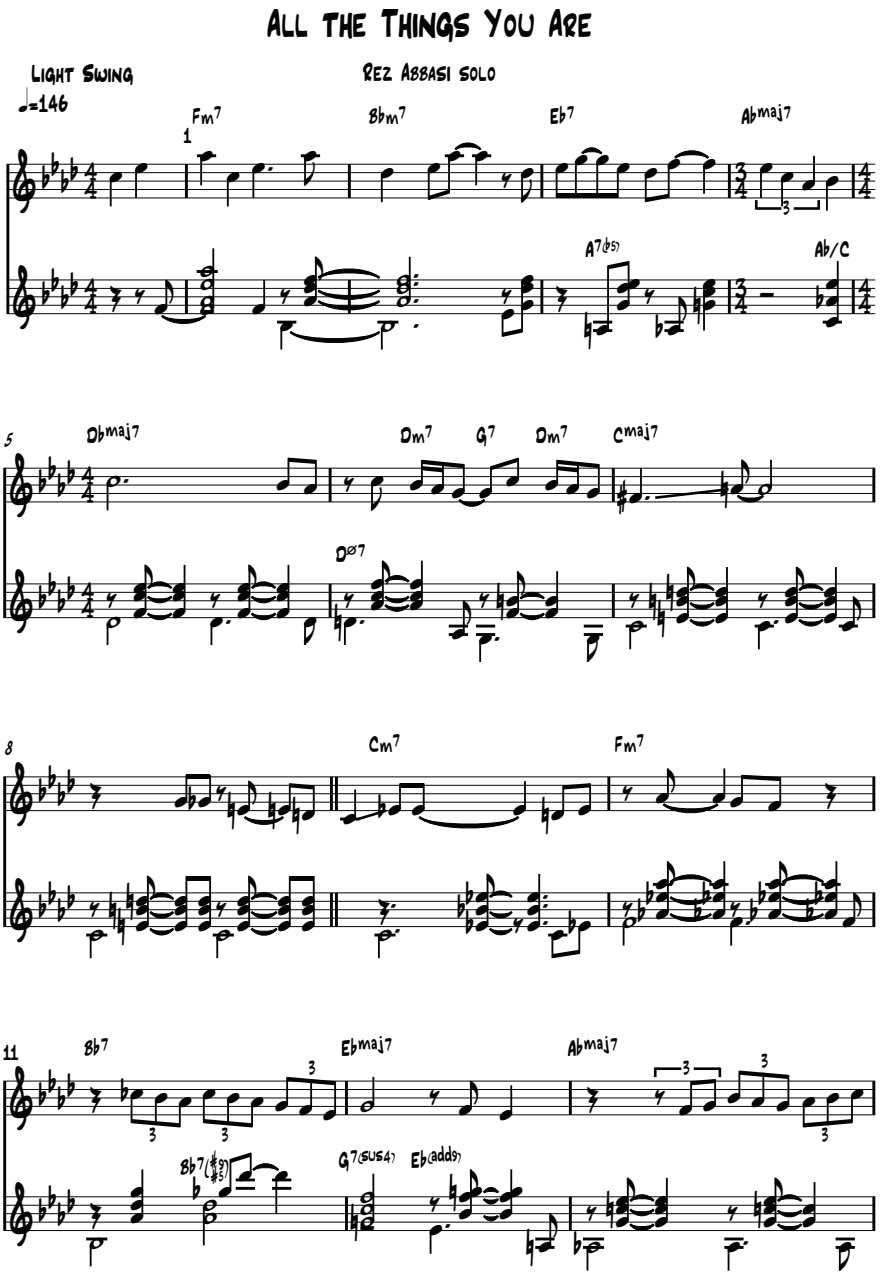
Structure characteristics. He is the only one of the five guitarists who uses a stepwise scale movement for an entire seven-tone scale (mainly major). He is also the only guitarist who employs a chord style in his solo. He uses many templates, where the chromatic combinations F♯^{7} to G^{7sus} over Dm^{7} and C♯m to D tetrachord over E$^{7♯5}$ are the more special ones. Rhythmically he uses rhythmical subdivisions of quarter triplets, over the time phrasing as 16th note phrasing, and polyrhythmic chord style implementing three against four. Melodically his phrasing is horizontal, moving stepwise with sudden explorations into strong vertical structures with 16th note groupings.

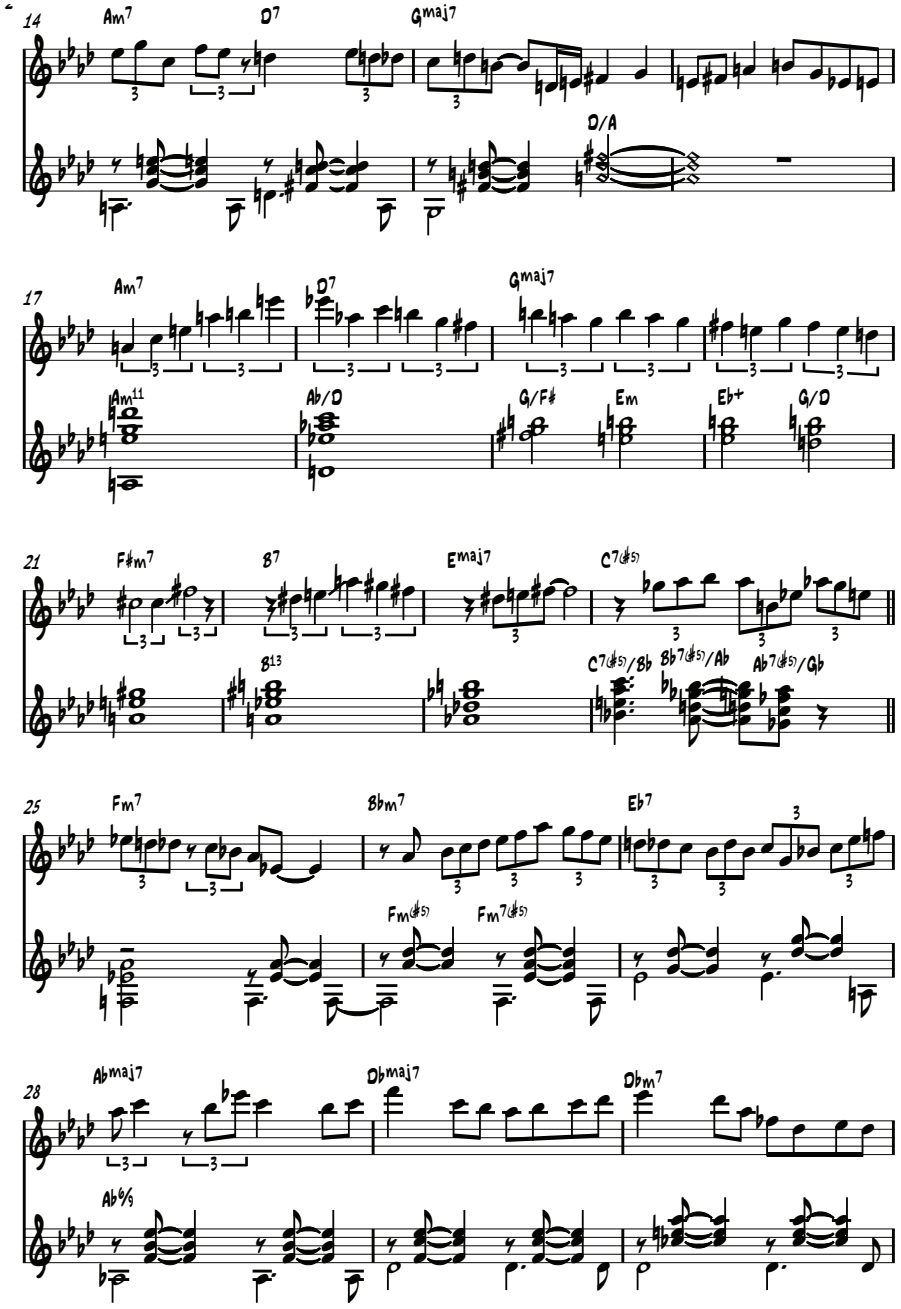
Form: solo structure, content and execution

A♭ area (I–5)	Polyrhythmic phrasing six against four, large descending leap, octave and a minor seventh, (fourteenth) moving stepwise ascending back again, repeating the pattern three times.	2
C area (6–8)	Repeating the pattern within a ninth in bar 6, then within an octave in bars 7 and 8.	3
E♭ area (9–13)	In the end of bar 8, a chromatic descending passage (G-F) is followed by similar chromatic descending passages (E-C) and (F-G) in bars 9 and 10, narrowing the range further. E half-whole tone passage in bar 9. This passage is followed by Em^7, Am^7 and F^{maj7} arpeggios in bars 11–13.	11
G area (14–20)	Chromatic up and down passages from G, interspersed with Em^7 arpeggio. C pentatonic movement in fourths in bars 19 and 20.	4
E area (21–23)	Starting a C major arpeggio in the end of bar 20 that is followed up by an F major arpeggio with a leap pattern from phrase 1. The ascending movement contains a D harmonic minor scale in the top range. Rhythmic phrasing in bar 23, which also contains an A harmonic minor scale over the C major chord.	7
Transition (24)	C♯ blues scale.	1
A♭ area (25–29)	Chord solo, using a syncopated three against four patterns from bar 26 to 29, 1 and 2 and 3.	1
B area (30)	Chromatic chord movement $F^{\sharp 7sus}$ to G^{7sus} on Dm^7.	
A♭ area (31)	Chromatic chord movement D^{13} to $D^{\sharp 13}$ on Em^7.	2
B° area (32)	D^{13} to $F^{\sharp o}$.	0
A♭ area (33–35)	Blues feeling.	5
Transition (36)	G augmented scale.	1
	Sum of tension notes	37
Tension notes distribution	35% of his tension notes fall within the dominant areas. The dominant areas are places of expected (schema-based) tension use. The dominant areas outline 11 of 36 bars, roughly 30% of the harmonies.	
Peak of solo	Bars 34 to 36, rhythmically interesting, stressing different tones in the triplets, bluesy feeling and interesting use of the augmented scale in bar 36.	
Interplay	Tight in bars 23 and 27. The most difficult to comp of all five guitarists and at certain places it almost stops, as in bars 20 to 21 when he goes from six against four, to four against four using mainly sixteenth notes.	
Characteristics	Building on rhythmic motives, based on 6 against 4, adding rhythmic complexity inside this polyrhythmic scheme. Quartal harmonic lines in bars 18 to 20. Adding chords to his solo in the last section, using three against four rhythmic patterns. Rhythmic variety in the use of triplets in the last three bars, use of the augmented scale in bar 36.	

Table 8.6 Ben Monder. Form; based on modal matrix in C major.

8.2.4 Rez Abbasi

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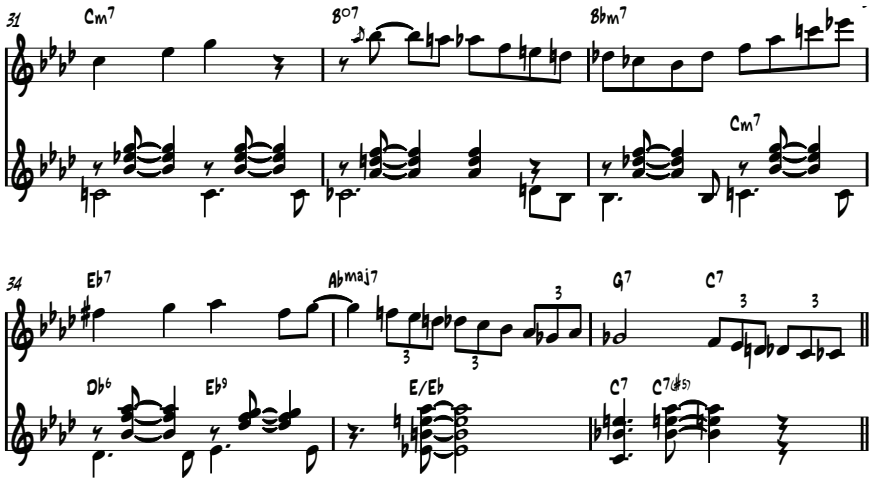
Am7
D7
Gmaj7
D/A
17
Am7
D7
Gmaj7
Am11
Ab/D
G/F♯
Em
Eb+
G/D
21
F♯m7
B7
Emaj7
C7(♯5)
B13
C7(♯5)/Bb
Bb7(♯5)/Ab
Ab7(♯5)/Gb
25
Fm7
Bbm7
Eb7
Fm(♯5)
Fm7(♯5)
28
Abmaj7
Dbmaj7
Dbm7
Ab6/5



Time: pacing the solo

Phrase length: Abbasi's solo contains 9 phrases and has a phrase length ranging from almost three bars, phrase 6 in measure 22, to just over five bars, phrase 3 in measure 8. His phrasing length divides into two groups: three medium phrases and six long phrases. His long phrasing contains three phrases around five bars and three phrases around four bars. His medium phrase length distributes with three phrases around three bars. His average phrase length is long phrasing, almost four bars (3.86).

Phrase combinations: He changes the phrase length continually between three, four and five bar lengths. Only once does he use a large change of length, from a five bar length in phrase 5 to a three bar length in phrase 6.

Section phrasing: Abbasi is the only guitarist using pick-up notes in the first phrase, which ends with a natural ¾ bar in measure 4. It sounds natural based on the rhythmic pattern of the phrase, where Abbasi plays behind the beat and uses a quarter triplet and a single quarter note afterwards. The antecedent first phrase follows with a consequent phrase in the second half of the period, concluding the first phrase. Ideas are novel after important cadences; this is especially evident in the B section part of this solo stressing a continuum of quarter triplets. The A parts are more associative. He uses two phrases in each of the first sections (AAB) before concluding it with a

long-medium-long combination in the final A' part. Over the entire chorus his phrases are connected to sections in this way: A1 section (l-m) group, A2 section (l-l), B section (l-m) and A' section (l-m-l).

Rhythm: Three of the first phrases start as downbeat, then one offbeat phrase. Then follows one downbeat phrase and one offbeat phrase, before ending with two downbeats and one offbeat phrase. This gives a ⅔ in favor of downbeat phrasing. The shifting between downbeats and offbeats gives a restless feeling in this solo. Phrase endings are one downbeat and one offbeat, then one downbeat and three offbeats, before ending with two downbeats and one offbeat. This gives a ¾ in favor of offbeat endings. Having four phrases ending on the downbeat is a deviation from the other four guitarists, who end nearly all their phrases in the usual way, on the offbeat. The downbeat placement gives more of a feeling of rest than the upbeat endings.

Harmony: Phrase beginnings have chord tones as the most usual; the seventh appears three times, the third twice, the fifth and tonic once. Scale tones appear twice; sixth on phrase 4 bar 13 and the nine on phrase 8, measure 29. He ends his phrases twice on the 1, 3, 6 and once on 5, 7 and 9. In phrase 9, the major seventh appears against a dominant seventh chord and creates a strong dissonance, but the strong directed targeting toward the dissonance gives it a hip sound. This gives five chord tones in total, three scale tones and one tension tone in the phrase endings.

Rests: He spaces his solo with only two small rests (1.05 and 1.50 beats) between phrases. These rests appear in measure 13 phrase 4, and measure 32 phrase 9. However, he frequently rests inside his phrases using quarter note rests in measures 8, 10, 23, and 24 and a half note rest in measure 8. These rests make his solo breathe and feel natural, and as with Wilkins the need for long rests between phrases is somewhat less important.

Interval joins: The eight interval joins used between his phrases are 2, $\underline{2}$, 2, 4, $\underline{\flat 3}$, 3, $\underline{2}$ and $\flat 3$. He joins his phrases with four 2nd intervals, two minor thirds and one fourth interval. By joining the phrases with small intervals a sense of continuity is established; in Abbasi's case it feels like he is just continuing the idea when a new phrase occurs, changing the shape in an associative way. This way of phrasing is similar to Wilkins way of phrasing, which has the fifth as its largest interval join.

Phrasing characteristics. Abbasi has a phrase distribution at around three to five bars in length. He changes the phrase length slightly every time and distributes the phrases evenly between three, four and five bars. His phrasing is downbeat heavy, using consecutive downbeat phrasing several places in both the start and end of the phrasing. He uses small intervals in joining the phrases and little rests, but spaces his solo by using a lot of rests within the phrases.

Structure: material used

C^{maj}	C, 1	C, 4	C^{+}, 16	Cr.(E-G) 12	Cr.(E-G), 35
Dm^{7}	Dm, 17	Dm+C = Dm11, 33			
$E\flat^{\circ 7}$	Cr.(C-D), 27				
Em^{7}	Em, 31				
$E^{7(\sharp 5)}$	C^{maj9}, 24	Cr.(E♭-G), 36			
F^{maj}					
G^{7}	G h.w., 11	Cr.(F-G), 14	D♭, 18	Cr.(E-G), 27	Cr.(B♭-C), 34
Am^{7}	Cr.(F-G), 25				
$B^{7(alt)}$					

Table 8.7 Rez Abbasi. Harmonic chunks in the modal matrix.

Abbasi employs eight chromatic figures in this chorus, and the largest one is composed of a major third interval and five chromatic tones, found in bar 36. As with the other guitarists, these chromatic figures outline the majority of tension notes used in the solo. The C^{+} in bar 16 outlines a lydian augmented tonality, the C^{maj9} on $E^{7\sharp 5}$ outlines an E altered (♯5,♯9) tonality, the altered tonality is also outlined by using the tritone substitution D♭ on G^{7}.

His chromatic figures include most of the tension used in the solo. On major seventh chords, he uses the standard tension notes ♭5 three times and the less common ♯5 once. The ♭7 appears on the final phrase in bar 35 and repeats as a strong dissonant major seventh sound on the next dominant chord. On the dominant chords, he uses the ♯9 five times and the b9 three times, while the ♭5 appears twice and the ♯5 only once. On the minor seventh chords, he uses the more unusual major third, major seventh and b9 twice, while the more common ♭5 and ♯5 appear once. The only template he uses

is a D minor that combines with a C major triad in bar 33; this combination produces a Dm^{11} chord.

Rhythm. He mixes different rhythmic units in the A1 section, from punctuated half notes to 16th notes, which gives an open feeling. In the A2 section, he uses more triplets that build intensity. In the B section, he uses only quarter triplet in six bars before ending it with eight note triplets in the last two bars (23 and 24). The eight note triplets continue for four bars in the A` section, making triad-based improvisation for 12 continual bars. In the final two bars, he concludes the solo with triplets again (35 and 36).

He uses 28 eight note triplets in his solo, which in total outlines seven bars; he has 12 quarter note triplets outlining six bars. His sixteenth notes are only used for one and a half beats in the solo and pause for two and a half bars. Altogether, this makes up for 17 bars of entire chorus.

Rhythmically he chains his phrases by continuing the rhythmical flow created in the previous phrase; the ideas evolve from phrase to phrase. In measure 15, he uses a rhythmical syncopation figure that stresses two 16th notes on the upbeat and by this prepares another rhythmical subdivision coming in the B part. By using this little figure, he transforms the interplay between us and makes the B section more triplet-based. The phrases in the A section are once again joined by a stream of associations, the solo evolving like one long associative thought.

Melody. His phrasing is very melodic and the ideas are easy to sing. This is partly due to a small pitch range in the phrases and the small (mostly second) intervals in which he joins his phrases. His Indian glissandi are the single most recognizable feature of his phrasing. All his phrases are within an octave in the first A part; in the B part he stretches the range somewhat more in the beginning of the first phrase but ends it with melodic phrasing in the one octave region for the rest of the B part. In the final A section he stretches the phrase's range to about two octave and a half and by this increases the tension in the solo as well.

His range in this solo is the smallest of all the guitarists, going from Cb2 to F5 with one occurrence each, making two octaves and an additional fourth. His average pitch is D♭4 and his median pitch is D♭4. E♭4 appears 19 times, C4 is used 17 times and A♭4 is used 17 times. The repetition notes outline an A♭ major triad.

Structure characteristics. He joins his ideas via a small range in phrasing and small intervals in connecting the phrases. He uses many chromatic figures and few chord substitutes and templates in his playing. His phrasing is very melodic and heavily triple-based. His range is small in this chorus, and he emphasizes notes that appear less frequently in the material by the other guitarists (the C note) and has an average and median pitch of Db4, not found with the other guitarists. His most recognizable feature is his Indian-inspired glissandi used several times in the chorus. These are simply long glissandi performed horizontally on one string.

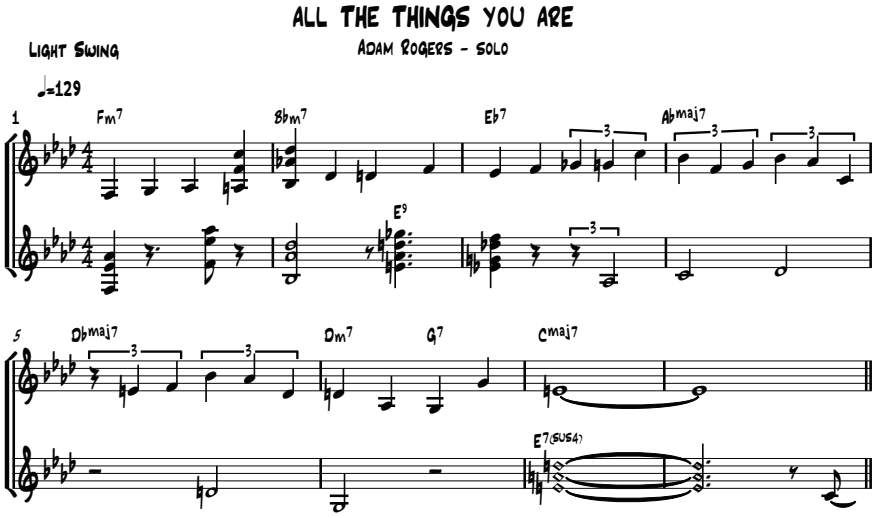
Form: solo structure, content and execution

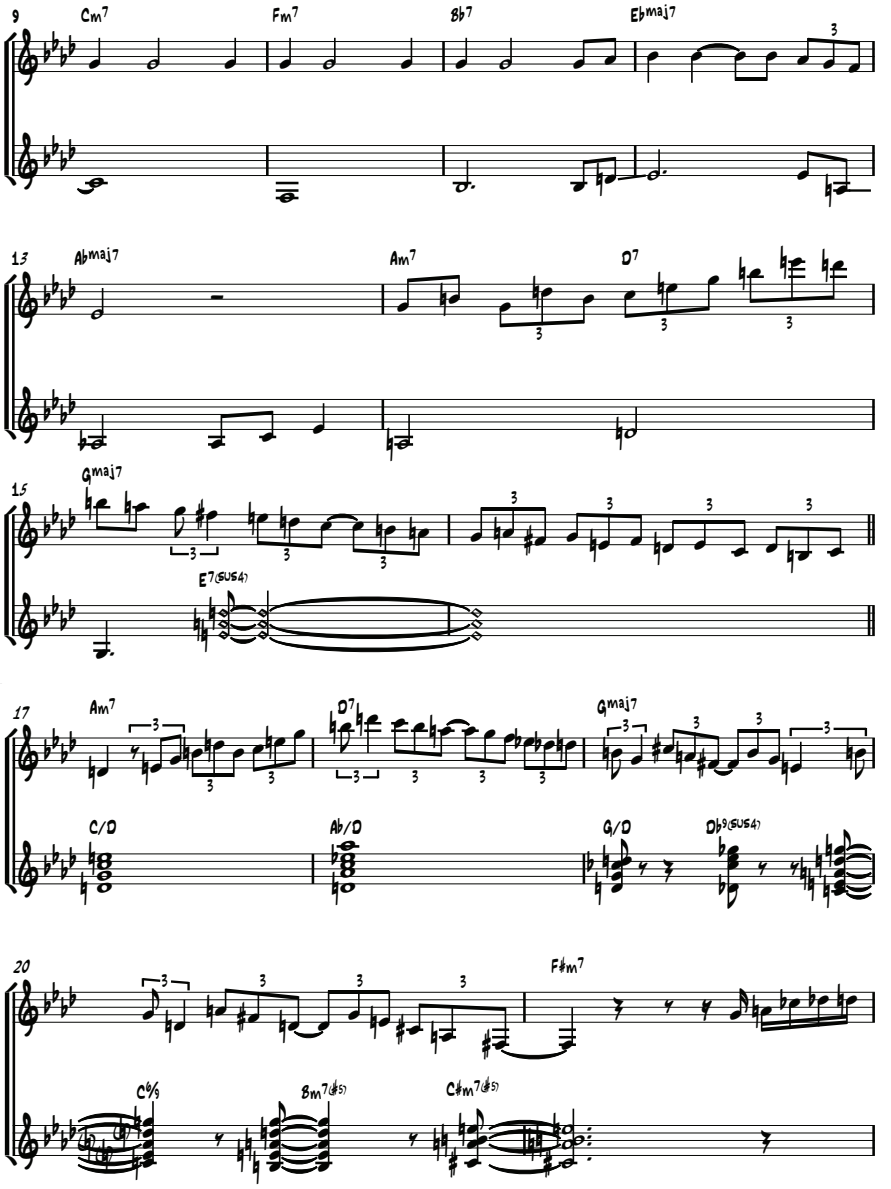
A♭ area (I–5)	Top tones in motives make a descending line, C, B, A, G. Bar 4 is played as a ¾ bar accidently.	0
C area (6–8)	G phrygian tetrachord is used over Dm^7 and G^7 in bar 6, Glissando from F♯ to A, Eastern inspiration over C^{maj} in bar 7.	6
E♭ area (9–13)	Glissando from A to C on Am^7.	3
G area (14–20)	Fm over Dm^7, later a descending chromatic pattern from G♯ to F on G^7 in bar 14. In bar 16 to 22, six against four pattern. Bar 18 a tritone substitute is used D♭ over G7.	8
E area (21–23)	Indian slide is used again in bar 21 from A to D on Dm^7, and in bar 22 from C to F on G^7.	0
Transition (24)	C^{maj9} on $A♭^{♯7♯5}$.	1
A♭ area (25–29)	D dorian be-bop scale (both ♭3 and major third are used in the scale) in bars 25 and 27.	2
B area (30)	Dm^9 arpeggio on Dm^7.	0
A♭ area (31)	Em on Em^7.	0
B° area (32)	Chromatic descending line from ♭9 on E♭°.	1
A♭ area (33–35)	Dm^{11} arpeggio on Dm^7 in bar 33, chromatic line between B♭ and C on G^7. Chromatic descending line from G to E, then b7 on Cmaj.	5
Transition (36)	Stressing the major seventh on B^{7alt}, making a strong dissonance, ending with a chromatic descending line from G to E♭ on E^{7alt}, a new strong dissonance.	3
	Sum of tension notes	29

Tension notes distribution	72% of his tension notes are used on dominant areas; this is the highest of all the guitarists. He uses two typical cadence phrasings starting the phrase in the bar before the dominant chord. This happens in phrase 2, measure 5 and phrase 5, measure 17. Twice he starts his phrases on the dominant chord, phrase 6, measure 22 and phrase 9, measure 32.	
Peak of solo	Bars 32-36 bluesy line, many outside tones, high pitch, and interesting contour of the line. Stressing the major seventh on the B^7 altered, is very "out" harmonically, but sounds very good by having it as a defined target note.	
Interplay	Tight in C area, bar 6; E♭ area, bars 11 and 18; transition area, bar 24. Nice relaxing atmosphere, very tight in the interplay, especially in the bridge sections 17 to 24. Right before the end bar my hand stopped in the middle of a chunked action; I was hearing something in his phrasing that suggested a hipper sound than the one I was originally aiming for.	
Characteristics	His Eastern-inspired glissandi in bars 7, 9, 21, 22, 32 and 35. Polyrhythmic 6 against 4 in the bridge. Many eight note triplets: 11, 13 to 15, 24 to 28, 35 and 36.	

Table 8.8 Rez Abbasi. Form; based on modal matrix in C major.

8.2.5 Adam Rogers

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Bb7
Ebmaj7
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Abmaj7
Am7
D7
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Gmaj7
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D7
Gmaj7
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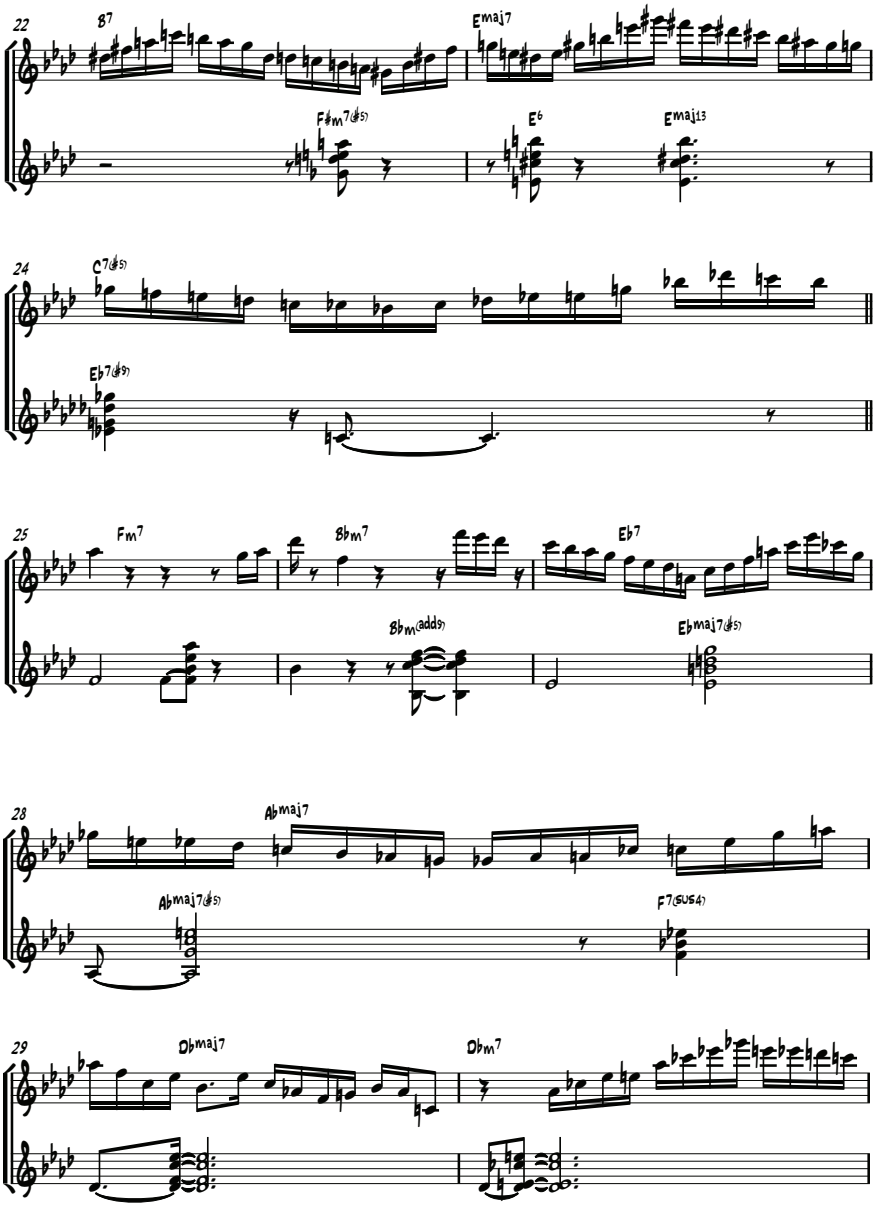
C#m7(♭5)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E6
Emaj13
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Fm7
B♭m7
E♭7
B♭m(add9)
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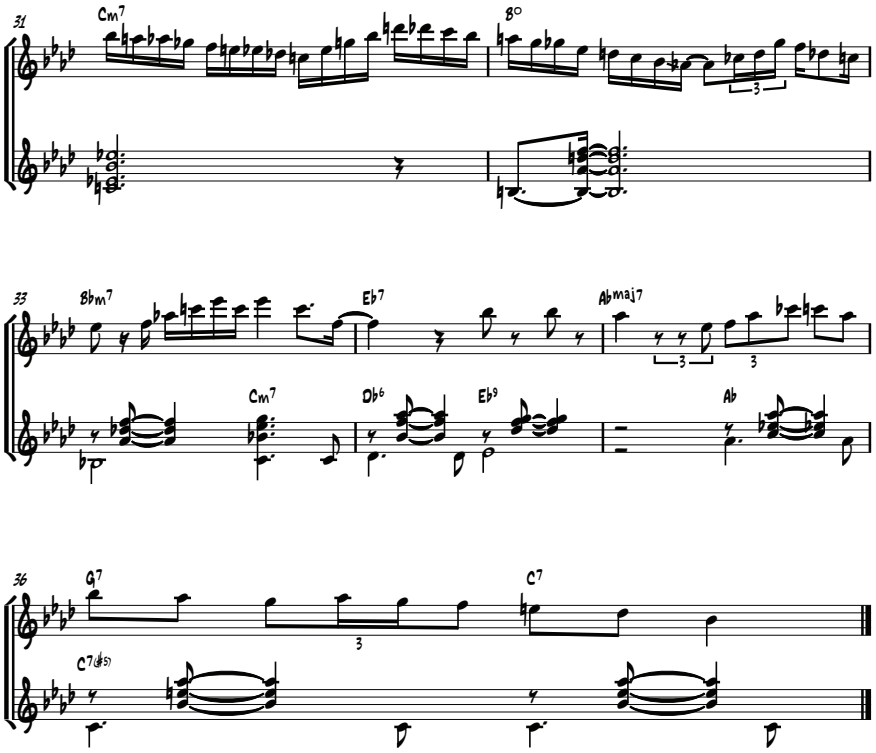
D♭maj7
D♭m7



Time: pacing the solo

Phrase length: Rogers's solo contains eight phrases and has a phrase length ranging from five bars in the first phrase to almost three bars in phrase 7. His phrasing length appears in two groups: one medium phrase (phrase 7) and the remaining phrases are long phrases. Six of the long phrases are between three and five bars. His average phrasing length is long phrasing, just over four bars.

Phrase combinations: His phrase length changes with one bar length between the first five phrases and then around two bars between phrases 5, 6 and 7. Chunked patterns of long (l) and medium (m) phrasing length will be from beginning; six long phrases (3–29) and one medium and long phrase (30–36).

Section phrasing: A quarter note-based walking bass line introduces the first phrase and the first phrase starts in the middle of the third bar where he continues with a single string solo with a pick. It is the same kind of introduction as Wilkins uses in his solo. Identification of chunks is subjective, and it is possible to hear the first A1 section as two four bar phrases, with the introduction as a part of the first phrase. The phrase length is based on several listenings of the solo, and in this respect, the change of sound going from fingers to a pick was experienced as the most natural start of the phrase. His phrasing is very section-based, outlining the important cadences. Long sustained notes are used in bars 7 and 8, triplets spinning into a heavy downbeat on the first beat of bar 17, 16th notes spinning into a heavy downbeat on the first beat in bar 25. He uses crossover phrasing from the A to B section and back to the A section again. He employs only one phrase in the first A part, then two phrases in the second A part and B part, and 3 phrases on the final A' part.

Rhythm: Four of the first phrases start on downbeat, then one offbeat phrase, and then three downbeat phrases again. This gives a 7⁄1 in favor of downbeat phrasing. This is a more classical kind of phrase placing, possibly inspired by Rogers's background and experience as a classical guitarist. It is also perhaps created by the open form in the interplay between us, using many artificial sounds and rests. The pick-up note heard in the upbeat to the second phrase in bar 9 is the sound of my guitar (although it blends very well with Rogers's sound in this case), and he uses this pickup note as a beginning to his next phrase. Phrases are concluded with two downbeats, five offbeats, and then one downbeat. This gives a 5⁄3 in favor of offbeat endings.

Harmony: Phrases begin with four chord tones, two scale tones and two tension notes. The fourth and fifth are used twice; the ♭3, ♭7, ♭9 and ♯9 are used once each. The ♯9 in phrase one is used as a lower chromatic approach note to the 9th, the ♭9 start note in phrase 5. Bar 21 is resolved to the ♭3 of the minor chord, up a whole step. He ends his phrases twice on the ♭7, major seventh, and once on 3, 4, 5 and ♭9. This gives a total of six chord tones, one scale tone and one tension tone in the phrase endings. The ♭9 of the B^{o7} chord is not resolved chromatically but is resolved by going up a minor third to the eleventh of the B♭m^{7} chord.

Rests: He uses two rests over a quarter beat between phrases; these rests appear before phrase 3 in bar 14 where he uses a two beat rest. The second

rest appears before phrase 5 in bar 21 where he uses a 1.75 beat rest. He also spaces his phrasings with rests. This is particularly evident in phrase 6 where he uses two rests almost immediately in a row in bars 25 and 26; these rests equal 4.25 beats.

Interval joins: The seven interval joins he uses in his solo are ♭3, 3, 2, ♭9, b2, ♭6 and ♭3. The most frequently used interval (twice) for joining phrases is ♭3. All the other intervals appear once and all interval joins appear with an ascending interval. Rogers is the one guitarists who uses only ascending intervals in his joins. Even though his interval joins compromise many different intervals, he prefers the small ones, using only two intervals over a third to join his phrases in total.

Phrasing characteristics: Rogers's phrasing style is characterized by long notes in the beginning and then gradually increasing the rhythmic intensity by employing different rhythmic parameters in his phrasing. He is very much downbeat-based in his start of phrasing, and his beat placement is a little back on the beat, giving it a relaxed feeling. His extended flowing 16th note runs are a characteristic of his phrasing style.

Structure: material used

Cmaj	C Ion., 15–16 Cr.(B♭-C) E^{o7}, 28	C, Bm, Am, 19 A blues, 35		C, G, D^7, 20	C^{maj9}, 23
Dm^7	Dm^7, 2 Am^7, 33	C, 14	Am^7, F^{maj}, 17	E♭ whole-tone tc., 21	F^{maj9}, 30
$E♭^{o7}$	E♭m, 32				
Em^7	Cr.(C-D), (B♭-G), (Em^7), (F♯-E), 31				
$E^{7(♯5)}$	Cr.(C-D), (G♯-F♯), (C^{o7}), 24		A h.m., 36		
F^{maj}	$Dm^{7(♯4)}$, 5	Am^7, Am, 29			
G^7	F^{maj9}, 14	F^{maj9}, 18	B°, F dorian tc., Em^7, 22		$F^{maj9♯5}$, B^+, 27
Am^7	A^7, 1	C^7	Dm^7		
$B^{7(alt)}$	A harmonic minor, 36				

Table 8.9 Adam Rogers. Harmonic chunks in the modal matrix.

Rogers employs six chromatic four-note figures during the chorus. He uses scale chunks like the A blues over C major producing a C major ♯9 structure and an A harmonic minor over $E^{7♯5}$ and $B^{7(alt)}$ which produces a $E^{7♯5♭9}$

structure and a $B^{7\sharp9}$ structure. D7 over C major is used to produce a $C^{maj\sharp4}$ quality and E^{o7} to produce a $C^{7\flat5\flat9}$ quality, the last one being a very strong tension. Strong tension is also produced via the $Dm^{7(\sharp4)}$ on F^{maj} resulting in a $F^{maj\sharp9}$ structure, A7 on Am7 resulting in an $A^{7\sharp9}$ chord, and C7 on Am7 resulting in a $Am^{7\flat9}$ (phrygian structure). Rogers also produces tension by using a E♭ whole tone tetrachord over Dm7, and an F dorian tetrachord over G7, in both case a ♭9 structure.

Tension notes: His tension usage is unusual on the major seventh chords resulting in six ♯9 tensions, two b9 tensions and three b7 tensions. Rogers uses these tensions almost entirely in fast 16th note passages. The more common b5 is used only twice and a sharp five once. On dominant chords, all the alterations appear evenly with three tensions implying ♯9, ♭9, ♭5, and major 7, and two with a ♯5 alteration. On minor chords, he uses the unusual major third three times and the ♭7 twice; ♭5, ♯5 and major seventh appear once.

Rogers uses a lot of diatonic harmonic templates in his solos by deploying triads from the dominant key of C, and G major diatonic chords over C major. These lydian structures are found in bar 19, Bm and Am, and in bar 20, C, G and D7. A more dissonant template is the combination of $F^{maj9\sharp5}$ and B^{+} over G7 in bar 27 resulting in a $G^{13\flat5\sharp5}$ chord. On inside templates, he uses Am7 and F^{maj} over Dm7 in bar 17 producing a Dm^{11} chord.

Rhythm: Typical for Rogers is the use of a lot of space and long note values in the beginning of the solo. The first 13 bars are based on long note values from 8 beats, to half notes and quarter notes; this gives the solo an open approach. In bar 14, triplets appear as a basic unit until the middle part of the B section, where 16th note runs start in the end of bar 21 and are prevalent until measure 34. The last three bars are a be-bop dominated phrasing consisting of eight notes interspersed with triplets.

Ideas are supposed to be novel after important cadences; this is especially evident in the different sections (AABA') of this solo. Like Abbasi, Rogers uses much rhythm to generate new levels of ideas, taking a motive and using it with another rhythmical subdivision. He uses triplet-based rhythms in eight bars altogether, sixteenth notes groupings add up to eight bars, and pauses equal three bars altogether.

As with Abbasi, he relies on large sections of one rhythmical subdivision to join different phrases, in such a way that the traditional sections can be

experienced as less important than the new rhythmic level. Rogers is for the most part playing behind the beat, which gives a relaxed feeling even though he is playing fast-flowing 16th note lines.

Melody: His phrasing is both melodic and harmonic orientated. The first phrase is harmonic orientated using strange interval combinations, while the second phrase is very melodic, repeating a single pitch for several bars and ending with a range of a perfect fifth. The third, fourth and fifth phrases are harmonically orientated emphasizing harmonic template structures in triplets. From bar 20 he uses long wave contours of 16th notes, giving a feeling of tension and forward motion. Melodically these structures are scale structures interspersed with chromatics.

The solo's range travels from F2 to G♯5 with one occurrence each. These notes are found in the beginning of the solo measure one and in measure 23; his range is 3 octaves and a minor third and he has the largest range of all the guitarists in his solo. His average and median pitch is D♭4 (the same as Abbasi). He uses G3 25 times, E♭4 17 times, and B3 16 times. This outlines an E♭, G or B augmented structure.

Structure characteristics: Rogers's phrasing is based on a rhythmical hierarchy, using long note values then going to triplets, before using long 16th note lines and ending it with eight note-based improvisation. Rogers also uses rests in a very effectual way, building tension before introducing a new element in his solo.

He uses many chord extensions and alterations in his solo. More than any other guitarists, he relies on the scale as a device for soloing, sequencing the scale in diatonic third structures. This is also evident in his frequent use of diatonic template structures, combining thirds and four note structures in the scale. His rhythmic concept is characterized by adding tension to the solo by introducing new rhythmic subdivisions. He couples these subdivisions with more chromatics in his lines; this is particularly evident in his 16th note lines.

Form: solo structure, content and execution

A♭ area (I–5)	In the first three bars tension notes make a dominant sharp ninth chord 6 against 4 rhythms in bars 4 and 5. Using sharp nine on F major in bar 5.	3
C area (6–8)	Few notes, large intervals–b5 and 8.	1
E♭ area (9–13)	Few notes, narrow range (5th), rhythm and tone repetition.	0
G area (14–20)	In bar 14, ascending fast in range using a combination of C and F^{maj9} arpeggios over Dm^7 and G^7, then descending in steps in bar 15, before sequencing in thirds further down in register in bar 16. Repeating the pattern using Am^7 and F^{maj9} over Dm^7 and G^7. In bars 19 and 20, diatonic descending sequencing of triads in G major over C^{maj}.	5
E area (21–23)	E♭ lydian tetrachord is used over Dm^7 in bar 21. B^{o7}, F dorian tetrachord and Em^7 are used over G^7 in bar 22 to create in-out-in phrasing. On C^{maj} the E♭ half-whole tetrachord is used to create tension.	9
Transition (24)	The tension from the previous chunk is extended by using chromatic descending lines from D and G♯, and then finishing in a C^{o7} arpeggio over $G^{\sharp 7\sharp 5}$.	2
A♭ area (25–29)	Combining $F^{maj9\sharp 5}$ and B^{+} over G^7 in bar 27, adding more tension by moving from ♭7 and using the B♭ diminished (whole-half tone scale) scale over C^{maj7} in bar 28.	10
B area (30)	Ending an F^{maj9} arpeggio with an E♭ and D♭ on Dm^7.	2
A♭ area (31)	Chromatic descending lines from D, A and F♯ (D) interspersed with an Em^7 arpeggio over Em^7	4
B^{o} area (32)	Using C whole tone tetrachord and E♭m to create tension.	5
A♭ area (33–35)	A blues.	1
Transition (36)	A harmonic minor ending with a D diminished triad.	0
	Sum of tension notes	42
Tension notes distribution	47% of his tension notes are in the dominant areas. He uses three typical cadence phrasings starting the phrase in the bar before the dominant chord; this happens in phrases 4, 5 and 8. Twice he starts his phrases on the dominant chord, phrase 1 and 3.	
Peak of solo	Bars 30–36 chromatic 16th note line, many outside tones, high pitch, and interesting contour of the line, when seen as a wave form. From bar 33 the density of 16th note chromaticism ends in an inside be-bop type sound.	

Interplay	Tight: A♭ area, bar 2; E♭ area, bar 13; G area, bar 18; 20 E area, bar 22; A♭ area, bar 27; transition area, bar 24. Nice relaxing atmosphere, very tight in the interplay, a lot of space in the beginning. I place some substitute chords in the bridge sections 17 to 24. Rogers' solo consists of sequencing diatonic triads; these are "answered" in the comp. It's also interesting to study how our feet tap the rhythm.	
Characteristics	Virtuous technique, flowing 16th note lines being contrasted with periods with little activity in bars 24 to 26. Rhythmically he uses 6 against 4 in bars 3 to 5, and a lot of eight note triplets in bars 14 to 20. The solo has a clear structure: The first 13 bars have little density and long note values, bars 14 to 20 are the eight note triplet period, then the 16th note period is from bars 21 to 33. The last bars return to less density.	

Table 8.10 Adam Rogers. Form; based on modal matrix in C major.

8.3 Jazz guitarists' comments on analysis

A crucial part of practice-led research is to allow interlocutors to comment on the researcher's analysis. In this research project, I found it particularly useful in relation to the musical analysis and the way I have interpreted the music in the modal matrix.

Lage Lund: "I think the transcription is accurate. . . . If I had played another guitar, I would have probably played further up. . . . It's a lot of work [you have done]. Making all the details as specific and detailed as possible is important for me and I can find it in your study as well."

Jack Wilkins: (Listening to the interplay) "It's good"! He laughs when he reads Ben's solo transcription. "This is fantastic; it is some kind of study you're doing here. This is hilarious, this is fascinating, I'm impressed, I love it! You have all five solos transcribed, and you got them all put together, put them in different keys. You figured out the tension notes, the phrase length, the high point in the solo. . . . It's almost like you're an archeologist, digging up bones and finding where it came from."

Ben Monder: "Yeah, I think you wrote this right, definitely. Maybe I would have used a more open frame, where you didn't have to prove anything, and just see what would happen. It is nice with the focus on a standard in the follow-up session."

Rez Abbasi: "You better graduate soon; you scare me." Then I talked about the modal matrix and the ideas he uses in this solo. We look at the phrase length and especiallly the 3/4 bar: "It sounds natural, this is the magic, it wasn't a mistake." "This is neat," he says when talking about the modal matrix. "You have asked very good questions since you are a guitar player. Focusing fieldwork 2 even more on one tune is a good idea."

Adam Rogers: "Your study seems to be pretty relevant; it is something that you build as you go along. On the top of my head, I don't see specific things that I would have done differently. It seems to me that you asked relevant questions, sort of technically based, in terms of abstract musical ideologies, even extra musical concepts." When talking about my modal matrix in the analysis, he says "that's great, that's really cool."

Many of the findings in the music analysis correspond with issues stressed by the five jazz guitarists in the interviews. For example, Lund stresses triads and a focus on rhythm in improvisation; both aspects are prevalent in his own soloing. Similar issues appear with the other guitarists, demonstrating the link between words and action, theory and practice in their playing. To make this link clearer, I will describe the most distinct features of their explicit and implicit knowledge in the findings.

9 Findings

In this final chapter, I will present the findings related to the research question, discussing what I see as the major contributions of the research. Each chapter contains both analysis and discussion, and this findings chapter will synthesize the various analyses. The research questions were formulated as follows:

What strategies are used in professional jazz guitar improvisation? What is implicit and explicit in these strategies?

Jazz guitar practice relates to both goal-directed and perceptual chunking. Goal-directed chunking implies a focused and structured way to achieve results, targeting one aspect of a larger problem at a time, and breaking down the greater problem into simpler, more manageable units. Such deliberate practise—working within restrictions and focusing on one aspect at a time—is more appropriate for practicing improvisation than for performing it.

Performance resembles perceptual chunking and implies circumventing analytical thinking used in deliberate practise to listening and intuition in context. This implies that after a sufficient time of concentrated practise the individual and targeted topics may appear more naturally and intuitively in improvisation, due to considerable repeated practise. This description recognizes that jazz improvisation is dependent on practise ahead of performance in form of pre-composed material (chunks) conceived, shaped and transformed by the special conditions (schemas) in performance.

Illuminating how professional jazz guitarists create chunks in practise and integrate them into performance as part of an overall improvisation strategy

or plan has been fundamental in this project. Adding unique features to performance often happens as a result of interplay in jazz, and collaboration, emphatic attunement and creativity are key elements in succeeding. The result is then as much a group process as an individual process, and has dynamic properties that are hard to define ahead of time. Practicing jazz is about exploring these dynamics together, recognizing emergence, and acknowledging that the whole is greater than the sum of its parts.

Performances, which include concerts, gigs and recordings, are closely monitored to improve skills, and as such, can be thought of as practise. This is also the case the other way around; by making practise as important as gigs, including recording one's own practise, everything can be thought of as performance. This shows that the distinction between practise and performance can be difficult to define. Yet I have found it useful to make a distinction between a more private practise space versus a public performance space that includes dealing with an audience.

Strategies are often an implicit part of the jazz guitarist's competence, and much of the time they do not think of them as strategies. Traditionally, musical analysis and interviews have been the most common methods for investigating jazz improvisation. Musical analysis has been conducted on material not observed in action, and interviews are performed with an outsider's perspective. In this project, the findings are gathered by using an embodied insider strategy, utilizing my own jazz guitar skills in interplay with professional jazz guitarists to frame questions. I have also utilized my training as a researcher in making a post-event analysis of the videotaped material. By using this approach, framing explicit knowledge in interviews and implicit knowledge in playing, I have become aware of the correlates and differences between implicit and explicit knowledge in jazz guitar improvisation. As far as I know, this is a novel approach to studying jazz improvisation.

Jazz guitar competency is a delicate mixture of both explicit and implicit knowledge and is both time and context dependent. I will first present the findings that focus on unarticulated knowledge, gathered by playing together and then being analyzed via the modal matrix. Identifying musical material in quantitative ways is an important part of practice-led research. Multiple representations are recommended as long as it is useful for the researcher, and the material can be exemplified in a way that makes sense in practice.

To answer questions about the strategies jazz guitarists use, I also needed to know what type of knowledge they possess. Do professional jazz guitarists simply know much more than other guitarists, or is there something qualitatively different about their knowledge compared to the knowledge of a non-professional? This question led me to the field of expertise and principles of expert knowledge. Through an inquiry into theory, coding of interviews and analysis of musical form, I identified three main themes: structure, time and form. Structure deals with WHAT material and processes are used, time deals with WHEN these structures are used, and form is about HOW structure and time are constrained by the standard tune itself.

The psychological framework for expertise has been thoroughly discussed in Chapters 4, 5 and 6, which deal with structure, time and form. Understanding how vital the psychological concepts of chunking and schema organization are in both practise and performance has helped me to develop tools, including "the modal matrix," for understanding musical structures.

9.1 Structure: harmony, rhythm and melody

Guitarists use *basic chunking strategies* when learning new material associated with improvisation. This links patterns of sound (phrases, ideas and licks) to a specific harmonic background. When a guitarist uses the same patterns over the same chords repeatedly, he uses a basic coding strategy. Guitarists use *extended schema strategies* when employing different chunks or patterns on the same harmonic background, depending on the context. When a guitarist uses his domain-specific knowledge on an advanced level, he is employing *altered template strategies*. At this level, interaction and negotiation are very important; the improviser can redefine both the possibilities of the harmonic background and the patterns in use by listening to what is happening in the moment. Chords are not linked to specific patterns but are treated as structures with many potential directions, which are dependent on the interplay. If needed, pre-learned patterns (chunks) for improvisation are transformed during its execution. Altered tones might replace the basic structure to the degree where it is hard to know the basic form. Flexible interpretation is then coupled with many potential actions.

The modal jazz matrix allowed me to identify tension notes used by the five guitarists. I will now present the essence of the guitarists' strategies and

also discuss their practical implications, which is a vital part of practice-led research.

9.1.1 Harmonic tension schema

Cmaj^{7} Ionian	B♭ tone	A♭^{7sus}	E♭m	B♭m^{7} No.5	G♭ no5	E♭m^{7sus}		**G♭ pent.**
Dm^{7} Dorian	A♭2 No.5	A♭^{7sus}		G♭2		E♭m^{7}	D♭2	**G♭ pent.**
E♭^{o7} Diminished	E^{o7}							**E^{o7}**
Em^{7} Phrygrian	G♭^{add9}							**G♭^{add9}**
E$^{7(\sharp5)}$ Augmented	D♭2	E♭m No.5						**E♭m^{7} No. 5**
F^{maj} Lydian	E♭^{sus}							**E♭^{sus}**
G^{7} Mixolydian	G♭^{add9} No.5	A♭^{9sus}	E♭m^{sus}	G♭^{add9}	E♭m^{7sus}	B♭m^{sus}		**G♭ pent.**
Am^{7} Aeolian	E♭m E♭^{sus}	G♭5						**G♭ pent.**
B^{ø} Locrian	B♭ tone							**B♭ tone**

Table 9.1 Tension Structures. In the left column is the modality given (outlined in bold) and to the far right are the resultant bold chord structures of all five guitarists' tension notes defined.

In six of the modal categories in Table 9.1 the harmonic content ends up in notes contained in a G♭ pentatonic scale, including G♭^{add9}, E♭m^{7} and E♭^{sus}. Using a very general (schema) approach, this implies thinking of a major pentatonic scale (G♭) a tritone away from the tonal center (C) and applying chords derived from this scale. The diminished seventh chord is replaced by a diminished chord a half step up to create maximum tension.

When it comes to single tones that are most often used for tension building, it is the B♭, which is used on both C major and on B^{ø} (half diminished). My findings show that mixing minor and major quality and dominant seventh and major seventh quality, regardless of chord type, was the most common tension among the guitarists. This is not uncommon in be-bop, but the guitarists in this study also stressed these tones without using them as the typical passing notes often found in be-bop phrasing.

Chromatics are used quite differently among the guitarists. Wilkins is the most traditional of the five guitarists, and surprisingly he was the guitarist that used chromatics most. However, it is important to see how the chromatics are used. Wilkins uses chromatics around the tonic of the chord and immediately resolves it back to a consonance. This is also the case with Abbasi. With Monder the chromatics are heard as more dissonant because of the way they are placed in the overall harmonic context.

Several of the guitarists were critical to thinking in scales when improvising. This is also shown in playing. The only guitarist that uses a seven-note scale in full length is Monder (see Table 9.2). Together with Rogers, he is also the one who uses harmonic templates most frequently, and they both use templates with about the same amount of inside and outside structures in their playing. It is Wilkins and Abbasi who most uses outside structures, both guitarists in the form of long associative lines where the outside structures are not heard as particular outside the main tonality. Lund, whom I consider a modern player, is the most inside player of all the guitarists, but it matches his opinions in the interview, stressing the importance of knowing the essential chord tones.

Lund is also the guitarist who by fare uses the most rests in his playing and combining this with frequent use of 16^{th} notes runs. While Lund uses 16^{th} note runs for shorter periods, Rogers resorts to another strategy, namely building his solo in different rhythmic structures, first slow rhythm (whole note values) before increasing the build up of the solo by using increasingly more dense rhythmic patterns in periods, including a total of eight bars of both triplets and 16^{th} note runs. Abbasi and Monder also rely on rhythmic patterns over time to create intensity and overall structure in their solo—Monder with 28 bars of quarter note triplets and Abbasi with 13 bars of the same rhythmic subdivision.

Rogers has the greatest range while Abbasi has the narrowest tonal range, but the differences between all the guitarists' ranges are not large. When linking their most preferred pitches, they can be chunked into small chord structures, and with all of the guitarists, these chord structures were very similar, except with Rogers, who outlined an $E♭^{+}$ chord structure using, as the only guitarist, the B3 tone sixteen times. As earlier mentioned, mixing major/minor quality and major and dominant seventh quality produce most tensions.

STRUCTURE		Lage Lund	Jack Wilkins	Ben Monder	Rez Abbasi	Adam Rogers
Harmony	Chromatics	2	10	9	8	3
	Special	9th	Cr. around 1	7 note scale	Glissandi	Diatonic
	Templates	4	1	6	1	6
	In /outside	14/8	8/17	15/17	5/12	15/15
Rhythm	Sixteenth	8 bars	0,5 bars	3 bars	1,5 beat	8 bars
	Triplets	2,5 bars	2,5 bars	28 bars	13 bars	8 bars
	Rests	6 bars	3 bars	2 bars	2,5 bars	3 bars
Melody	Range	F2-G5	F2-F♯5	G♭2-G♯5	C♭2-F5	F2-G♯5
	Pitch	A-F4 M-F4	A-C4 M-D♭4	A-C4 M-D♭4	A-D♭4 M-D♭4	A-D♭4 M-D♭4
	Frequency (Tones)	G4-27 E♭4-23 C5-20	E♭4-15 G3-14 D4-14	A♭3-27 A♭4-25 G4-24	E♭4-19 C4-17 A♭4-17	G3-25 E♭4-17 B3-16
	Macro Chunk	Cm (high)	$E♭^{maj}$ (medium)	$A♭^{maj}$ (no. 3,5) (medium)	A♭ (high)	$E♭^{+}$ (low)
Tension	Major	♯5 (5x)	♯9 (4x)	♭5, ♯5 (3x)	♭9 (4x)	♯9 (6x)
	Dominant	♭9 (5x)	♯5 (6X)	♯9 (5x)	♯9 (5x)	♭9, ♯9, ♯5, 7(3x)
	Minor	♭5 (3x)	3, 7 (2x)	3, 7, ♭9 (2x)	♭9, 7, 3 (2x)	3 (3x)
Characteristics		Surprising	Flowing	Polyrhythmic	Intuitive	Compositional

Table 9.2 Harmonic, rhythmic and melodic structures. Harmony: Chromatics, number of chromatics used; Special, most prominent feature; Templates, number of templates; In/outside, number on left is inside structures, on right/outside structures. Rhythm: total amount of sixteenth, triplet and rests used. Melody: A is average pitch, M is median pitch, macro chunk summarizes frequency tones into a chord structure (high, medium, low register of the guitar). Tension: type of tension used on major, dominant and minor chords (x) number of occurrences. Characteristics: stylistic description.

9.2 Time

Time is critical for the improvisational process, dealing with short, medium and long-term anticipation and monitoring. On micro-, meso- and macro-time levels guitarists employ different strategies. In general, fast tempos

make the improviser employ more chunk-based behavior, pre-learned movements employed in the same way, due to more severe time constraints. Medium and slow tempos on the other hand allow for flexible execution based on more schema-based adaptable movement patterns.

Micro time level strategies: The guitarists are sensitive to the beat, sometimes playing ahead of the beat, sometimes on the beat and sometimes behind the beat. In general, they use a flexible approach to beat placement, depending on what emotional experience they want to evoke in the listener.

Meso level strategies: Targeting is a very important aspect at this level, hearing the phrase as a unit and having the ability to place it in time. The guitarists manipulate the phrase by starting and ending it on both upbeat and downbeat and by keeping the general contour of the phrase while using it on new places in the form.

Macro level strategies: At this level the pacing and the architecture of the solo is essential, for instance pacing the solo by leaving room for interaction (rests) and connecting the phrases with intervals that make the rest natural. This level is probably the hardest one to master. All the guitarists balanced their play-rest activity in a coherent way, similarly to a good narrative or story.

The guitarists also seem to combine micro-, meso- and macro-time in a flexible way, suggesting that music is stored in memory, recalled and considered during the course of improvisation. The guitarists are less reliant on continuous feedback and can anticipate future actions (target the phrase) by imagining where the phrase is going to end. This implies a very special way of hearing, being in the moment with the fingers and in the future with the mind. The guitarists seemed to be more orientated toward external feedback coming from me as a co-player, since monitoring of their own actions is more or less automatic at this advanced level. Listening to the interplay and what happens was crucial in this process, including the ability to instigate and transform heard patterns into the overall context in real time.

Chunking has been an important aspect of this study, and Table 9.3 shows the guitarists' phrasing length. As already noted, these tables were presented along with musical notation in the second fieldwork where the guitarists commented and approved the findings.

9.2.1 Time: Phrases, rhythm, harmony, intervals and rests

		Lage Lund	Jack Wilkins	Ben Monder	Rez Abbasi	Adam Rogers
TIME	**Overview**					
Phrases	Number	13	7	13	9	8
	Length	1–4	2–7	2–5	3–5	3–5.5
	Average	2.20	4.5	2.56	3.86	4
	Parts					
Rhythm	Start	11/2	4/3	9/4	3/6	1/7
	End	9/4	7/0	9/0	5/4	5/3
Harmony	Start	10/2/1	2/4/1	8/3/2	7/2	4/1/2
	End	8/4/1	3/2/2	9/2/2	5/3/1	6/1/1
	Joins					
Intervals	Most used	1–3 (3x)	♭2 (2x) 5, 5	♭2 (4x) 2, ♭3 (2x)	2, 2 (2x)	♭3(2x) ♭2, 2, 3 (1x)
Rests	In-out phrase,	8 (in) 16 (out)	1.75 (in) 3.05 (out)	2.5 (out)	1.05, 1.50 (out)	2, (in), 4.25 out
Characteristics		OF-CT-R	OF-ST	OF-CT	DB-CT	DB-CT-R

Table 9.3 Time structures. Left column contains **phrases** showing number, length and average length in measures. Rhythm showing offbeat/downbeat start and ends. Harmony showing chord tone/scale tone/tension note in start and end of phrases. Interval showing size of interval (i.e. 1 is prime and 3 is a third) and (X = number of occurrences). Underscore (_) indicates that the interval is going down. Rests (in) is number of beats inside the phrase, (out) is between phrases. Characteristics is my way of labeling their playing style. OF = off beats, DB = down beats, CT = chord tones, ST = scale tones, NST = non-scale tones, R = rests.

I found a wide variety of phrase lengths when analyzing the guitarists. Wilkins has the longest phrase length counting up to seven bars for the longest phrase, but also very short phrases counting two bars. The difference in phrasing length is also clearly demonstrated by Lund, who varies between one and four bars in his phrasing. Interestingly, these guitarists were also the ones who suggested most strongly to vary dynamics and phrase length in the interviews. Wilkins's phrases are on the average twice as long as Lund's phrasing (see Table 9.3), but even Wilkins's phrasing

is no longer than other instrumentalists.[9] That Wilkins plays phrases containing more bars is also a result of slightly higher tempo in performance than the other guitarist. The very common criticism against guitarists, implying that they never stop playing, does not seem to fit the players in my study.

Rhythmically, Lund, Wilkins and Monder are very upbeat orientated in the beginning of their phrasing while Abbasi and Rogers are downbeat orientated. Rogers starts seven out of eight phrases with a downbeat. In the phrase endings, Wilkins and Monder end all their phrases with upbeats, while Lund in the end has over twice as many upbeats as downbeats. Abbasi and Rogers have only slightly more upbeat ends. These findings might suggest that the typical upbeat orientation found in standard jazz is not necessarily so prevalent with a more modern playing style.

Harmonically, Lund is very chord tone orientated using only one tension note in start and end of his phrases. Jack Wilkins uses chord extensions (scale tones) twice as often as chord tones in the start of his phrases. With the other guitarists chord tones are most used in phrase beginnings. In the end of his phrases Wilkins uses exclusively extensions and altered tones while Monder and Rogers end their phrases the most chord tone based when compared to the other guitarists. What surprises me in these findings is that Wilkins uses the most extensions and alterations even though he is also the most traditional player. Extensions and alterations in phrase starts and ends are in this way not a feature that can be linked to a modern playing style in my study (rather the opposite).

The most commonly used intervals for joining phrases are second and third intervals. Only two players use other intervals for linking their phrases. Lund employs prime interval three times, which create continuity in his phrasing. By linking the last tone of a phrase and the first tone of a phrase in this way, he creates continuity in his phrases, even though they are separated by pauses. Wilkins uses the fifth interval twice for linking ideas, and this creates a similar feeling of continuity, although with a bit more tension. A tonality shift might be dramatic, and the guitarists' use of small joins is a way to smooth out this tension and stress continuity.

9 See Chapter 5 in reference to Lehman and Goldhahn's study, which concluded that the average phrasing of many jazz musicians is between 2.5 and 3.5 seconds. This average phrasing matches the 3-second window described in meso chunking.

Spaces are important for developing the solo. Lund uses much more space than the other guitarists, in total eight beats inside phrases and 16 beats between phrases. Abbasi uses little space both inside and outside phrases, while Rogers uses a lot of space between phrases but not so much inside his phrases. Only one guitarist has no spaces (defined as at least a quarter rest) in his solo, and that is Monder. Interestingly, in the interviews he said that the first thing he has to remind himself about is to use space in his solo.

9.3 Form

A throughout knowledge of form was stressed by all guitarists as essential for improvising fluently over a standard tune. Form strategies involve creating and retrieving images of musical form as well as sonic images on the fretboard. Three stages of retrieving form and associated patterns were identified.

Associative form strategies: This is a fragile way of retrieving patterns and form, since ideas are connected by association, meaning that a response is triggered only when stimuli are given. Improvisation in this form might be very intuitive but not necessarily great since the ideas often are just a "stream of consciousness" with no overall plan. In relation to practise, ideas are generated the same way, from the beginning of the piece, since no other retrieval structure exists.

Hierarchical form strategies: The guitarists have created hierarchies of form in practise that enable more flexibility in performance. Road maps and other retrieval structures are examples of this strategy. The guitarists use a lot of energy in developing flexible retrieval structures that could guide memory during performance. Although important for memory, improvising in this style might sound rigid if playing is restrained to the imagination of hierarchical performance cues during playing.

Heterarchical form strategies: These combine bottom-up strategies, coming from the fingers, with top-down processes coming from the mind. Single ideas are generated in multiple ways and with a high degree of flexibility in relation to what one hears in the moment. This implies combining the intuitive with a planned strategy, knowing the general direction but not exactly how it is going to turn out, due to ongoing monitoring of interplay. Being able to use hierarchical strategies successfully implies a large and

nuanced long-term memory that is frequently accessed by long-term working memory processes. Musically this involves controlling the musical direction (instigating music) and being open for new directions (reacting to music) depending on interplay. My findings suggest that this is the approach most favored by the guitarists.

An essential feature of form is about knowing how the phrases are connected to the structure of the tune. This implies knowing where in the tune the phrase starts. In Figure 9.1, we can see that four of the guitarists start their phrasing in bar 1, the next strong phrasing area (including three guitarists) starts in bar 9, which is the start of the second A part. Then, the next area is bar 16, which is the final bar of the second A part. The guitarists use this final bar as a pick-up bar for the B section coming in the next bar. Four of the guitarists begin their phrasing in bar 25 and, together with bar 1, this is the most commonly used starting point for phrasing. This makes sense since this is the beginning of the final A section. The final concentrated phrasing area (three or more guitarists have to start their phrasing in such an area) is in bar 29. This bar and the next bar are the most harmonic complex area in the tune, joining two distant tonalities, D♭ major and B major. The guitarists seem to use a strategy explicitly outlining the changes, reflecting Monder's perspective conveyed in the interview. Bar 29 is also the start of the second part of the A' section, which makes it different from the

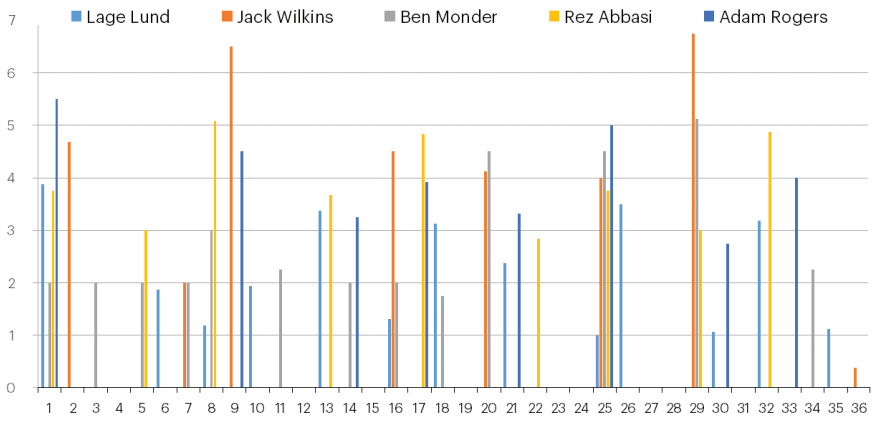


Figure 9.1 Individual chunk length in measures, all guitarists. Vertical axis shows number of bars in each chunk; horizontal axis shows where the phrases are located in the song form (36 bars).

first A part. Summing up; phrasing is instigated very much in accordance with schemas of where we expect them to be in the form.

Are there any connections between tension notes and dominant areas where it is expected that the distribution of tension notes will be high? Figure 9.2 shows that all the dominant areas in the tune have a concentrated use of tension notes, except the first dominant area appearing in bar 3, which is probably too early in the solo to expect a concentrated use of tension notes.

The next question relates to where the amount of tension notes in a single bar is highest. I found two high peaks (four tension notes or more) with all guitarists except Rogers who had four peaks (see figure 9.2). Interestingly, however, all the peaks are distributed in different bars. None of the guitarists had a tension peak in the same bar. Lund and Monder have both of their tension peaks outside dominant areas. Abbasi has both of his peaks inside the dominant areas, whereas Wilkins has one inside and one outside. And finally, Rogers has two outside and two inside. This shows that while phrasing and distributing tension notes is schematic, peak contours are not.

9.3.1 Tension note distribution

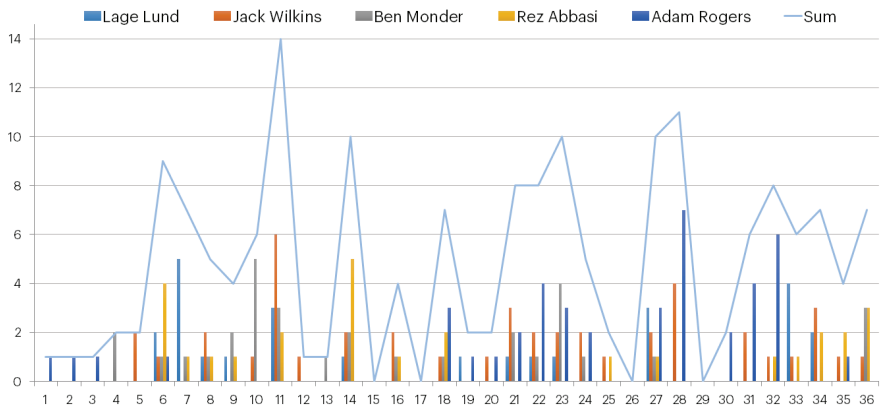


Figure 9.2 Tension chart. Vertical axis shows number of tension notes, and horizontal axis shows in which measures they are played.

The concepts of structure, time and form derive from theory and findings mainly developed from fieldwork 1 and focus on findings developed from musical interplay, possibly containing much implicit knowledge. I

will now discuss my findings in light of the more explicit process-based categories enquired in fieldwork 2, outlined from verbal dialogues. The seven categories describe typical stages contained in expertise practise and performance and pinpoint the order in which they can appear. The practise discussion relates to four phases: overview, parts, joins and maintenance. The performance discussion divides into three parts; intention, action and goal.

9.4 Practising strategies

Crucial for my inquiry into practise was to find out how the guitarists approach a standard tune in jazz. Asking what steps are involved and in what order they appear, as well as the demands on each step.

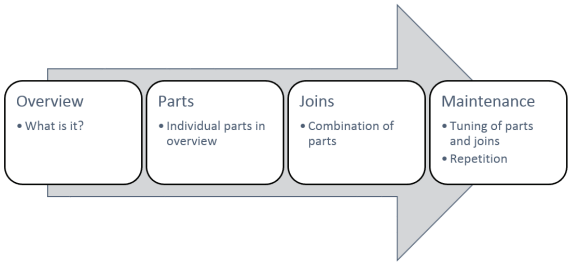


Figure 9.3 Jazz guitar expertise in practise. Overview provides an orientation of the whole. Parts describe the workings of single parts in the whole. Joins describe how parts are connected. Maintenance is the tuning of parts and joins and involves a large amount of repetition in practise.

9.4.1 Overview

Jazz guitarists have a large internalized knowledge base built on a thorough understanding of basic principles involved in rhythm, melody and harmony. When learning new music they prefer to listen to what they consider to be great records conveying the original chord progression and lyrics in the song. Going to the best possible source for inspiration seems to inspire dynamics and energy in own playing and more nuanced phrasing without too much intellectual interference. Knowing the entire tune (macro form)

enables one to build a solo, pace it in a manner that great artists do. They prefer to transcribe the music instead of getting a printed version, as this process entails valuable ear training.

The guitarists also suggested a thorough understanding of basic principles involved in improvisation, and then generating own ideas inspired by those learned. Practise with play-along recordings were not popular in this process, except for playing over a certain difficult progression repeatedly. The most serious complaint about play-alongs is that they deceive the feeling of interplay and the importance of dynamics in improvisation, because every nuance is already set in the play-along ahead of interplay.

Metronome was much more favored since the metronome basically only gives a minimum of support and can be used in different and challenging ways—for example, set it in 3/4 while one has to provide the one in 4/4 tempo, or playing ahead, on, or behind the beat in a very slow tempo as demonstrated by Lund.

9.4.2 Parts

Identifying parts in the music can mean many different things, depending on the focus. When focusing on the meso or phrase level of improvisation, I found that the guitarists had different labels for identifying the parts. Some of the guitarists focused on the motive, some on the phrase, and others on more formulaic content stressing similarity between phrases and how similar fragments relates to each other. By asking questions that focused on melodic, harmonic or rhythmic phrasing, I got specific answers as opposed to an "idea" which could be any length, from a few notes to an entire solo.

Music is usually learned and remembered by melody, and then elaborated to include harmony as well. Abbasi suggested keeping the rhythm and changing the pitches, and then the other way around, changing the rhythm and keeping the pitches, as a first step in knowing the parts of a piece. Lund and Monder learn by working on micro details—from a single tone and its harmonic and rhythmic functions to larger chunks—often focusing on either two or four bar periods (meso chunking). These periods are then practised repeatedly until they are internalized.

Several of the guitarists suggested targeting one's own phrasing, which means looking ahead of where to end a phrase. This involves an ability to

imagine the sound before it is realized on the instrument, also referred to by Pressing (1988) as feedforward. In identifying the parts, the guitarists spoke more about procedures based on general formulas or rules than retrieving specific patterns or licks. This is in line with template thinking, suggesting a flexible approach when retrieving material for improvisation.

Knowing the other musicians' instrumental roles and their function is important. Lund states that even though it is technically his solo, the others are just as important for the solo's development. Listening is then important, and several of the guitarists found inspiration in imitating parts of the band's sound, for example the drummer's hi-hat, the bass line, the guitarist's comping accents, etc.

Another approach was to use the contour of a phrase to improvise over a progression and change the phrase length and intensity according to the whim of the moment. Such a contour approach is vividly demonstrated in Monder's way of improvising, outlined in the first 16 bars of his solo (see transcription section).

9.4.3 Joins

To chain or join ideas, the guitarists suggested a narrative structure, focusing on letting the improvisation unfold as a story. Wilkins suggested listening to the lyrics (the story) in order to know where the peak of the music should be. Highlighting the lyrics seems reasonable, since the lyrics often are the main element that can separate one formula-based standard tune from another standard tune. Rogers said that if there is nothing "behind the notes," he very soon gets tired. Connecting the music to lyrics and then creating a personal narrative from these lyrics seems to be an effective strategy for making substance beyond the notes themselves.

Being flexible in relation to song form happens by being flexible in relation to harmonies. Monder suggested that the joins (pauses) between phrases should be possible to place everywhere, and not only on the typical ending of formal sections. This enables the story to be told differently each time, pacing it according to general intensity. The guitarists preferred to outline modulations incorporating common tones between tonalities, the strong joins in the phrase itself instead of using pauses. What is practised often appears in performance, this is particularly true with complicated material.

When analyzing the playing over some tricky passages i.e. the harmonic most distant relationship in All the Things You Are (from D♭^{maj} to D♭m7) I found the guitarists' choices to be more stereotype and predictable than in other places, which might indicate extensive practise on linking those remote tonalities (see musical transcription).

Another explicit strategy is the use of macro rhythms, using the polyrhythm as a device to create structures beyond the sectional AABA' form. In Rogers's, Monder's and Abbasi's playing in particular, I found this as an effective device to create new structures beyond the eight measure sectional form. The joins areas are perhaps the most explicitly defined areas in the song form, and the most critical for coherent playing. Generating phrases in new and surprising places in the form is an undeniable characteristic of expertise in jazz guitar playing.

9.4.4 Maintenance

Maintenance can be seen as performance practise and includes building strength, power, speed and agility. In addition to extensive physical practise, jazz musicians must develop advanced listening skills to be able to identify and transform musical images in fractions of a second. To develop physical flexibility in this process, all guitarists suggested knowing where and how to execute phrases everywhere on the instrument in practise. More specifically, playing one phrase with different fingerings and getting the right sound in different places and registers on the guitar was stressed.

Lund suggested using finger patterns in a lateral or horizontal way (using only one or two strings) to get a more melodic type of playing, feeling the distance in space when reaching for larger intervals. The idea also resembles more traditional approaches to playing stringed instruments, like the oud and the sitar. Making phrase conversations between two ranges on the instrument, questioning on one string and answering on another string was also suggested.

Learning concepts and developing flexible variations of them develop flexible templates. To practise standard tunes in all keys is suggested by many, focusing explicitly on new fingerings and how they should be generated in every new key. The guitarists acknowledged this principle but only one, Jack Wilkins, was familiar with transposing standard tunes to

all keys, due to his long experience in comping singers. He needed only to focus on the very start of the song and then the rest of the movements were implicit, automatically retrieved by the melody. The melody then works as a mnemonic device triggering the bass line, chords, and visual (sonic) shapes on the fretboard in new keys.

9.5 Performing strategies

In jazz performance, fundamental chunks of cognitive processes are control schemas for motor patterns that constantly rely on adapting to a changing environment. These skills rely much on open-loop actions, "reading the game" like, for instance, a soccer player, and being able to adjust according to the need of ongoing actions. Executing a well-practised motor sequence (closed-loop action) as fluently as possible depends on flexibility and on elaborating many possible solutions in practise.

Practise allows for a compositional approach, repeating and refining skills, writing out variations, and spending much time on details. This is not possible in performance; repetition and refinement only happens within the time given to play the form. Intention, action and reflection are contained in small now-points and will never be repeated exactly the same

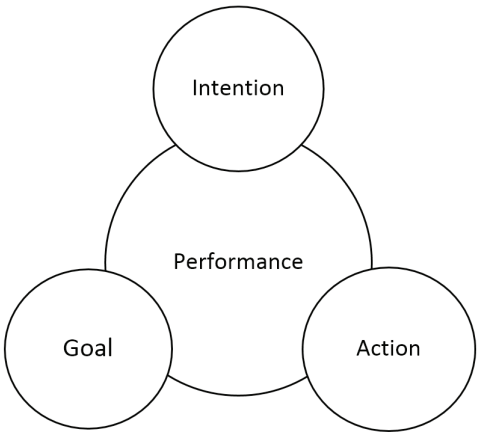


Figure 9.4 Jazz guitar expertise in performance. Performance has potential *for action*: *INTENTION*. Released *in action*: *ACTION*. Linked to reflections *on action*: *GOAL.* Action potential is highly dependent on a primed context that not only provides constraints but also enables cognition. Intentions in action must be coordinated in order to relate to a goal.

way, because being performed "now" is already history. It might be argued that there are not only two major phases (a practise and a performance phase) but many different phases or "rooms" at different times, depending on context and mode. This is certainly true, but for most performers the main phases will still be thought of as practise and performance. Figure 9.4 indicates that intention, goal and action are happening at the same time. The improviser uses her imagination to implement a representation of a single idea in fractions of a second. Feedback and error correction, anticipation, preselection and feedforward as discussed in chapter 4 and 5 are all important features of such skilled performance.

9.5.1 Intention

Intention links practise to an anticipated situational context and creates a heightened accessibility to performance cues appearing in the situation. Shared intentions among musicians enable flexible social interactions and shared perceptions in performance. Intention is *about* something, and in jazz it is very often about improvising over something, in this case a standard tune. As already noted, my findings suggest that improvisers spend much time in practise to develop road maps that entail a rough outline over the changes to be played. These road maps represent a possible direction of the music, and the signposts in the road maps signify an explicit intention about something to be remembered along the way as one actually improvises. Choosing one strategy instead of another strategy can greatly affect a solo, even before a single note is played.

Choosing a harmonic versus a melodic or rhythmic approach was a focus in the sessions. The guitarists preferred to remain open and plan to a minimum ahead of improvising but have a large potential of possible strategies available when the right cue appeared. Sometimes they preferred to chunk using the melody (4 + 4), and sometimes they preferred to use the harmony (5 + 3) as a framework for the solo. In the beginning, the guitarists preferred to play inside the changes and then gradually add tension as the solo developed.

All guitarists were critical to tonality-based improvisation relying on a common scale to guide the solo over several chords; instead, they stressed chord tones as the main framework for improvisation. When analyzing their solos, the inclusion of chord tones is also quite evident with most of

the players. In sum, intentions are flexible and very much context based. To succeed in interplay, each player needs to share an intention but also be able to plan his or her part.

9.5.2 Action

Entrainment, sharing the same physical environment, enables people to synchronize individual movements in novel ways. Simultaneous affordance enables shared perceptions; i.e. it is easier to perform actions one is concurrently observing. While practise is often analytical, based on reflection in a situation with plenty of time for correction, performing in-action is severely constrained by time, with little or no time for error correction. The guitarists in this study are experts within these time constraints, allowing human interaction and unpredictability to be in focus. To enable human interaction the guitarists all stressed the need for not only representing their own parts but also taking the entire situation into account.

Having an intention and a plan for the solo's direction can be productive. The same plan might be counterproductive if the road map does not at all correspond with what is happening in the moment. Lund stressed the importance of listening in action and making a collective statement based on interaction, building on ideas from the other players. Several of the guitarists stressed perceiving solos as a co-effort rather than an individual effort. Lund viewed his solos as coming from the others in the band just as much as coming from himself when playing.

The guitarists experienced planning and production as often occurring concurrently. Sometimes the hand instigates patterns and the mind follows; other times it is the mind leading and the hand follows. Instead of planning one chunk at a time and only generating it when the planning is complete, it seems that both processes overlap, devised as it goes along. They stressed that the right fingering should be accessed without any delay concluding a phrase, at the same time as the upcoming phrase is heard with the inner mind and translated into music in the next moment.

Negotiation in music, being able to react and act, is very much associated with degree of automaticity. When actions are internalized, the working memory is free to focus on the actions of others. Being able to approach

oneself as a listener when performing and asking, "How do my actions contribute to the other players' actions?," may be a performance anxiety reducing approach as well. For Monder, his ideas stop when being physically tense, the physical infecting the psychological. His remedy was to stop playing and wait until ideas popped up again, maybe redirecting his thinking to something else in the music, for instance interacting with the drummer's cymbal.

Successful actions rely on a collective mind, stressing the whole and the others more than my solo and me. Alternatively, as Rez Abbasi hinted at, a solo is actually a set of intertwined stories, where each soloist contributes to a larger narrative.

9.5.3 Goal

Developing one's own sound and getting closer to a personal voice in playing was highlighted by several of the guitarists, as was improving the ear-hand connection to be able to transfer this personal voice into musical sound without delay. I gradually became aware of the guitarists' use of a schema-based dramaturgy or tension/release build up in this process; I call this a narrative schema. The narrative schema enables external information to bring out internal information based on a desire to express something beyond notes. After interviewing and analyzing solos, I found this dramaturgy containing three levels of intensity:

- Calm/melodic: often defining a little motive with much space, little intensity,
- Tension build up: longer phrases, combining different motives, more dynamics,
- Peak/climax: bluesy feeling, chromatics, and larger register of instrument.

With the guitarists, these emotional stages seem to be coupled with action schemas that can fill the stages on each level. In the interviews, I found that the professional guitarists practise patterns, licks, progressions, etc., but their focus was of a more intuitive and narrative character; meeting the demands of the situation and having actions available to match calm, tension and peak levels of emotion on all musical material they play. Having a narrative structure can be essential for creating moments in

which performers can experience flow, a state of being which describes the guitarist's optimal goal in improvisation.

Related to obtaining flow in performance, they suggested being open and receptive in mind by asking questions like, "What would be the exact, right action for the emotions felt at this moment with these musicians and this material?" or, "Why is my solo important; what will I convey?" Focusing on the macro or narrative structure of the solo enables flow and continuity, instead of cinematic details that can easily lead to choking.

Analyzing and summarizing my material, I suggest three levels of interplay, reflecting a basic, extended and altered level of approach.

- Level 1. Internal action: me – my solo
- Level 2. External action: us – my solo
- Level 3. Narrative (expert) action: us – our solo

9.6 Final reflections

This research project has inquired about the implicit and explicit knowledge professional jazz guitarists have. In our reflective conversations, we have used a musical language without too many references to emotional aspects; however, I trust these ingrains in the musical language. John Blacking claims, "even if a person describes musical experiences in the technical language of music [music notation], he is in fact describing emotional experiences which he has learned to associate with particular patterns of sound" (Blacking, 1973, p. 52). Analyses of musical structures in improvisation are important because they reflect strategies based on multiple inputs in the situation.

My findings collapse the dichotomy constructed by the theories of top-down versus bottom-up expert skill, emphasizing that both approaches are needed dependent on time and place. Jazz guitarists use both top-down hierarchical strategies suggested by Chaffin, Imreh, Lerdahl et al., but also bottom-up embodied cognition suggested by Dreyfus, Sudnow, Iyer et al. My findings refer to both hierarchy (vertical) and heterarcy (horizontal) spreading. Some of the guitarists were more likely to rely on top-down processes (Lund, Monder and Rogers), others on bottom-up processes (Wilkins and Abbasi), but all of them seem to rely on a dynamic interaction between the two.

The guitarists all stressed the need for hierarchical plans to be open to modification, encoded in a way that allows it to be consistently chunked and re-chunked, depending on situation. Dynamically responding to a new situation involves the retrieval of the most effective combination of learned material seen as templates. The guitarists stressed the importance of targeting a direction for the solo, which involves "really listening to what is happening at the moment" as opposed to the mechanical and unfocused use of mechanically retrieved schemas. This is a combination of bottom-up and top-down processing, including the use of principles (chunked concepts) learned during practise as salient cues that emerge and coalesce differently according to situation.

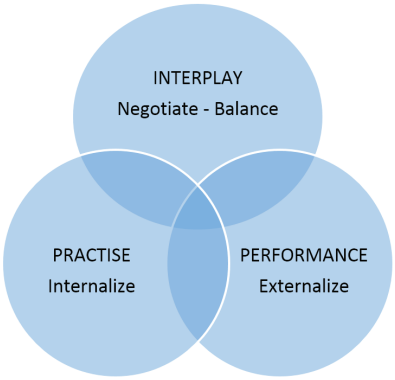


Figure 9.5 Practise and performance phases. Figure showing that practise, performance and interplay are interconnected. Balancing and negotiating impulses in interplay coming from within and from outside (other musicians).

According to a hierarchical view, chunk formations appear to be set and arranged prior to the performance, triggered by expressive, interpretive or structural cues in the performance itself. The guitarists suggest that chunking in performance happens in a more multimodal, flexible way; they react instantaneously to the situation, and chunks (expressive, interpretive or structural) combine spontaneously in the most efficient way according to the demands of the situation. The guitarists' have to negotiate and balance these in performance (see Figure 9.5). Such dynamic responding seems to rest on effective chunking and retrieval processes in practise, based on internalized principles (rules) which are generated, in Abbasi's words,

"under the radar" in performance. Having music under the radar means the freedom to switch between various levels at which information has been chunked. This is the opposite of being forced to think due to knowledge that is not properly internalized. Lund states that one can prepare almost endlessly, but what one has prepared is not necessarily at all what is going on in the musical moment. Really listening is based on intuition and being present in the moment, externalized in interplay, rather than relying on a set overarching structures. Negotiating the balance between individual expression and dynamic interplay with the rest of the band seems to be the clue to successful performance.

My findings suggest that advanced jazz guitar improvisation involves extensive use of templates, and that accurate goal-directed chunking in practise is crucial for flexible chunk, schema and template retrieval in performance. This acknowledges that advanced skills rest on elaboration and frequent generating of small chunks in jazz guitar improvisation. Flaws in these knowledge structures can be detrimental to performance, for example, not knowing the entire chord progression in a tune, or how to outline the changes in a solo.

Three main findings relate to jazz guitar expertise:

- Jazz guitarists are sensitive to chunks of meaningful information,
- Jazz guitarists' knowledge is highly organized in schemas,
- Jazz guitarists' knowledge is readily accessible when needed because it contains information about when it will be useful, in the form of templates.

In doing transcriptions of these great guitarists' solos, I have slowed down the tempo of the recordings, changed keys, and it still sounds good. Sometimes the phrases in normal tempo are so fast that a bridging note probably would have joined a phrase in slower tempo. But in high speed tempos the constraints of the performance create a rest (the performer is living inside an imperfect situation online) to reach the right fingering. It is this "on-edge" type of living that makes it perfect for true improvisers.

9.6.1 Coda

The aim of this research project has been to describe guitar improvisation within a given setting and ask how we can best characterize the unfolding processes. Ideas and principles from cognitive psychology have been found to be useful, as they allow understanding of the psychological processes underlying the practise. This type of understanding may empower teachers to devise methods suited for individual students and particular situations, and to modify them in principled ways.

I have made strong efforts to develop applications of the concepts of chunking and schemas for use in jazz guitar improvisation. Using methods common for the practitioners in the field, interviewing performers and transcribing their music, ideas are outlined in a way I hope will be useful to other musicians.

The interdisciplinary approach has been broad and ambitious. Important and sophisticated questions are raised concerning the basis for human learning (chunking and schemas) and their application in improvised music. Daring to ask the big questions and coupling them with practical and experiential knowledge has been a rewarding approach. I have found it necessary to delimit the project to existing jazz research and research on expertise. It is my hope that this inquiry can stimulate to new research within this exciting interdisciplinary field of music cognition.

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Appendices

Appendices from 1 to 3 contain video material found on a DVD, while the rest of the appendices are written material. The DVD provides three sections of video material from fieldwork conducted in New York City in 2010, 2011 and the follow-up fieldwork conducted in New York City in 2013. The video clips show the musical and verbal interplay happening at these sessions. The video excerpts of *All the Things You Are* were recorded in fieldwork 1 2010/11 while the examples from fieldwork contains material from both fieldworks.

List of appendices:

1 All the Things You Are – full version (video, DVD only)
2 All the Things You Are – transcribed part of solo (video, DVD only)
3 Examples from fieldworks (video, DVD only)
4 Tension schema
5 Tension notes in measures
6 Tension notes related to tonal areas
7 Chunk length in measures
8 Tonal areas, tension notes, peak of solo, interplay and style
9 Interview guide for fieldwork 1
10 One example of an interview guide for fieldwork 1
11 Jazz guitarists´ approval of fieldwork
12 Participant biographies

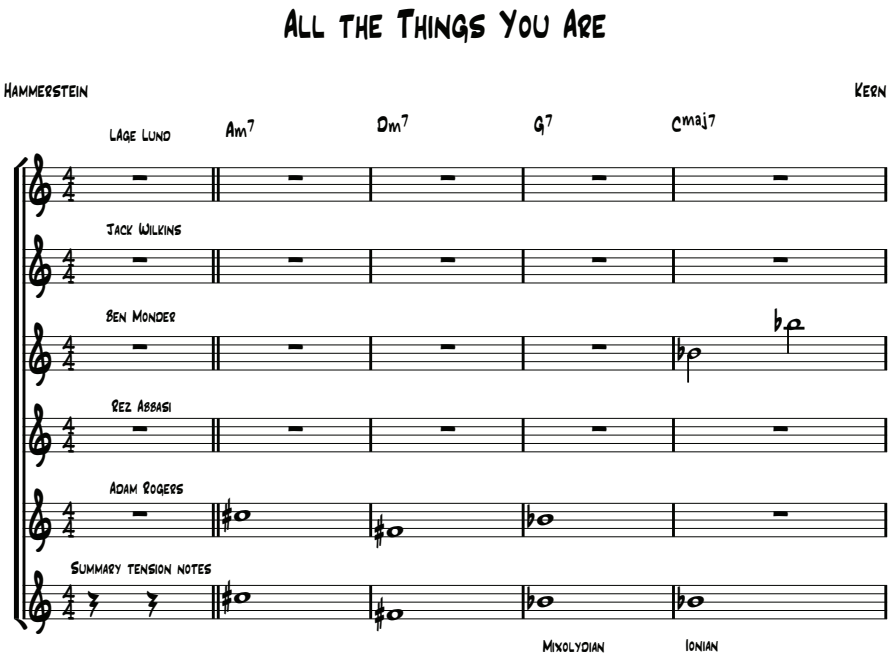
Appendix 1: All the Things You Are—full version (video)

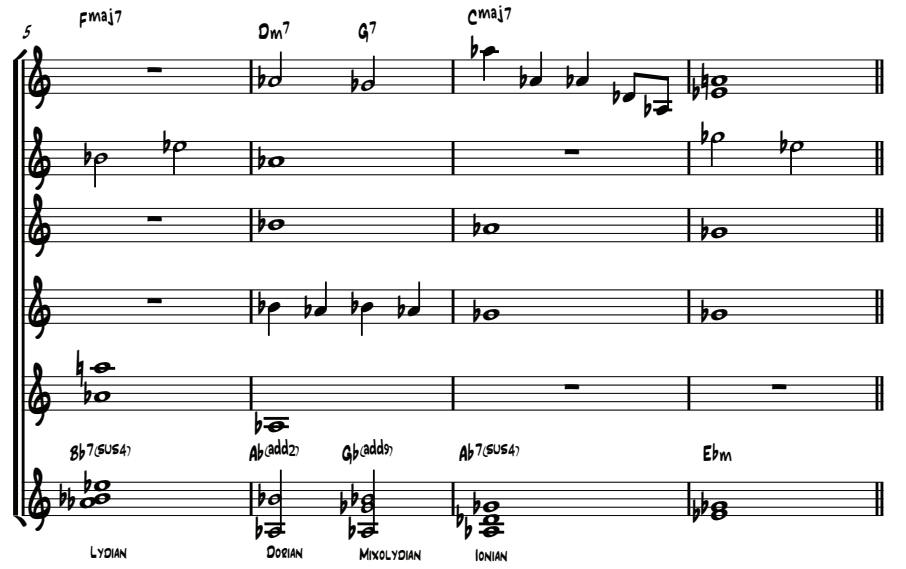
Appendix 2: All the Things You Are—transcribed part of solo (video)

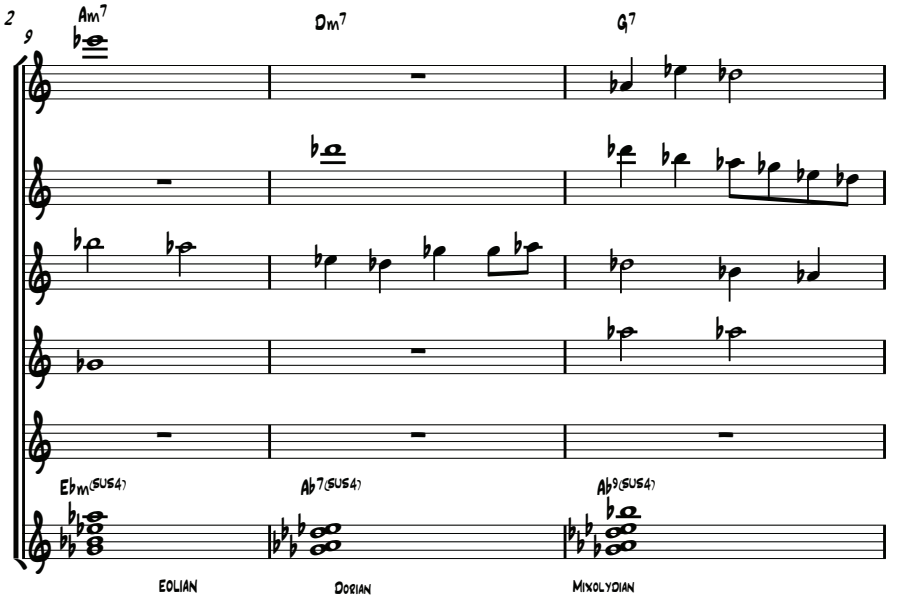
Appendix 3: Examples from fieldworks (video)

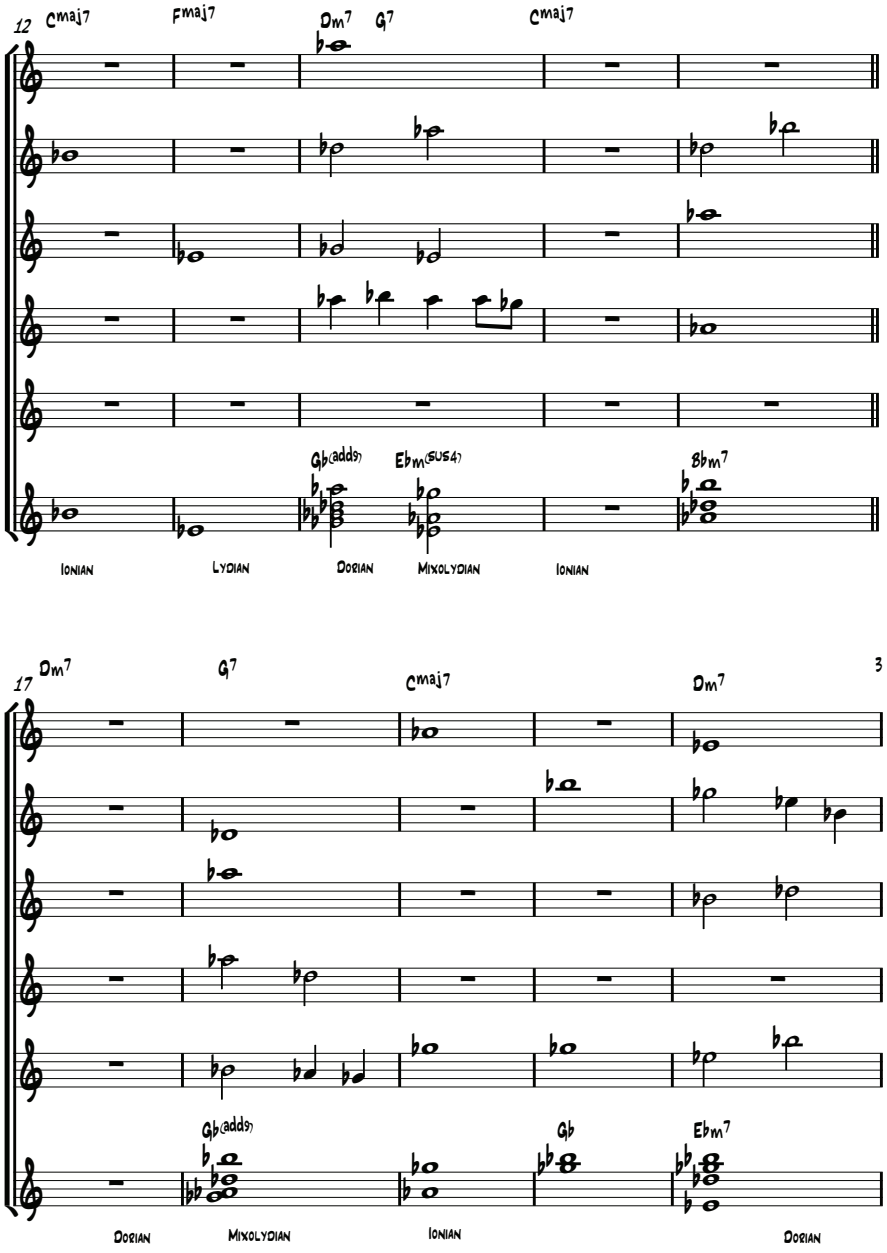
Appendix 4: Tension schema

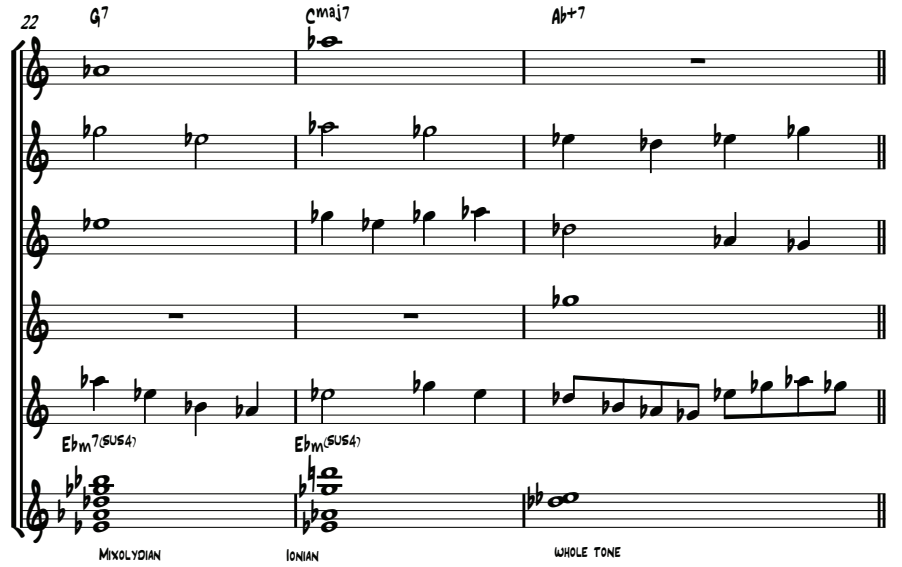
Tension notes used by the five guitarists: The modality and the resultant chord structure of the five guitarists' tension notes are defined in the bottom note system. This makes the outside scheme, defining the sum of tension notes used by the guitarists in their improvisations.

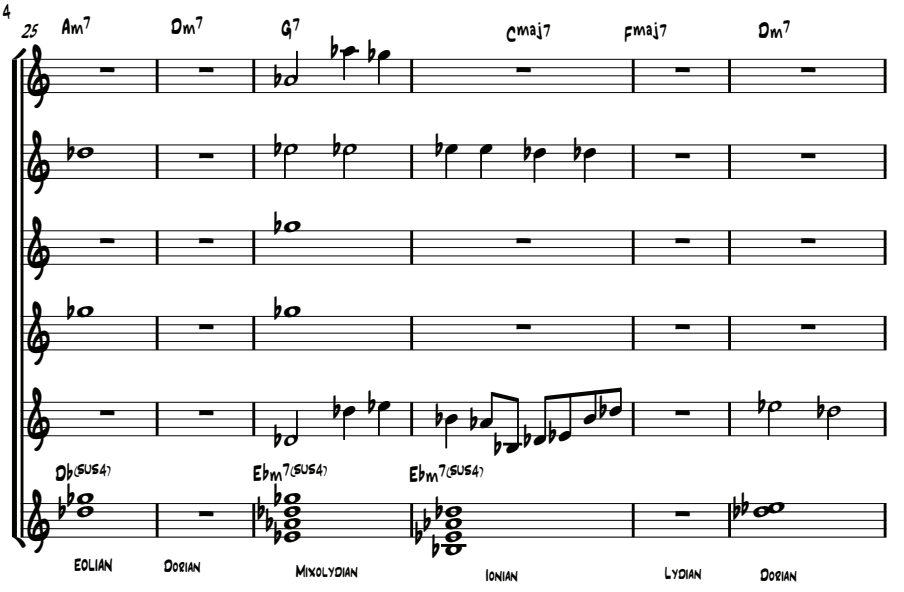


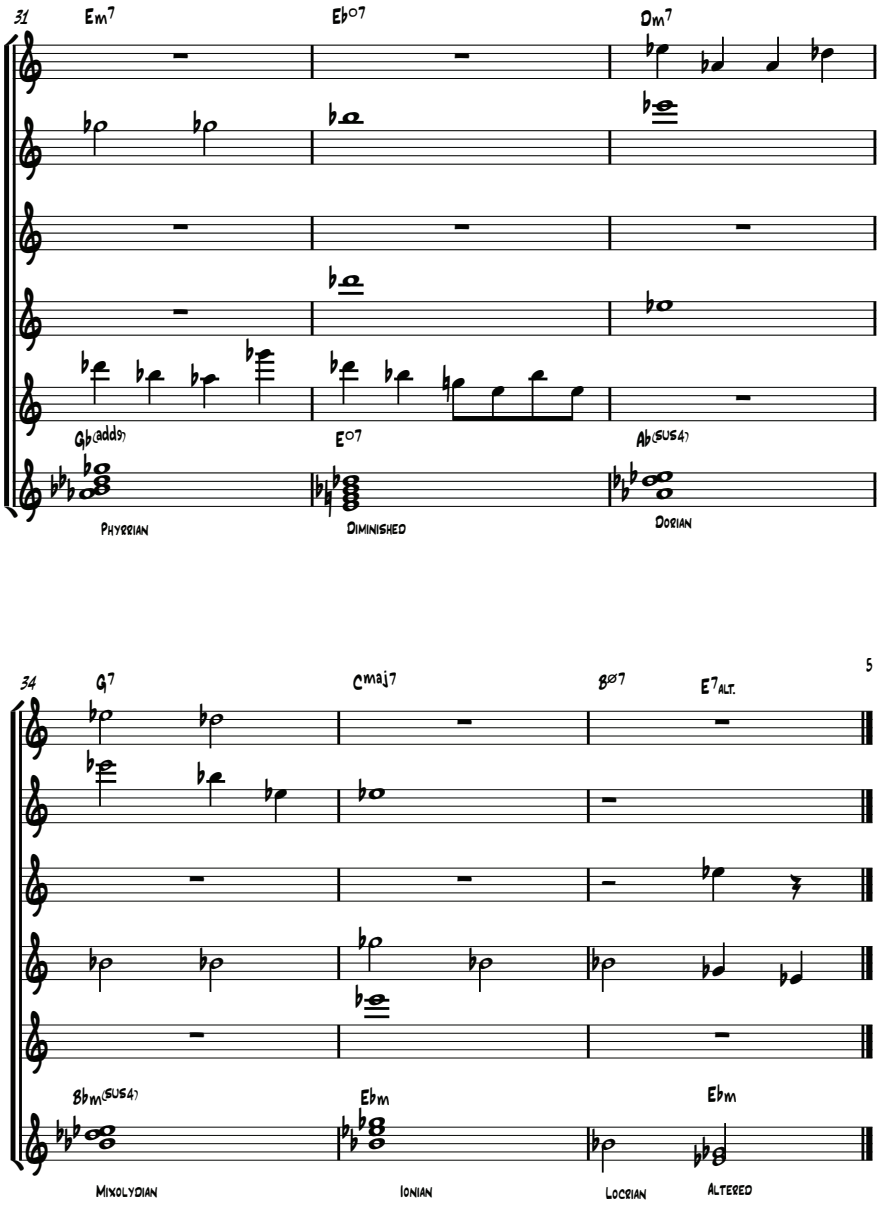

5
Fmaj7
Dm7
G7
Cmaj7
Bb7(sus4)
Ab(add2)
Gb(add9)
Ab7(sus4)
Ebm
Lydian
Dorian
Mixolydian
Ionian


2
9
Am7
Dm7
G7
Ebm(sus4)
Ab7(sus4)
Ab9(sus4)
Eolian
Dorian
Mixolydian


12
Cmaj7
Fmaj7
Dm7
G7
Cmaj7
Gb(add9)
Ebm(sus4)
Bbm7
Ionian
Lydian
Dorian
Mixolydian
Ionian
17
Dm7
G7
Cmaj7
Dm7
3
Gb(add9)
Gb
Ebm7
Dorian
Mixolydian
Ionian
Dorian

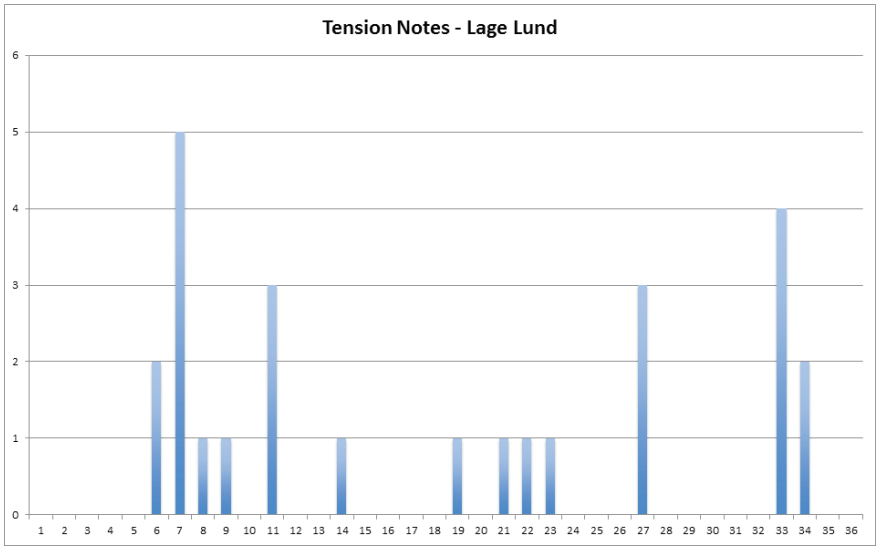

22
G7
Cmaj7
Ab+7
Ebm7(sus4)
Ebm7(sus4)
Mixolydian
Ionian
Whole tone

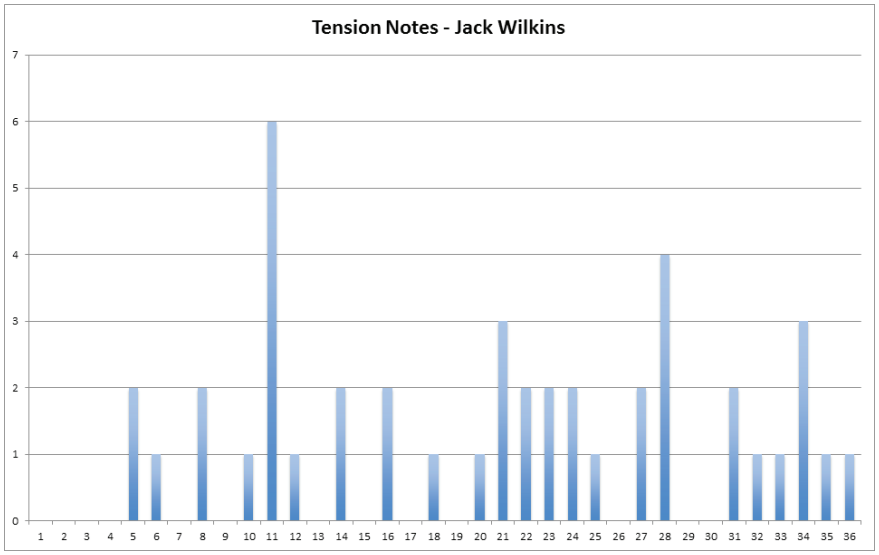

4
25
Am7
Dm7
G7
Cmaj7
Fmaj7
Dm7
Db(sus4)
Ebm7(sus4)
Ebm7(sus4)
Eolian
Dorian
Mixolydian
Ionian
Lydian
Dorian

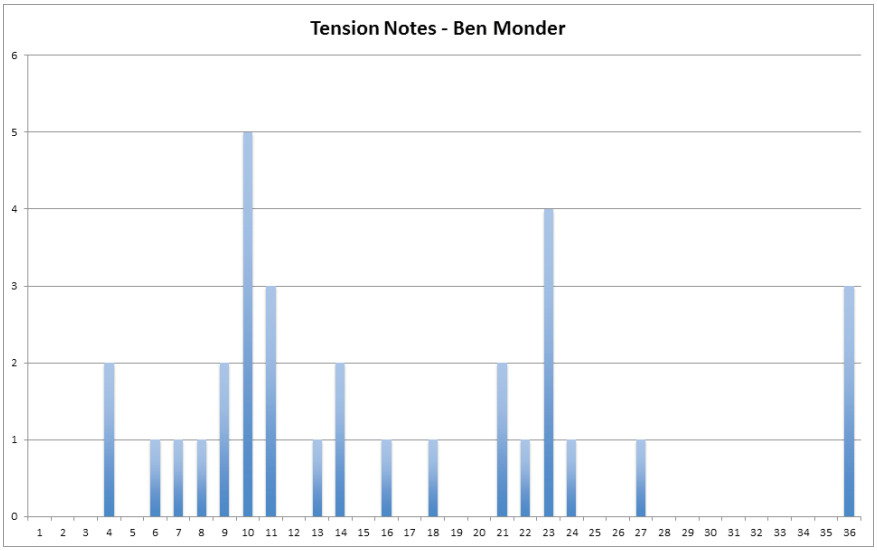

31
Em7
Eb°7
Dm7
Gb(add9)
E°7
Ab(sus4)
Phyrgian
Diminished
Dorian
34
G7
Cmaj7
8ø7
E7alt.
5
Bbm(sus4)
Ebm
Ebm
Mixolydian
Ionian
Locrian
Altered

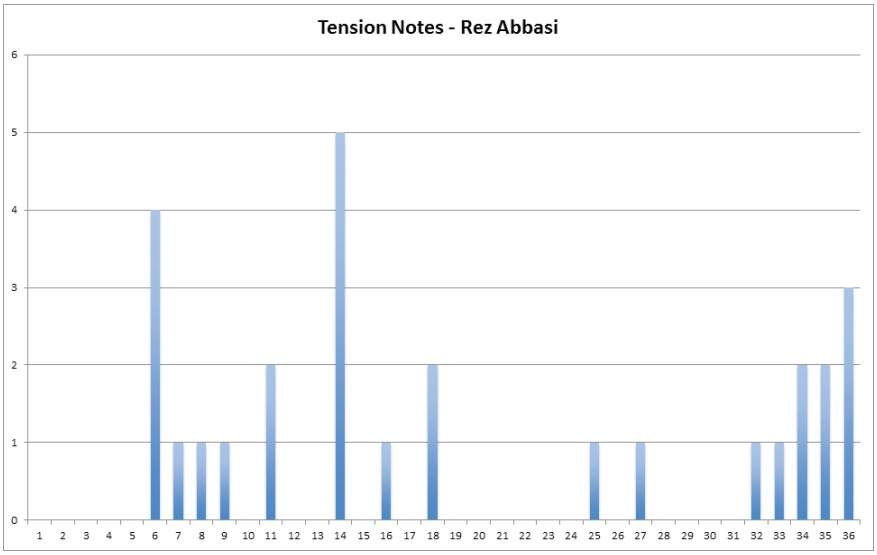
Appendix 5: Tension notes in measures

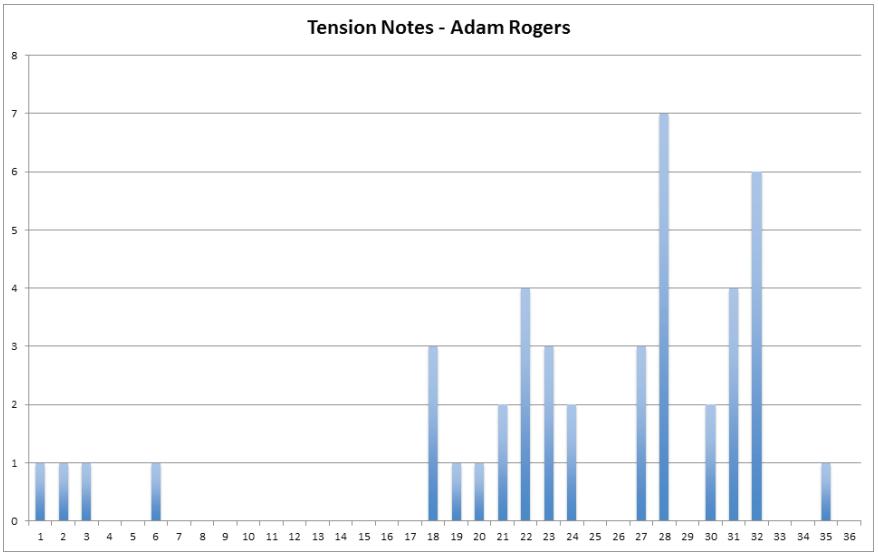
Figures 1–5.: Tension notes: Lund, Wilkins, Monder, Abbasi and Rogers. Vertical axis showing number of tension notes; horizontal axis showing measures.






Tension Notes - Ben Monder
0
1
2
3
4
5
6
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36


Tension Notes - Rez Abbasi
0
1
2
3
4
5
6
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36


Tension Notes - Adam Rogers
8
7
6
5
4
3
2
1
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36

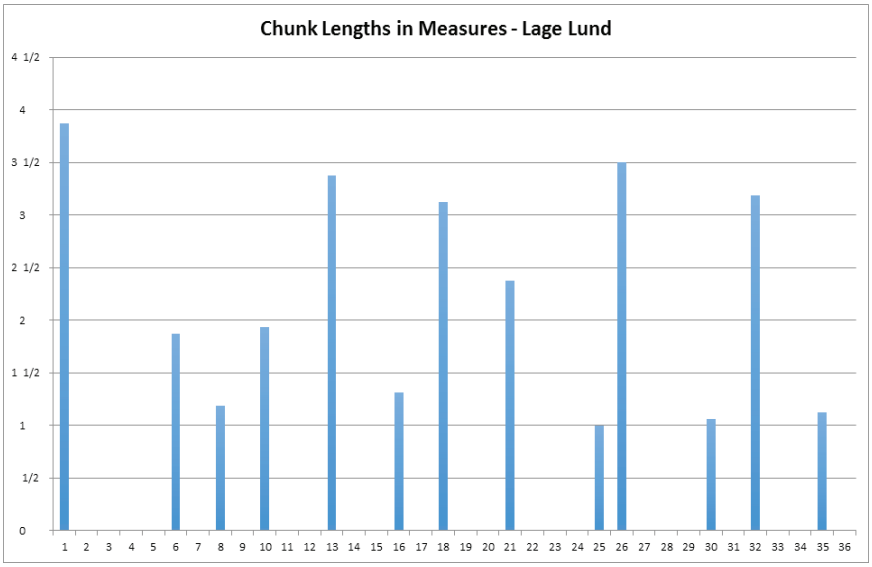
Tonal areas	Dominant areas (yellow) Tension notes (red)					
	Bar	Lage Lund	Jack Wilkins	Ben Monder	Rez Abbasi	Adam Rogers
A A♭ area	1	0	0	0	0	1
	2	0	0	0	0	1
	3	0	0	0	0	1
	4	0	0	2	0	0
	5	0	2	0	0	0
B C area	6	2	1	1	4	1
	7	5	0	1	1	0
	8	1	2	1	1	0
C E♭ area	9	1	0	2	1	0
	10	0	1	5	0	0
	11	3	6	3	2	0
	12	0	1	0	0	0
	13	0	0	1	0	0
D G area	14	1	2	2	5	0
	15	0	0	0	0	0
	16	0	2	1	1	0
	17	0	0	0	0	0
	18	0	1	1	2	3
	19	1	0	0	0	1
	20	0	1	0	0	1
E E area	21	1	3	2	0	2
	22	1	2	1	0	4
	23	1	2	4	0	3
F Transition	24	0	2	1	0	2
G A♭ area	25	0	1	0	1	0
	26	0	0	0	0	0
	27	3	2	1	1	3
	28	0	4	0	0	7
	29	0	0	0	0	0
H B area	30	0	0	0	0	2
I A♭ area	31	0	2	0	0	4
J B° area	32	0	1	0	1	6
K A♭ area	33	4	1	0	1	0
	34	2	3	0	2	0
	35	0	1	0	2	1
L Transition	36	0	1	3	3	0
Average		0.7	1.2	0.9	0.8	1.2

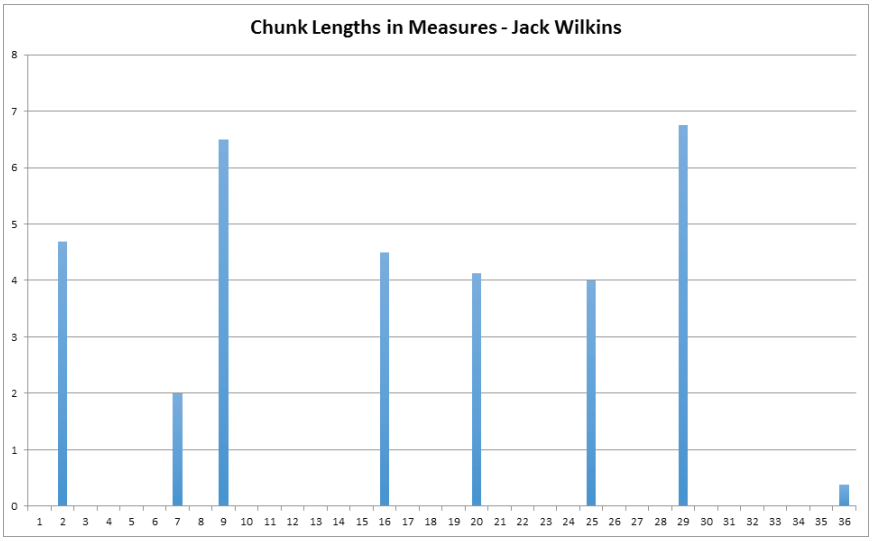
Appendix 6: Tension notes related to tonal areas

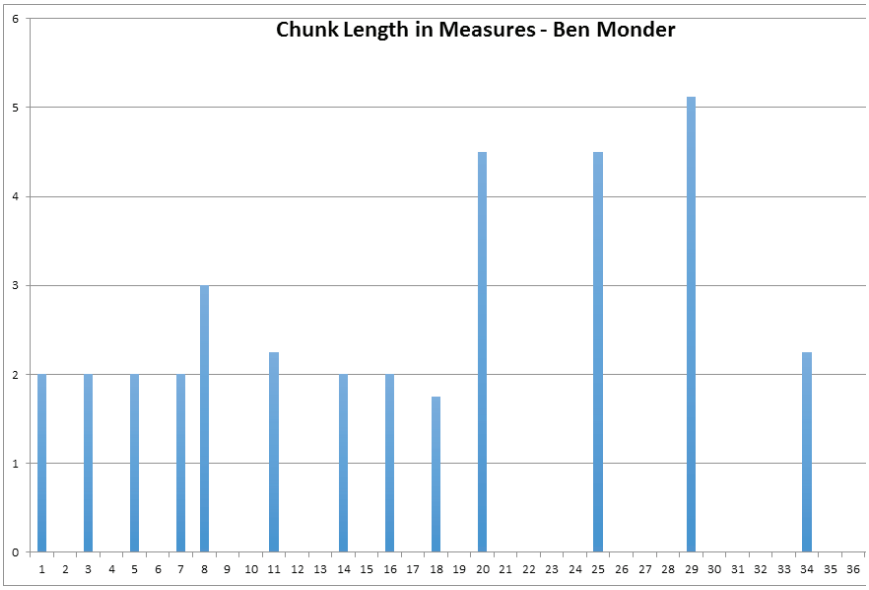
Table (page 302) showing number of tension notes in red areas. Yellow color indicates dominant areas where one expects more use of tension notes in the solos. The yellow areas appear in 11 out of 36 measures, and as expected contains more tensions on average compared to the other areas.

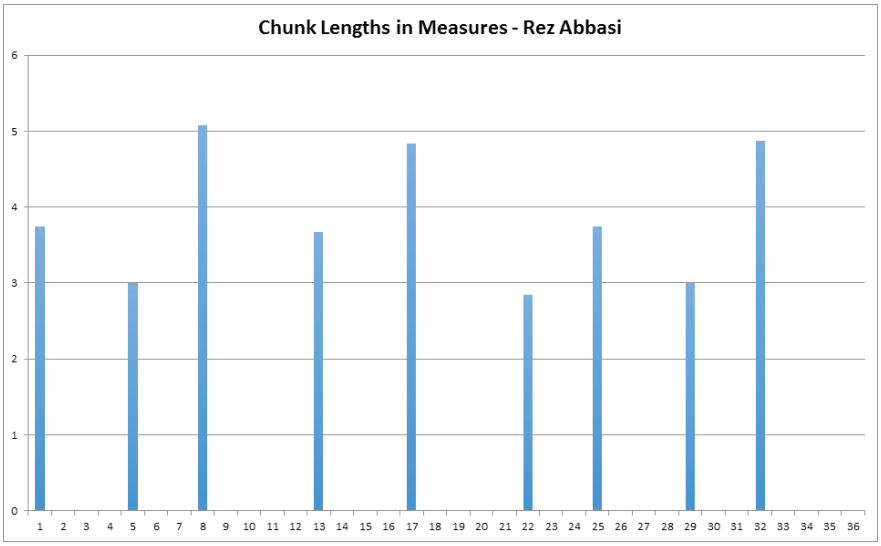
Appendix 7: Chunk length in measures

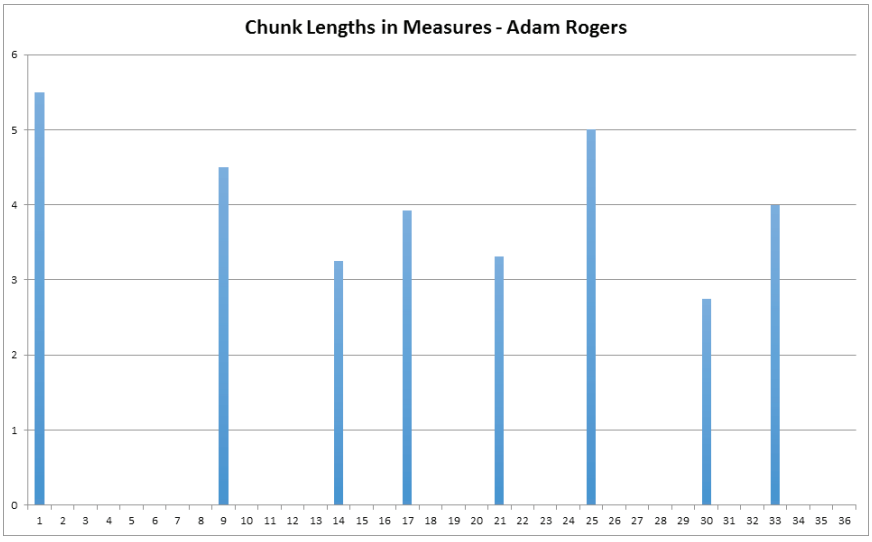
Figures 1–5.: Chunk length in measures: Lund, Wilkins, Monder, Abbasi and Rogers. Vertical axis shows number of bars in each chunk; horizontal axis shows where the phrases are located in the song form (36 bars).




Chunk Lengths in Measures - Jack Wilkins
0 1 2 3 4 5 6 7 8
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36


Chunk Length in Measures - Ben Monder
0 1 2 3 4 5 6
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36


Chunk Lengths in Measures - Rez Abbasi
0
1
2
3
4
5
6
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36


Chunk Lengths in Measures - Adam Rogers
0
1
2
3
4
5
6
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36

Appendix 8: Tonal areas, tension notes, peak of solo, interplay and style

Below is an overview of the form description given earlier. By reading the overview horizontally, one discovers similarities and differences between the guitarists' solos on each defined tonal area. Experimenting with this schema can give exciting results, for example playing in one tonal area at a time and experimenting with all the features described before moving to the next area and repeating the process. The whole matrix then transforms from notes to words. Using only the words in the matrix as cues for the improvisation, the cues and its embodied actions have to be properly internalized in order to make sense. When the whole tune is covered using this approach, it can be very useful to record entire choruses and then analyze how it turns out in performance.

Tonal area	Lage Lund	Jack Wilkins	Ben Monder	Rez Abbasi	Adam Rogers
A♭ area (I–5)	**Rhythmic phrasing** **Large range**	**Eight note movement** **Chromatic blues feeling**	**Quarter note triplets** **Stepwise movement** **Interval contraction** **Repetitive melodic contour**	**Descending top tone motives** **Improvised meter change in bar 4**	**Quarter note triplets**
C area (6–8)	**Chromatic upper and lower neighbor tones** around G in three octaves **Cross the bar line phrasing**, Cm anticipation in bar 7		**Rhythmic displacement**	**Glissando** from F♯ to A, **Eastern inspiration** over C^{maj} in bar 7	**Great pacing** Few notes, large intervals: ♭5 and 8
E♭ area (9–13)		**Tritone pentatonic:** G♯m pentatonic over Dm^7-G^7 in bars 10–11	**Chromatic descending** passages with **interval contraction**	**Glissando** from A to C on Am^7	**Great pacing** Few notes, narrow range (5th), rhythm and tone repetition
G area (14–20)	**Interval repetition** and "bluesy" phrasing	C major bebop scale over C^{maj} in bar 20	**Chromatic up and down passages** from G **C pentatonic movement in fourths**	**Descending chromatic pattern** from G♯ to F on G^7 in bar 14	**Fast ascending range, descending** **- steps** **- thirds** **- diatonic triads**
E area (21–23)		**Descending bebop melodic minor scale** movement, ending in a bluesy 6th interval	Ascending **D harmonic minor scale** in the top range. **Rhythmic phrasing** A harmonic minor scale over the C major chord	**Indian slide** is used again in bar 21 from A to D on Dm^7, and in bar 22 from C to F on G^7	**In-out-in phrasing**
Transition (24)			**C♯ blues scale**	**$Cmaj^9$ on $A♭^{♯7♯5}$**	Chromatic descending lines from D and G♯, and then finishing in a C^{o7} arpeggio over $G♯^{7♯5}$

Tonal area	Lage Lund	Jack Wilkins	Ben Monder	Rez Abbasi	Adam Rogers
A♭ area (25–29)	**Large interval leaps**	**Chromatic triplets** from D and C on G^7-C^{maj} (27–28)	**Chord solo, three against four patterns**	**D dorian be-bop scale**	**Template $F^{maj9\sharp5}$ and B^+ over G^7**
B area (30)	**Rhythmic phrasing**		**Chromatic chord movement** $F\sharp^{7sus}$ to G^{7sus} on Dm^7		**Altered ending** an F^{maj9} arpeggio with an E♭ and D♭ on Dm^7
A♭ area (31)			**Chromatic chord movement** D^{13} to $D\sharp^{13}$ on Em^7		**Chromatic descending lines** from D, A and F♯ **with inside arpeggio**
B° area (32)		1–5 ascending/descending E♭ **minor scale on E♭° chord**	**Template** D^{13} to $F\sharp^{o}$	Chromatic descending line from ♭9 on E♭°	
A♭ area (33–35)	**Template** F^{add9} and $C\sharp m^9$ is used over Dm^7-G^7	1–5 ascending D minor scale, then D-F ascending chromatics on Dm^7	**Blues** feeling	**Dm^{11} arpeggio on Dm^7**, chromatic from G to E,	**A blues**
Transition (36)	**F over B^7 altered** **E as part of $C^{maj9\sharp5}$ over E^7 altered, sequencing**	**Gm and G♯m on $E^{7(Alt)}$**	**G Augmented scale**	**Strong dissonance,** major seventh on B^{7alt}, ending with a chromatic descending line from G to E♭ on E^{7alt}	**A harmonic minor ending with a D diminished triad**
Tension notes distribution on dominant chords	**46%**	**50%**	**35%**	**72 %**	**47%**
Peak of solo	Bars 32–36 **outside tones, 16th notes, rhythmic variety,** attack and highest note (end of bar 32), then solo descends from this climax in the end.	Bars 32–34, **bluesy ascending movement, many outside tones,high pitch, interesting contour**	**Bars 34–36, rhythmic interesting, accenting different tones in the triplets, bluesy feeling and interesting use of the augmented scale in bar 36**	**Bars 32–36, bluesy line, many outside tones, high pitch, and interesting contour of the line. Accenting the major seventh on the B^7 altered, defined target note**	**Bars 30–36, chromatic 16th note line, many outside tones, high pitch, and interesting contour of the line, seen as a wave form, end in an inside be-bop type sound**

Tonal area	Lage Lund	Jack Wilkins	Ben Monder	Rez Abbasi	Adam Rogers
Interplay	**Breathing** Easy to comp, my hands make a reverse action in bar 8	Flowing In bar 28 the triplet patterns in the solo makes me ahead of the beat in the two next bars	**Tense** The most difficult to comp of all five guitarists and at certain places it almost stops, as in bar 20–21 when he goes from 6 against 4, to 4 against 4 using mainly sixteenth notes	**Relaxing** atmosphere, tight interplay, especially in the bridge section 17–24. Right before the end bar my hand stops in the middle of a chunked action; I hear something in his phrasing that suggested a hip sound	**Relaxing** nice atmosphere, very tight in the interplay, much space in the beginning. I place some substitute chords in the bridge section 17 to 24. Adam's solo is sequencing diatonic triads, these are "answered" in the comp. It's also interesting to study how our feet are tapping the rhythm while playing
Style	**Chromatics** around 2 and 5 step (D-G) in C modality E major and F minor triads over G^7 chords **Rhythmic diversity** **Vertical phrasing** (large range in phrasing)	**Much sequencing** 10–11, 31– 33 **Be-bop triplets** 12– 14 **Ascending chromatics** 27–28 **Blues feeling** 5–6, and 32–34	**Rhythmic motives**, based on 6 against 4, with subdivision **Quartal (fourth based) harmonic lines.** **Chord soloing**, using 3 against 4 Eight note triplets 3 **Augmented scale** in bar 36	**Eastern inspired glissandi,** bars 7, 9, 21, 22, 32 and 35 **Polyrhythmic**, 6 against 4 in the bridge **Many eight note triplets,** 11, 13 to 15, 24 to 28, 35 and 36	Virtuous technique, **Flowing 16th notes lines**, being **contrasted with periods with little activity,** bar 24 to 26 **6 against 4**, bars 3–5, and a lot of **eight note triplets,** bars 14–20 **Composed intensity**

Appendix 9: Interview guide for fieldwork 1

1. How do you practise?
2. How much of your playing is internalized and beyond conscious thought?
3. How do you approach harmony?
4. How do you approach melody?
5. How do you approach rhythm?
6. What is your favorite format for playing?
7. Do you have any special ways of preparing for performance?
8. How do you stay inspired in general, - and in performance?
9. What is your goal as a jazz guitarist?
10. Get feedback on my own playing – what work and what doesn`t?

Appendix 10: One example of an interview guide for fieldwork 2

Fieldwork 2: Ben Monder. Focusing on "All the Things You Are" in practise and performance

Practise: Link to analysis and earlier interview

1. **How do you get an overview of the entire form (AABA')?**

Interview 1: In the last interview you said that ideally there shouldn't be any conscious thoughts on improvising over a standard. How do you manage this?

(Follow up questions are in italics). If we start with the big picture, how do you link sections into an entire form? Do you primarily approach melody, harmony, rhythm or lyrics first, or is it a combination?

2. **Do you engage much in separate practise of phrases, formulas, (II, V, I) etc. within each section (A, B part)?**

Interview 1: There are certain voice leading exercises and other things that I have practised that come up in my playing, intervallic structures that I move along the scale. I don't visualize it much. I hear it more than I see it.

How do you internalize these phrases? Can you demonstrate this on "All"? Do you think of each chord as a separate unit or as a part of a larger chunk?

Do you sometimes restrict your thinking to a certain style when working on patterns like this?

3 **How do you practise linking separate phrases, formulas, etc.? Melody based (4 + 4), tonality based (5 + 3), formula based (1 + 3) + (1 + 3)**.

Interview 1. I practise Bach chorales and try to learn the voice leadings from them; I also use triads over changes.

Can you specify how triads and Bach chorales help you in connecting phrases on "All the Things You Are"?

Do you hear certain counter melodies or guide tone lines that go along with the main melody?

Can you demonstrate some of these counter melodies?

Do you consciously create multiple starting points? Do you write tunes out from memory? Do you sometimes practise only joins, the connection between phrases?

4 **How do you work on maintaining the piece?**

Interview 1: For difficult material, I woodshed the difficult spots and work mostly on that.

Do you focus on specific details (chunk based), the general outline of the tune (schema based) or a combination when trying to remember a tune?

Performance

Interview 1: It is important to remember to keep the intellectual thing away when performing; separate practise from performance.

How do you separate practise from performance?

Interview 1: When you improvise, you make choices all the time, and part of this is muscle memory.

Do you have some sort of ideas before you play?

How many of these choices are conscious in performance? . . . what about choosing a direction for your solo ahead, like I'm going to play in the low register, hold back for a little while, then add some rhythm, like building up a longer argument or chain of thoughts, defining a climax in the solo?

Interview 1: I guess I anticipate the chord changes.

If you automatically anticipate the chord changes, do you also think that the associated action that goes along will be automatically triggered, triggered so much that your reaction is habit memory more than what is actually happening in the moment?

Interview 1: How do you stay inspired? I think it is dangerous too get too much inspiration from the instrument itself: . . . I would never transcribe my own solos.

Why would you not transcribe your own solos? (The Brecker Brothers, Jamey Aebersold and several other people advised this as a way "to find your real self").

Interview 1: (Comments on my playing)

Your feels sound a little bit like un-edged.

I heard you follow certain ideas, which is good, but maybe your approach is a bit to symmetrical and not subtle enough; you ramble around a little bit too hard.

Can you elaborate on this?

Do you think consciously about phrase lengths and what should be contained in it?

What do you think characterizes your own playing?

Analysis

Chunk Lengths: He uses some cross-section phrasing, many phrases (13 phrases), one long line in bar 29, two phrases over four bars, starting in bar 20 and 25.

Do you agree on the phrase lengths?

Beginning of phrases: four first are downbeat, two next are offbeat, two downbeats, one offbeat, two downbeats and two offbeats.

Endings (target of phrases): thirteen phrases are offbeat.

Phrases start and end on chord tones, except in bars 4 and 13 (♭7 on maj).

Question: How do you think when improvising over these chords in bar: 24, 30, 32, 36?

I Chorus

Triplet based = twenty-eight bars.
Sixteenth note groupings = three bars.
Pauses = two and a half beat
Thirty-seven tension notes.
What are my findings and analysis? Confirm or not confirm? Get in depth comments from the guitarists.

Range from G♭2 to G♯5 (two and one occurrence) (three octaves and a whole tone).

Average pitch C4, median pitch D♭4.

A♭3 used 27 times, A♭4 25 times, and G4 24 times. Much tone repetition.

Setup for session (two cameras: Zoom Q3 on entire section and Nikon camera on playing sessions)

Present aims and goals for the session, and how they build on fieldwork 1! (Two choruses).

1. Play and record A) "All" without me comping Ben (time feel), B) new recording with comping, C) triads and chromatics.
2. I present solo from 2010/11 on computer. They comment.
3. I present my analysis. They comment. I include only the most salient aspects.
4. Knowledge in practise and performance. Follow-ups.
5. What works with this fieldwork design? What could have been different and made better?
6. Analysis presentation: Phrase lengths, agree, range, modal transcription, tension notes, comments on my analysis, present modal matrix score of the five guitarists' solos.

Appendix 11: Jazz guitarists' approval of fieldwork

New York, (date)

Statement of Approval

I hereby confirm that Stein Helge Solstad may record sound and video material from my guitar lessons with him. This material shall only be used for his PhD project. All other sorts of publication shall have my approval and signature.

Best regards

(Signature)

Appendix 12: Participant biographies

Lage Lund

Lage Lund was born in Skien, Norway on December 12th, 1978. He is a Norwegian jazz guitarist living in Brooklyn, New York. He started to play guitar at the age of 13, and at 16 he was allowed to start playing jazz on a more regular basis. After high school he got a scholarship to study at the Berklee College of Music in Boston. In 2002 a grant from the Fulbright Foundation gave him the chance to move to New York, where Lund was the first student to graduate from Julliard School of Music with jazz guitar as the main instrument. He was also the winner of the Thelonius Monk guitar competition held in Washington DC in 2005.

For several years he has been listed on the Down Beats list in the "Rising Star Category." In 2014 he was placed number two on this list. Lund has a reputation as an excellent guitarist, as documented by a series of critically acclaimed solo records. He has also played as a sideman with artists like Wynton Marsalis, Maria Schneider, Bill Stewart, the Mingus Orchestra, Ron Carter, Mulgrew Miller, Carmen Lundy, Ingrid Jensen and David Sanchez.

Jack Wilkins

Jack Wilkins was born on June 6th, 1945 in Brooklyn, New York. He has been on the international jazz scene since the early 1970s. A native of Brooklyn, he started to play the guitar at age 13. He studied with John Mehegan in his early years and learned vibes, piano, and classical guitar, but has been a jazz guitarist throughout his career. He has gained a strong reputation due to his long association with Buddy Rich. He lists Johnny Smith, Django Reinhardt, Charlie Cristian, Wes Montgomery and Joe Pass as some of his major inspirations in jazz guitar.

Jack Wilkins has recorded several critically acclaimed solo albums and is very much in demand as a sideman, including by artists like Chet Baker, Red Rodney, Ira Sullivan, Johnny Griffin, Jack DeJohnette, the Brecker Brothers, Bob Brookmeyer, Stanley Turrentine, Phil Woods, Harvie Swartz, Jimmy Heath and Eddie Gomez. Wilkins is also a much-sought sideman for singers, including Mel Torme, Tony Bennett, Sammy Davis Jr., Sarah Vaughan, Ray Charles, Cassandra Wilson, Nancy Marano, Jay Clayton and The Manhattan Transfer.

An NEA (National Endowment for the Arts) grant has recognized his work both as an artist and as a teacher.

Ben Monder

Ben Monder was born on May 24th, 1962 in New York. He started to play guitar at the age of 11, mostly learning pop tunes from the radio, and began studying jazz seriously as a teenager. He studied at the University of Miami and Queens College. He has conducted clinics and workshops around the world and has served on the faculty of the New England Conservatory. His influences range from rock guitarists to contemporary jazz guitarists, but Jim Hall, Bill Frisell, Egberto Gismonte and Ralph Towner are among the most important. Monder's chord voicings are beautiful, and he lists guitar books like Ted Greene's "Chord Chemistry" and Mick Goodrick's "The Advancing Guitarist" and "Almanac of Voice Leading" volumes as especially important in this respect.

Monder has released several solo albums and is a much sought after sideman who is featured on over hundred and eighty albums. He has performed with, among others, Maria Schneider, Paul Motian, Toots Thielemans, Marc Johnson, George Garzone, Dave Liebman, Jack McDuff and Lee Konitz. He has been listed as one of the most interesting guitarists on the jazz scene, acknowledged as deserving wider recognition in the Down Beat annual poll "Rising Star Category" several times. In 2014 he was voted onto the top-ranking poll.

Rez Abbasi

Rez Abbasi was born on August 27th, 1965 in Karachi, Pakistan. He came with his parents to the United States at the age of four and grew up in Los Angeles. He discovered Charlie Parker and be-bop at age 16 and became very focused on music that swung. He studied both jazz and classical music at the University of Southern California and Manhattan School of Music. For later studies he went to India to study with percussionist Alla Rakha. In 1987 he moved to New York City, where he has worked since. He lists Jim Hall, Pat Metheny, George Benson and Bill Frisell as some of his musical influences on guitar.

His reputation as a jazz guitarist has grown steadily in the last few years, and he regularly appears on the Down Beat Magazine list "Rising Star

Category," winning the category in 2013 and placed on the established list alongside John Scofield, Pat Metheny and more in 2014. He is a composer and producer as well, and has developed a unique sound as both a composer and instrumentalist on the New York scene, where he often combines Indian music with jazz. He has been working with downbeat winners Vijay Iyer and Rudresh Mahanthappa on several recordings. Likewise, he has performed or recorded with artists like Ruth Brown, Peter Erskine, Dave Douglas, Marc Johnson, Billy Hart and Greg Osby. He has also twice received the Chamber Music American Grant for composition.

Adam Rogers

Adam Rogers was born on August 19th, 1965 in New York City. He studied jazz guitar with Barry Galbraith, Howard Collins and John Scofield, and classical guitar for four years with Frederic Hand at the Mannes Conservatory of Music. Due to this long and extensive training he has an approach to improvisation that is reflected in his attention to form and clear expression. He mentions Wes Montgomery and Bill Frisell as some of his favorite guitarists, and John Coltrane and Miles Davis as favorite musicians in the jazz style.

Adam Rogers has a long and extensive session history. He has played on over 200 recordings as a studio guitarist, in addition to releasing his own solo projects and playing on soundtracks of numerous films and television commercial jingles. His reputation as an excellent guitarist is documented by a number of solo records in different styles but foremost in the modern jazz idiom. He has performed or recorded with jazz artist like Michael Brecker, Chris Potter, Cassandra Wilson, John Patitucci, George Russel, Eliane Elias, John Zorn, Kenny Barron, John Patitucci, Ravi Coltrane, and with more commercial artist such as Paul Simon, Norah Jones and Walter Becker (Steely Dan).

What strategies are used in professional jazz guitar improvisation? In this project Stein Helge Solstad finds that professional jazz guitarists use three main strategies; a basic coding strategy named chunking, an extended coding strategy based on context seen as schemas and an altered coding strategy based on skilled interaction in context, defined as templates. Chunking entails grouping of small information units into chunks. Networks of chunks are triggered in form of a schema, which can develop into large flexible entities, templates, and function as a resource during improvisation.

Solstad's practice-led research strategy has allowed questions, problems and challenges to be initiated and worked on in fieldwork. His aim has been to investigate how jazz guitarists' develop and use their skills in improvisation. The inquiry includes participant observation, playing with and interviewing five professional jazz guitarists in New York City. By examining the fieldwork Solstad has developed a modal matrix for analyzing structure, time and form in jazz guitar improvisation.

This research project finds that professional jazz guitarists' strategies are crucially dependent on context, style and type of interplay. Improvising is based on listening to what is happening in interplay and having flexible actions available to match the given input. Interplay defines the ways implicit (sub-conscious) and explicit (conscious) knowledge is used; the more familiar the context, the more use of implicit knowledge and intuition. Solstad's findings collapse the dichotomy constructed by the theories of top-down versus bottom-up expert skill, emphasizing that both approaches are needed dependent on time and place.

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ISSN 0333-3760
ISBN 978-82-7853-207-2