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Descriptions of Improvisational Thinking by Artist-level Jazz Musicians

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Descriptions of Improvisational Thinking by Artist-level Jazz Musicians

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Dissertation

Presented to the Faculty of the Graduate School of

The University of Texas at Austin

in Partial Fulfillment

of the Requirements

for the Degree of

Doctor of Philosophy

The University of Texas at Austin

August, 2008

Dedication

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Descriptions of Improvisational Thinking by Artist-level Jazz Musicians

Publication No._____

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The University of Texas at Austin, 2008

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I investigated the thought processes of seven artist-level jazz musicians. Although jazz artists in the past have spoken extensively about the improvisational process, most have described improvisation only in general terms or have discussed specific recorded improvisations long after the recordings had been made. To date, no study has attempted to record artists' perceptions of their improvisational thinking regarding improvisations they had just performed.

Seven jazz artists recorded an improvised solo based on a blues chord progression accompanied only by a drum track. New technologies made it possible to notate the recorded material as it was being performed. After completing their improvisations, participants described in a directed interview, during which they listened to their playing and looked at the notation of their solos, the thinking processes that led to the realization of their performances. The interviews were recorded, transcribed, and analyzed using a qualitative research methodology.

Six main themes were identified through the coding of the interviews. In all of the interviews, artists described making sketch plans, which outlined one or more musical features of upcoming passages. These plans became increasingly more explicit as the time to play each idea approached. The artists also described monitoring and evaluating their own output as they performed, making judgments that were often incorporated into future planning. Interestingly, the artists at times expressed surprise in hearing what they were playing, indicating that not all of the improvisations were based on ideas that were first imagined before they were played.

The artists described four strategies for generating the note content of their improvisations: recalling well-learned ideas from memory and inserting them into the ongoing improvisation, choosing notes based on a harmonic priority, choosing notes based on a melodic priority, and repeating material played in earlier sections of the improvisation.

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Chapter One

Introduction

Though improvisation lies at the heart of jazz, the thought processes guiding improvisation have received little attention in the research literature. The innumerable momentary decisions made by improvisers are influenced by multiple factors. Note choices are guided by the accompanying chord structure and rhythmic feel and are influenced by preceding events and intended goals. Rhythmic feel affects note placement, duration, melodic shape, and inflection. Interactions with other ensemble members add further complexity to the decision-making process.

Musical improvisation has been compared to spoken language, as both are created in real time (Berliner, 1994; Patel, 2003). Word choice is guided by syntactic rules just as tonal improvisation is guided by melodic, rhythmic, and harmonic rules. Language contains words and combination of words that are part of a speaker's vocabulary (Harley, 2008). Similarly, improvisers accrue a collection of melodic figures that can be incorporated into improvisations (Pressing, 1988).

The study of improvisation is informed by findings from multiple fields of study. Improvisation is but one form of human creativity, and both the improvisational processes and its products, like improvised music, have been analyzed in detail (Berliner, 1994; Pressing, 1988). Improvisation in music has also been considered through the lens of historical analyses that describe improvisational practices linked to styles and cultures (Fischlin & Heble, 2004; Nettl & Russell, 1998). The study of motor learning as it relates to the skilled execution of music instrument performance is certainly a part of this milieu.

More recently, a number of scholars have attempted to describe the cognitive processes engaged in the perception and production of music, helping to illuminate the many complexities of improvisational thinking in music and in other domains (Arentz, Hetland, & Olstad, 2005; Knosche et al., 2005; Koelsch & Siebel, 2005; Zatorre, Chen, & Penhune, 2007).

Though the literature review in the following chapter cites articles from a number of related fields, my focus in the current study is on performers' verbal accounts of their thinking processes during real-time improvisation. To begin to understand the decision making involved, it is helpful to consider improvisational thinking at several temporal levels.

The Temporal Levels of Decision Making

The details of improvisational analysis vary depending on the size of the improvisational unit being analyzed: note, idea, phrase, period, melody, section, movement, piece. This is not unlike the differences in levels of detail that appear as one views a physical object from different angles and distances. Paintings from afar, for example, appear quite different than they appear close up. The master pointillist Seurat created the impression of the color purple by placing individual points of reds and blues in juxtaposition. The viewer from a distance sees purple, even though there is no purple paint on the canvas.

Classical music can similarly be described using different units of analysis. An entire symphonic work may be described as one unit, or in terms of the individual movements it comprises. Individual movements may be described in terms of their structure. Individual themes may be subjected to a more detailed account, and the themes may be further parsed into phrases or smaller motifs or gestures, which are typically

characterized by note groupings of three to ten notes (Caplin, 1998). The analysis can focus ultimately on individual notes and their function.

In music composition and improvisation, these units of analysis also serve as the fundamental units of decision making and thus provide a framework for discussing musical creation with composers and improvisers. Specifically, jazz musicians' improvisational choices can be categorized according to the unit size that the choices encompass. Improvisational decisions may affect the entire solo, an upcoming chorus, the next phrase, figure, or individual note.

Decisions made on the solo level affect the overall architecture, length, and style of the solo. The improviser may decide to start a solo with a general predetermined plan. Clarke (1988) argued that this type of pre-planning of entire solos was prevalent in early jazz. The architecture plan may involve starting the solo with slower notes in a lower register and developing the solo by transitioning to faster notes in a higher register.

Decisions made on the chorus level affect all improvisational choices of the upcoming chorus. Many improvisations are based on multiple repetitions of the form on which the improvisation is based. The form is referred to as a chorus, and each repetition of the form represents another solo chorus. Improvisations based on the 12-bar blues form, for example, may contain many choruses. An improviser may decide to play simple repeated figures for an entire chorus. Different chorus-level decisions may be made about subsequent choruses.

Decisions made on the phrase level may affect various features of an upcoming phrase, like length and contour. The chord and melodic structures within a chorus that provide the context for tonal jazz improvisation contain predetermined phrase structures. At times the phrases of the improvised solo align with the phrases of the underlying chord structure, yet expressive tension may be created by deliberately adjusting the

phrase structure of the solo so that the structure does not align with the phrases suggested by the harmony.

Decisions made on the figure level only affect note choices of the upcoming melodic figure. A number of terms appear in jazz analyses and in interviews with jazz musicians that refer to small groupings of notes: licks (Owens, 1995), events (Clarke, 1988), ideas (Berliner, 1994), formulas (Finkelman, 1997), motives (Schuller, 1968), figures (Berliner, 1994), melodic patterns (Jost, 1974). Berliner (1994, p. 561) lists a number of figures derived from Charlie Parker solo transcriptions. Each figure contains between 5 and 13 notes; most include 8 to 10 notes. Improvisers may generate figures in the moment, though Pressing (1988) suggests that many such figures are stored in the improviser's long-term memory, and that the improviser inserts learned figures into improvised solos (cf. Clarke, 1988). The improviser's collection of learned figures is often referred to as his vocabulary (Berliner, 1994, p. 95).

The note is the smallest unit of decision making. It is probably rare that experienced improvisers make decisions about individual notes in isolation.

Of course, the decisions made on different levels during improvisation necessarily interact. Though it seems logical to assume a top-down process in which decisions made on higher levels always affect lower level decisions, it appears that a more complex interaction between levels occurs. One could imagine a scenario in which a top level decision concerning the melodic contour of an upcoming chorus is interrupted as a particularly salient repeated figure suddenly catches the attention of the improviser. The plan implied by the decision on the chorus level may be abandoned as decisions about the figure become the focus of attention. Little is known about the exact interactional processes between the decisions on the various temporal levels during improvisation.

An improviser may not make any conscious, deliberate decisions concerning the architecture of an improvisation, yet a structure may appear when the solo is later analyzed. No previous research has examined the difference between the apparent structure of transcribed improvised solos and the thought processes used by improvisers during real time creation. The current research attempts to disentangle the thought processes of improvisers from structures observed through analysis by asking improvisers to describe thought processes used in the creation of a solo immediately after performing an improvisation.

What Affects Decision Making?

Improvisational decision making is influenced by myriad factors, some of which are more or less determined before the music begins, whereas others come into play during the course of the improvisation itself. These influences may be categorized in terms of their locus of control (internal or external) and their temporality (a priori or in the moment).

For example, consider improvisational choices available to a jazz musician working as a sideman in a small group performing for a swing dance. By deciding to take the gig, the musician accepted a number of a priori external constraining factors that will influence all improvisational decisions throughout the gig. These factors include the setting, which calls for all the music to be in the swing style, and the sideman status, which means the musician will not typically choose the tunes. The knowledge and skills that the musician brings to the situation, like a vocabulary of swing style melodic figures and memorized chord progressions, are a priori, internal factors. As the musician improvises during a solo, other factors, like audience response and the playing of the other musicians in the band, influence the improvisation in the moment.

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All the internal factors that are present before the initiation of the improvisation are part of the improviser's knowledge and skill base (Pressing, 1998). The knowledge base includes a vocabulary of licks, memorized tunes, and knowledge of the history and theory of music, including specific information about stylistic conventions. The improviser's skill base includes problem solving strategies, techniques for choosing, adapting and connecting learned licks, and approaches to creating and storing new melodic figures. The skill base also includes listening strategies, like the ability to remember material played previously that can be used as a basis for new ideas, and the ability to interpret signals from other band members. In addition, the skill base includes the motor movements engaged in playing learned melodic figures that are encoded into procedural memory.

An ongoing internal evaluative process serves to further guide decisions on all levels. It appears that improvisers' evaluations of what they perform guides upcoming choices. Kenny and Gellrich (2002) suggest that this process takes place on multiple temporal levels similar to those described previously. Berliner (1994) quotes jazz drummer Max Roach, who explained that "from the first note that you hear, you are responding to what you've just played" (p. 192).

Interaction between the players in small group jazz influences all improvisational choices (Macdonald & Wilson, 2006; Monson, 1996). A jazz pianist, for example, may select chord voicings depending on the note choices made by the soloist he is accompanying. A soloist may spontaneously incorporate into her own solo the melodic or rhythmic figures performed by the rhythm section. Audiences may also affect the improvisational choices made by all members of a jazz group by their overt responses to the music as it is played.

The Timing of Decision Making and the Use of Learned Material

Improvisers routinely make decisions concerning upcoming material while performing. Just as speakers are able to construct new sentences during a conversation without pausing, which indicates that some improvisational planning must occur during speech (Harley, 2008), music improvisers also plan upcoming choices while in the midst of solo playing. No previous research has explored the timing of improvisational decisions by asking performers to identify decision points immediately after creating an improvisation.

It is in some ways difficult to differentiate material that is truly improvised from material derived from previously learned figures that are recalled from memory. Finkelman (1997) analyzed the use of figures in transcriptions of solos by bebop guitarist Charlie Christian. He found that Christian had a vocabulary of figures that permeated his improvisations. Similar results have been found in the solos of other jazz greats (Giel, 2004; Owens, 1995).

Little research exists that fully explores the use of learned figures in improvisation. How often, and under what circumstances, are figures used? How much can figures be altered and still be considered the same figure? These are the types of questions that remain to be answered.

To What Extent Do Improvisational Decisions Involve Conscious Thought?

The demands of real-time processing make it unlikely that all improvisational decisions involve conscious deliberation in that the number of decisions necessary to execute a musical improvisation far exceeds what is possible to decide consciously. As mentioned earlier, an improvising musician has to make decisions concerning pitch, rhythm, and articulation, and relate those choices to previously played material and to

overall plans. It is well known that only a limited number of decisions can be made on a conscious level concurrently and within a limited time frame (Dietrich, 2004).

The state of intense immersion into a seemingly automatic process has been labeled as "flow" (Csikszentmihalyi, 1990), "an almost automatic, effortless, yet highly focused state of consciousness" (Csikszentmihalyi, 1996, p. 110). Although some improvisational decisions are made unconsciously, the expert improviser is fully engaged in the task.

Though Csikszentmihalyi describes how many activities can be experienced in the flow state, Kenny and Gellrich (2002) specifically suggest that the flow state is applicable to improvisation. If a flow state is to be achieved, the activity should have "clear goals every step of the way" and "provide immediate feedback" (Csikszentmihalyi, 1996, p. 111). The improviser's goals are to follow the outlined plans on multiple levels and to play notes that fit the underlying chord progression. The improviser constantly receives auditory and proprioceptive feedback regarding those goals. Csikszentmihalyi explains that, during flow, self-consciousness disappears and that there is no worry of failure, which is reminiscent of verbal accounts by jazz artists. English jazz musician Ronnie Scott said that "One becomes unconscious of playing, you know, it becomes as if something else has taken over and you're just an intermediary between whatever else and the instrument" (Bailey, 1992, p. 52).

Theoretical Models of Thinking in Jazz Improvisation

Several theoretical models have been constructed over the past two decades to describe the improvisational thought process in jazz (Clarke, 1988; Kenny & Gellrich, 2002; Pressing, 1988). Clarke's model (1988) suggests that there are three main generative principles that guide improvisational choices: the hierarchical principle, the

lick assembly, and the associative chain. These principles are not mutually exclusive and are often used in combination to create the improvised output. The hierarchical principle applies when the overall design of the solo guides all lower level decisions. Clarke suggests that this generative principle was prominent in early jazz where solos were typically shorter and the overall structure often predetermined. The lick assembly involves connecting pre-learned figures to form longer lines, a technique typical of the bebop era of the 1940s. The associative chain is used when output is based on previously generated material from the same solo forming a "chain" of related newly created ideas. According to Clarke, this process was used frequently in free-jazz where there were no constraints set by chord structures.

Pressing (1988) designed an elaborate model of the improvisational process. According to Pressing, an improvisation is divided into a string of events. Each event is a grouping of notes initiated by one movement pattern. The improviser's key decision points are then defined as a series of time points corresponding to the beginning of each movement pattern. These decisions are based on previous events, the chord pattern or other structure on which the improvisation is based, a set of current goals, information stored in long-term memory, and the sounds produced by other performers. Also included in Pressing's model are mechanisms for incorporating auditory and proprioceptive feedback. Essential to this model is the division of improvisations into movement patterns or schemata, implying that the improviser makes decisions about note groupings but not about individual notes.

Kenny and Gellrich (2002) focus on conscious evaluative and planning processes that occur on different time scales. Their speculative model was devised by Gellrich and is based on unpublished interviews with expert improvisers and analysis of his own improvisation. In the model, the improviser alternates among eight mental processes

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during improvisation: short-, medium-, and long-term anticipation; short-, medium-, and long-term recall; a "flow status" process; and a feedback process. The anticipatory processes involve planning upcoming note choices, and the recall processes focus attention on what was just performed. Gellrich defines the flow status as a thought process in which the improviser is concentrating "solely on what is being created at that particular moment" (p. 124). The feedback process is defined as a thought process in which new material is created depending on material that was just performed. The model highlights how our finite cognitive resources constrain improvisational choices by focusing on only one of the eight processes at a time. In other words, if the improviser is consciously planning upcoming choices using the long-term anticipatory process, she can not evaluate performed material concurrently, according to Gellrich.

The speculative theoretical models mentioned above have not been verified in published experimental research. Verbal accounts of the process of improvisation have been gathered, yet none of this research has been systematically connected to the speculative models.

Interview Data

Two significant ethnographic studies have been conducted to examine the thinking of improvising jazz musicians. Paul Berliner (1994) conducted a large qualitative study based on interviews with over 50 renowned jazz artists. Another qualitative study by Ingrid Monson (1996) is based on 14 interviews and is primarily focused on the interactive element of improvisation.

The comments provided by the informants in both studies are often expressed in general terms. Interviewees were asked questions about improvisation most often without reference to specific music examples.

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Berliner (1994) shows specific music examples in solo transcriptions that illustrate some of the general findings of his study, locating the examples post hoc according to his interpretations of his informants' comments. It appears the interpretations were not verified by the participants, and many of the music examples are by artists who were not interviewed (e.g., Louis Armstrong, Lester Young, Clifford Brown, and Miles Davis).

Monson asked specific questions about actual music examples from her informants' extant recordings, but the material had been recorded long before the interviews were conducted. For example, she played a recording of the tune "Bass-ment Blues" for pianist Jaki Byard, which had been recorded live on April 15th, 1965; the interview was conducted nearly 30 years later. There is no doubt that Monson's analysis of the interaction between players on the recording is greatly enhanced by comments from Byard, yet it seems likely that his recollections of his thinking in 1965 were colored by the passage of time between the performance and the interview.

PURPOSE OF THE STUDY AND RESEARCH QUESTIONS

Great improvisers possess an astounding ability to create original music in the moment. The thinking processes underlying improvisation have been explored through speculative theoretical work; however, to date, the cognitive models constructed have not been experimentally verified. The improvisational process has also been explored through interviews with practitioners, but most of the information provided by informants is nonspecific and few analyses are linked to specific music examples.

The purpose of the present study was to describe the thinking processes underlying expert jazz improvisation. Artist-level jazz improvisers were asked to improvise on a known chord progression and were interviewed immediately afterward. I

used as the basis for the interviews audio recordings and approximate transcriptions of their improvisations, which I created immediate after their creation. I asked my informants to narrate their improvisational thinking processes as they listened and watched the notation of their just-completed performances, linking comments to specific musical material. The limitations of previous qualitative research concerning specificity and time between performance and interview were thereby addressed by the current research design.

In this study, I sought to accomplish the following goals:

1. Describe the thinking of artist-level jazz performers during improvisation.
2. Determine the consistency among different performers in the reports of their improvisational thinking.

LIMITATIONS OF THE CURRENT STUDY

The participants in the current study performed alone on their primary instruments, which include piano, saxophone, trumpet, violin, double bass, trombone, and guitar. Although all of my participants are recognized artist-performers, I selected them based on their availability and their willingness to participate. All participants were male.

The recordings of the improvisations and subsequent interviews took place in the residences or offices of the participants. One participant was recorded in a hotel room. All improvisations were performed at the same tempo along with a drum track; no chordal accompaniment was supplied.

Of course, it is possible, even likely, that results would have been different if the improvisers had performed on an unfamiliar chord progression, in a live setting with other musicians, or perhaps even in a different tempo. Any generalizations beyond the

data obtained from this sample of participants, who performed solo improvisations on the

blues form at medium-up tempo should be made with appropriate caution.

Chapter Two

Review of Literature

Ferand (1961) defines improvisation as "the spontaneous invention and shaping of music while it is being performed" (p. 5), a definition that has been adopted by a large number of scholars and is consistently cited in music reference materials (Nettl, 1998). Of course, the spontaneous generation of artistic products is not limited to music. Examples of improvised behavior are found in poetry (Lord, 1960), theater (Sawyer, 1999), dance (Blom & Chaplin, 1988), and other art forms. In fact, the central elements that define improvisation appear in a range of domains, artistic and otherwise (Balachandra, Bordone, Menkel-Meadow, Ringstrom, & Sarath, 2005; Eisenhardt, 1997; Miller, McDaniel, Crabtree, & Stange, 2001).

Two key concepts are implied in Ferand's definition of improvisation: invention and shaping, and real-time performance. One could argue that every live performance is unique, since some variation will exist between performances even if they are based on a specific set of verbal or written instructions. It is impossible for a human being to replicate the same performance exactly. During music performances, variation naturally occurs in dynamics and phrasing, but invention and shaping of musical improvisation necessarily includes the creation of musical ideas (pitches or pitch groups) in the moment (Sutton, 1998).

The improvising performer cannot stop a performance to contemplate upcoming decisions and must deal with all sounds, once produced (Sloboda, 1985, p. 138). This is in contrast to a composer who has the option of revision. A three minute improvisation takes three minutes to create; a three minute composition could take years to compose.

Ferand's definition of improvisation includes features that are common to many domains of human activity. The general process of classroom teaching, for example, has been compared to improvisational performance (Borko & Livingston, 1989; Sawyer, 2004). Sawyer (2004) argued that classroom instruction should be viewed as a creative, interactive process that is similar to the improvisational process in small group jazz and that curricula provide goals and sample scripts for instruction that are analogous to the tunes used as the basis for jazz improvisation. Instruction is guided by the curricular goals, but is continuously adjusted according to student progress. Indeed, the ability to respond to students' questions without abandoning instructional goals has been linked to teacher's experience (Borko & Livingston, 1989).

Empirical Ethnographic Evidence

Since the key features that define improvisational behavior are not domain specific, it may be that the thinking processes that guide improvisation are similar across domains. The similarities between two large ethnographic studies of improvised behavior in different domains provide an illustration of common underlying thought processes. Both studies include interviews with performers and include analyses of a large number of recordings. Berliner (1994) describes all aspects of the learning process in tonal jazz, and Lord (1960) outlines how South Slavic oral poetic songs have been passed down through generations. The classic study by Albert Lord is listed by Berliner as influential in the design of his own study (Berliner, 1994, p. 4), and has been cited in several other writings concerning jazz improvisation (Finkelman, 1997; Gushee, 1991; G. E. Smith, 1991; Spring, 1990).

On the surface, of course, tonal jazz and poetic songs are quite different. Jazz is a relatively recent phenomenon, developed from African influences in the very beginning

of the 20th century in the city of New Orleans (Schuller, 1968). Tonal jazz improvisation involves creating extemporaneous melodies within the structure of preset chord progressions (Berliner, 1994). Notes have to fit within chord structures as melodies are developed. An interactive element exists as performers often respond by incorporating other musicians' melodic and rhythmic ideas into their own improvisations (Monson, 1996).

Oral poetry in the Serbo-Croatian region is often performed by illiterate singers who improvise new versions of each song every time it is performed (Lord, 1960). A lone singer composes long folk tales in performance following strict structural constraints. Each line has ten syllables and includes specific syntactic and acoustic qualities. The singers do not memorize the tales word for word, but create the exact wording in the moment. The singer can embellish themes and shorten or lengthen the tales according to audience reaction.

The similarities between these two areas of improvisation become clear when one analyzes the learning process involved. Both Berliner and Lord describe the initial learning stage as immersion in the "tradition," a process that is largely implicit. The young jazz musician may hear his father's band rehearse in the living room (Berliner, 1994, p. 22) just as the young shepherd boy may learn from listening to older singers who visit his house occasionally (Lord, 1960, p. 21). Berliner describes how many young jazz musicians heard jazz standards on the radio and on the jukebox and talked about jazz with their friends.

In the next stage of development, learning becomes active, as young, less experienced performers start to imitate their idols. In this stage, explicit learning strategies are more evident, and performers acquire specific learned phrases that are used in deliberate practice (Berliner, 1994, p. 101; Lord, 1960, p. 32; Treitler, 1974). In music,

these learned phrases are short melodic figures characteristic of the jazz style that help the young improviser play over specific chord progressions. These are often transcribed from recordings and practiced in all keys.

In oral poetry, the learned phrase is a ten-syllable line that expresses a particular idea, such as "and the emperor was angered at me" (Lord, 1960, p. 42). As the young performer becomes more proficient, the vocabulary of formulas deployed in performance is gradually expanded and the utilization of each formula becomes more fluid. During this stage, the young singer mostly practices singing alone or for smaller groups of friends, just as the young jazz musician performs in informal jam sessions.

In the final stage of learning, the performer has accumulated a large collection of learned phrases and the ability to vary them to fit different contexts (Berliner, 1994; Lord, 1960; Nettl, 1974). Both retrieving and shaping the learned phrases has now become completely automatic. The performer has developed the ability to improvise within the constraints of the tradition using unique versions of the learned phrases. The performer's conscious focus is now directed toward larger structures and toward interaction with the audience and other performers. The jazz musician is thinking of the overall structure of the solo and about communicating with the audience and rhythm section (Monson, 1996). The singer of tales in now concerned with developing longer and more elaborate stories.

These three learning stages can be described as immersion, imitation, and mastery. During the immersion stage, rules about the idiom are learned implicitly. This process seems to be essential for the later development of improvisational abilities (Hall, 1992). By the imitation stage, the performer already has a sense of the performance goal, which is essential to motivation and practice. The use of learned phrases supports the real-time component of the thinking process and serves as a link to the tradition. By the

third stage, the performer is able to improvise in a fluid, automatic process in which constraints are incorporated implicitly.

In the current study I investigate the thought processes of artist-level jazz improvisers that have presumably reached the third stage described above. To reach this stage, the improvisers have accumulated a great deal of information that is stored in memory.

The Knowledge Base

The knowledge base represents the tradition and strategies for creating improvisations in real-time (Pressing, 1984, 1998). It is built into the long-term memory of the performer through practice, listening, and cultural immersion. Pressing (1998) explains that "the knowledge base will include musical materials and excerpts, repertoire, subskills, perceptual strategies, problem-solving routines, hierarchical memory structures and schemas, generalized motor programs, and more" (p. 53). In music, this includes the performer's repertoire of tunes and melodic figures, and ways of analyzing and coding new repertoire.

It is important to consider that the information and skills included in the knowledge base vary in terms of their complexity and duration.

Learned melodic figures, referred to variously as licks (Owens, 1995), events (Clarke, 1988), ideas (Berliner, 1994), formulas (Finkelman, 1997), motives (Schuller, 1968), figures (Berliner, 1994), and melodic patterns (Jost, 1974) are perhaps the briefest elements of coherent, stored information. Two views exist in the literature concerning the use of learned figures. In one view, a learned figure is inserted into an improvisation note for note (Gushee, 1991; Weisberg et al., 2004); improvised performances are thus partly precomposed, though the performer may reshape and combine the figures in various

ways (Owens, 1995). Several studies have analyzed solo transcriptions of jazz performers and found multiple examples of repeated patterns (Finkelman, 1997; Owens, 1995; Spring, 1990; Weisberg et al., 2004).

In an alternative view, the performer inserts melodic figures that are based on a learned procedure (Finkelman, 1997). Finkelman uses the term "formula" to signify that the melodic figure is reconstructed in the moment according to a template that contains specific rules. He gives an example of a formula that dictates a collection of notes that must be played in descending motion starting on the first or third beat of the measure. Many different figures can be constructed using this procedure, yet all the resulting melodic phrases are derived from the same formula.

It seems likely that musicians at times insert specific learned figures note for note and at other times use formulas. This is in line with Berliner's description of ideas: "Ideas themselves may be specific or general, or comprise a combination of specific and general properties" (Berliner, 1994, p. 800). This suggests that the artist-level improviser's knowledge base contains both specific learned figures and formulas for creating new phrases. Unfortunately, the vocabulary used in the literature on improvisation is not uniform. At times, learned figures are referred to as formulas, and formulas as defined above are referred to as formulaic systems or superformulas (Gushee, 1991). In the current paper, I use the term learned figures to refer to material applied note for note from long-term memory, and formulas to refer to material created from a template.

Learned figures are represented as internal memory structures that are both musical sounds and instrument specific motor information (Pressing, 1998). One the most salient manifestations of internal representations of musical sound is the phenomenon referred to as musical imagery (Godøy & Jørgensen, 2001). Tonal imagery has been linked to phenomenological descriptions of jazz improvisation (Pike, 1974) and has been

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used by jazz musicians to describe the improvisational process (Berliner, 1994, p. 181). Most people can "sing tunes in their heads" without actually vocalizing aloud. Neurological studies have shown that musical imagery elicits neural responses in the auditory cortex similar to responses observed during the perception of actual music (Zatorre, Halpern, Perry, Meyer, & Evans, 1996). In addition, improved auditory imagery ability has been observed in musically trained subjects (Aleman, Nieuwenstein, Bocker, & de Haan, 2000). Musical imagery can even be triggered by music notation symbols whose decoding is dependent on musical training (Brodsky, Henik, Rubinstein, & Zorman, 2003).

Learned figures are also represented in long-term memory as procedural information linked to the motor movements necessary for performance on the improviser's instrument. These Generalized Motor Programs (GMPs) can also be classified as internal memory structures, but they are specifically tied to schemas for motor movements (Schmidt, 1975; Shea & Wulf, 2005). The GMP codes information about a movement sequence in a form that is adaptable to accommodate different performance conditions. Just as an individual can sign his name on a paper sitting on a desk top and adapt that same GMP to sign his name on a blackboard, so can a musician perform a given tone sequence with varied parameters of tempo, loudness, and articulation, all of which engage the same GMP.

Thus, in addition to the musical images stored in long term memory, the movement necessary to execute musical gestures is encoded through practice. As a newly learned gesture is practiced repeatedly, an internal representation is generated and stored in the parts of the brain associated with coordinated movement (Petersen, van Mier, Fiez, & Raichle, 1998). A skilled improviser can then retrieve the entire melodic figure as one entity in which the physical components of the figure are performed without conscious

involvement (Fuster, 2001) and can adapt the figure to different tempi or different keys (Pressing, 1998).

Structures of Moderate Duration in the Knowledge Base

The knowledge base includes information about longer memorized structures as well, including procedures for connecting melodic figures into longer phrases. The internal representation of higher structures in music has often been compared to the internal representation of language (e.g. Besson & Schön, 2003; Jackendoff & Lerdahl, 1980; Koelsch, Gunter, Wittfoth, & Sammler, 2005; McMullen & Saffran, 2004; Patel, 2003). This comparison is interesting, since many jazz improvisers often use linguistic terminology to describe their thinking process and the process of communicating with other musicians and the audience (Berliner, 1994; Monson, 1996). Patel writes, "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). Though it appears that language and music are processed in different parts of the brain, recent neurological studies have shown that the syntactical elements of the two domains may share processing features (Besson & Schön, 2003; Koelsch, Gunter, Wittfoth, & Sammler, 2005; Patel, 2003). Koelsch et al. (2005), for example, played two sequences of chords, one that represented a standard harmonic progression and one that ended with an irregular chord representing a syntactical violation of tonal principles. Event-related potentials (ERP) measured using electroencephalography showed similar responses between the irregular chord condition and a language condition that included syntactical violations.

Large Structures in the Knowledge Base

The knowledge base includes all the music the improviser has learned previously. Specifically, this includes structures that can serve as the basis for improvisation, sometimes called the referent, the structure within which the performer improvises during a particular performance (Pressing, 1998). Pressing (1984) explains that "the referent is an underlying formal scheme or guiding image specific to a given piece" (p. 346). An example from the jazz repertoire is the tune "Body and Soul," which includes a melody and corresponding chord progression. The improviser may use melodic material from the melody and is constrained by the chord sequence. For the improvisation to "fit the chords," the improviser has to follow conventions of the jazz tradition that dictate how the improvised line will relate to the chords (see the Johnson-Laird model below). During improvisation, the performer's familiarity with the tune (the referent) interacts with other information in the knowledge base (general internalized information).

In summary, the knowledge base of the improviser includes a collection of learned figures, formulas for creating new figures, and syntactical rules for combining the figures into longer phrases. The physical representations of learned material are stored as GMPs, and the auditory representations are stored as auditory images. The knowledge base includes all the musical material the performer has played previously, including referents that may be used as the basis for improvisation. Various models suggest ways the improviser uses the information in the knowledge bank to create an improvised output.

GENERATIVE MODELS

A number of speculative models have been suggested to describe the generative thought processes of improvisers (Clarke, 1988; Johnson-Laird, 1991; Pressing, 1988).

The Clarke and Pressing models both describe how groupings of notes are created and combined by the improviser. Johnson-Laird stresses how improvisers use rules to make individual note choices.

Clarke (1988) notes that the use of formulas is only one of three main principles that guide musical improvisation. The first principle is the use of a larger hierarchical structure that may be partially constructed beforehand. An analysis of an improvised solo constructed according to this principle is illustrated as a tree structure of individual tonal events (E) fitting together on various levels (see Figure 1a). Tonal events are combined to create phrases, phrases are combined to create each improvised chorus, and several choruses are combined to form an entire solo. The improviser may predetermine the overall structure of the solo and use this information to partially guide individual note choices. For example, Lester Young at times used a three section plan over a two chorus solo. He would start by developing a simple idea then switch to a more technical approach, culminating in an expressive peak created by a repeated riff (Berliner, 1994, p. 236). The predetermined plan for his solo therefore guided individual note choices.
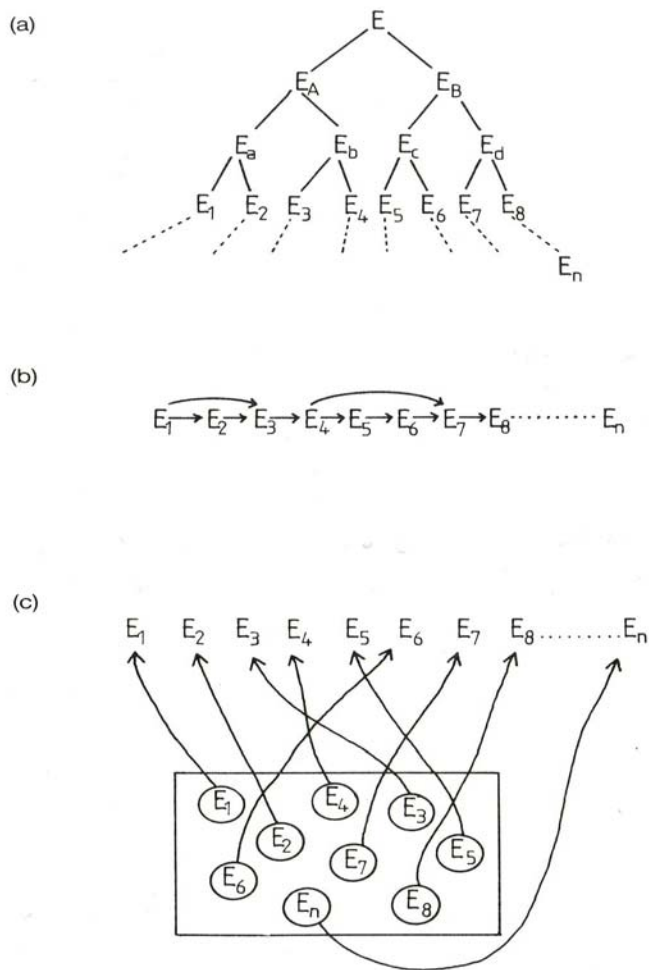
Figure 1:   Three ways of organizing musical events (E): a) hierarchically, b) associatively and c) by figure selection (from Clarke, 1988, p. 9).

Clarke's second principle guiding musical improvisations is the associative chain. Following this principle, the improviser starts the solo with a figure or musical event (E) and continues with musical material derived from the initial event. The initial musical figure may be repeated or repeated with slight variations. Subsequent figures could also contain elements contrasting the previous figures. When using this principle, musical

figures are improvised in the moment in response to previously played material. This generative principle is illustrated in Figure 1b.

The third principle guiding musical improvisations according to Clarke (1988) is the chaining together of melodic figures taken from the performer's vocabulary (Figure 1c). Clarke (1988) argues that the use of learned figures is part of the improvisational process. As noted above, this argument is supported by musicians' verbal accounts, jazz analyses, and analysis of other domains of improvisation (Berliner, 1994; Lord, 1960; Owens, 1995; Schuller, 1968).

Clarke makes clear that in actual performances, all three generative principles contribute to the creation of improvisations. However, he links the hierarchical principle with early jazz, the figure selection with the Bebop era, and the associative chain with free jazz. One of the issues left unresolved by Clarke is the length and nature of the event (E). He describes the event as a low-level musical unit or a pattern that the improviser has memorized, but does not specify its length.

Triggering Note Groupings

Pressing (1988) also divides improvisations into collections of note groupings. He suggests the improviser initiates groupings of notes during improvisation as opposed to thinking of individual notes. Each note grouping is triggered by a creative impulse that is translated into intended sound and corresponding motor action. As the grouping is being performed, the improviser compares the intended output with the actual output. All information about the grouping is then used to initiate the following note grouping.

Like Clarke, Pressing labels groupings of notes as events. Though he does not define the length of these groupings, he gives several examples of events that include three and four notes. According to Pressing, the model is based on the assumption that

each event is triggered by a mental schema at a specific time point at which a "creative impulse presents itself as an intention," represented as a cognitive image of sound and corresponding motor realization (Pressing, 1988, p. 159).

As the mental schema is executed, the improviser integrates the intention with the actual performed output through various feedback links. Pressing asserts that three main "aspects" are involved: musical, movement, and acoustic. Initially, the improviser has a cognitive representation of the intended musical output ("musical") and a corresponding motor realization ("movement"). As the note grouping is being performed, the produced auditory output ("acoustic") is compared to the cognitive representations of the intended musical and movement information.

On a larger scale, an improvisation is made up of a string of events that may or may not be related. New events often share features with preceding events, resulting in a related set of events. Yet, at times, the improviser may choose to interrupt the flow by initiating an event that is completely unrelated to a preceding event.

Pressing's (1988) model shows how an upcoming event is affected by the preceding event, the improviser's overall goals, the referent, material in long-term memory, and sound from other players. Figure 2 shows each of these influences as arrows that affect the array generator responsible for shaping the next event. Specifically, figure 2 depicts the moment the event Ei is fully executed and Ei+1 is initiated. As Ei+1 is executed according to a mental schema, various feedback processes compare intended actions with actual perceived feedback using the following parameters (labeled "aspects" in the diagram): "acoustic aspect (audible sound), the musical aspect (cognitive representation of the sounds in terms of music-technical and expressive dimensions), and the movement aspect (including timing of muscular actions, proprioception, touch, spatial perception, and central monitoring of efference)" (Pressing, 1988, p. 154). Each of these

aspects is further decomposed into three types of analytical representations (labeled "arrays" in the diagram): objects (unified entities such as a note), features (tunable features of each object, such as the pitch, duration, and articulation of a note), and processes (changes in objects and their features over time). All the information about Ei is gathered and fed to the "array generator" that plans the following event Ei+1 by integrating and comparing this information with sounds from other players, the referent, overall goals, and other information stored in long-term memory. The array generator's output is the mental schema for the next event, Ei+1, divided into the same aspects and array divisions used in the feedback process. As the next event is executed the entire process repeats.
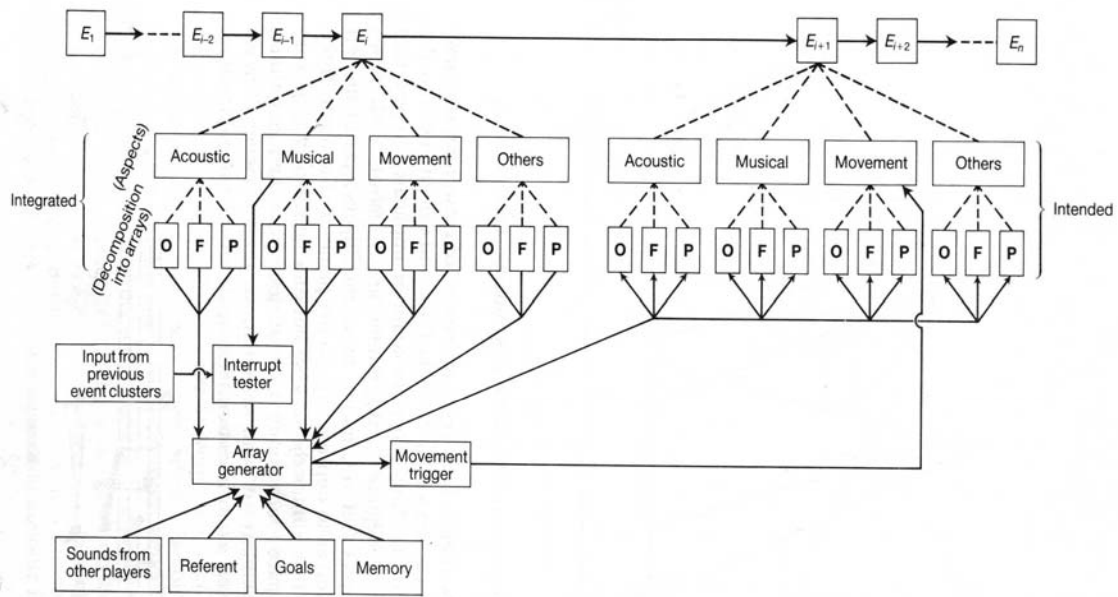
Figure 2:   The model shows the moment a mental schema of Ei+1 is formulated based
on the preceding note grouping, event Ei. At this point the "Acoustic"
(audible sound), "Musical" (cognitive representation of sound), "Movement"
(motor information) and "Other Aspects" of Ei are realized. The intended
and actual behavior of Ei is "Integrated," whereas the various aspects of
Ei+1 are only planned as "Intended" action. Each aspect is "decomposed
into arrays," where O represents existing objects, F, the objects' features,
and P, how the features and objects change over time. The "Array
generator" receives input from the executed event Ei and compares this to
the "Referent," the "Goals" of the improviser, information in the
improviser's "Memory," and the "Sound from other players." In addition, the
array generator incorporates information from an "Interrupt tester" that
receives "Input from previous event clusters" and from the musical aspect of
the current event to determine whether the upcoming event, Ei+1, should be
related to the event Ei. Finally the output of the array generator
communicates a plan for the upcoming event, Ei+1, to the improviser
through the same arrays and aspects. A "Movement trigger" is added
between the array generator and the movement aspect of the upcoming event
(from Pressing, 1988, p. 160).

A chain of events may be based on similarity or contrast (Pressing, 1988). Similar to Clarke's associated chain, Pressing proposes that each event is related to the preceding event; however, he adds an "interrupt tester" module that compares each event to previous event clusters. If the interrupt tester is engaged, it resets all array components in the next event through the array generator so the next event is completely unrelated. The decision to continue the current string of ideas or interrupt the chain and start a new class of related events is guided by input from previous event clusters and information in the musical aspect.

Pressing adds that many elements of the process are represented multiple times in the model. He explains this redundancy in the design as necessary to model how some elements can be represented in multiple forms. He cites as an example how "the performer knows that certain motor actions involved in striking a kettle drum (motor aspect) will correspond to a particular sound (acoustic aspect), with associated musical implications (musical aspect)" (Pressing, 1988, p. 158).

The interaction of perception and action planning implied by Pressing's model has been explored in recent research. In one experiment, subjects were asked to play intervals on an electric piano while the auditory feedback from the instrument was altered electronically (Drost, Rieger, Brass, Gunter, & Prinz, 2005). When the auditory feedback did not match the key presses, musicians' performances were slower, leading the authors to speculate that learned associations between actions and perception interfered with performance. This learned association between the sound that is expected and corresponding motor movements is critical to the improvisational process. This also implies that skilled musicians may be able to execute their intended output with more accuracy.

Determining Individual Notes Based on Rules

Johnson-Laird (2002) argues that note groupings are less important than rules and instead focuses on these rules as the main guiding principle behind improvisation. These rules are dictated by the chord progression of the referent and melodic contour considerations. His theory is based on the assumption that the improviser must be able to improvise with minimal use of working memory. To model human thinking during improvisation, he designed a computer program that can improvise a bass line that fits a given chordal progression without storing intermediate results.

Johnson-Laird (2002) states that it is easier for improvisers to extemporize new melodies based on a set of rules than to commit a large number of learned figures and phrases to long-term memory. He cites as evidence transcriptions that show that jazz improvisers invent novel material more often than simply inserting learned figures because the appearance of exact repetitions of figures are rare. Additionally, he argues that even if improvisers at times use prelearned figures, these figures would have to be created at one point. His main argument is simply that artist-level improvisers have internalized enough rules to create improvisations that are aligned with the tradition without the use of learned phrases.

Johnson-Laird (2002) based his model on general theories of creativity. In many creative domains, the initial output generated is not acceptable. Multiple stages must follow to evaluate and refine the output and finally create an acceptable solution. According to Johnson-Laird, humans are better at criticizing than creating, so they often create a draft that is then refined in progressively better versions until a final version is settled upon (Gardner, 1993). However, generating this way takes time and would not be applicable to creative products generated in real-time.

Johnson-Laird (2002) suggests that jazz improvisers use a different algorithm in which a set of constraints assure that all output is valid after the initial generation stage. If the output includes more than one possible option, then the final selection is more or less arbitrarily determined. Johnson-Laird argues that such an algorithm must be used by jazz improvisers since they are able to generate an output in real-time.

In addition to generating a valid output according to constraints, the improviser, according to Johnson-Laird, must be able to create with limited use of working memory. Johnson-Laird states that "the bottleneck in improvisation, as in cognition in general, is the limited processing capacity of working memory" (Johnson-Laird, 2002, p. 422). He gives examples of tasks that require that the individual retain intermediate results in working memory. For instance, the sentence "The woman the pupils admire likes running" requires the reader to store information in working memory due to the embedded clause. To limit the processing requirements of working memory, Johnson-Laird suggests that the improviser should not be required to retain intermediate results in working memory.

Johnson-Laird (2002) suggests a simple set of rules that fulfill the requirements listed above. The rules constrain note choices so that only a few possible outcomes are generated at a given moment. In addition, the rules do not require the improviser to retain very much information in working memory. To illustrate these points, Johnson-Laird created a computer program that can improvise a walking bass line when given a chord progression. He states the program improvises on "the level of a moderately competent beginner" (Johnson-Laird, 2002, p. 438), and that it is designed to model very limited use of working memory.

The two rules that Johnson-Laird uses to create an improvised output are based on chord-scale relationship and contour considerations. In tonal jazz, the improviser uses the

chord symbols of the referent to suggest scale choices (Baker, 1988). The scale choices include both the notes in the chord and passing tones. Johnson-Laird suggests that the improviser uses a set of rules related to the chord to choose possible notes in a given moment.

Johnson-Laird proposes that contour rules then determine note choices, explaining that the improviser chooses notes that are mostly a scale step apart with some leaps interspersed. He notes that scale passages often alternate between chord tones and passing tones. Passages that use primarily skips, however, consists of mostly notes in the chord.

Both these rules do not require the improviser to store intermediate results. The chord dictated by the referent suggests possible notes independent of which notes were played previously. The contour rules, according to Johnson-Laird, require the improviser to retain only the last couple of notes in working memory. In both instances, the rules are independent of previous note groupings or phrases. Therefore, the processing capacity of working memory to execute the rules suggested by Johnson-Laird is limited.

The models above suggest ways that improvisers use information in the knowledge base to create improvisations. Pressing and Clarke suggest that improvisers use note groupings while creating. Johnson-Laird stresses that rules for choosing individual notes rather than groupings drive the thinking of advanced improvisers. None of these models address directly what the improviser is thinking about consciously. The following section addresses the perspective of the improviser.

Conscious and Unconscious Processes

According to verbal accounts, it appears that two mental processes occur during improvisation, a conscious, explicit process and an unconscious, implicit process.

"Sometimes, the ideas come from my mind, and I have to find them quickly on my horn. But other times, I find that I am playing from finger patterns; the fingers give it to you." (Harold Ousley quoted in Berliner, 1994, p. 190). Ousley's comment roughly reflects two mental processes outlined by Dietrich (2004). One process is explicit and relies on the conscious mind; the other is automatic and is directed by implicit information. Dietrich argues that this separation is reflected in two functional systems that can be dissociated anatomically and in the way the systems process information. The explicit system is associated with higher cognitive functions processed by the frontal and medial temporal lobes, and the implicit system relies on skill-based knowledge supported by the basal ganglia. This separation of processes is consistent with the division of long-term memory into explicit memory (episodic and semantic memory) and implicit memory (skills and habits, emotional associations, and condition reflexes) (Nolte, 2002).

Both processes rely on information stored in the knowledge base. During conscious engagement, the improviser may use explicitly learned rules related to the tradition to construct new material. When consciously disengaged, the improviser relies on learned material stored as GMPs and simple routines like those suggested by Johnson-Laird (2002).

The implicit, unconscious process is often described as automatic. Performers describe how they watch their body achieve fluency, often beyond the performers' known limitations. Jazz musician Ronnie Scott explains, "one becomes unconscious of playing, you know, it becomes as if something else has taken over" (Bailey, 1992, p. 52). Pianist Fred Hersch describes how this state of mind appears to expand ones abilities: "Everything just fell into place in my hands and in my head. I played all this technical stuff that I couldn't sit down and play now - even if I could practice it for eight hours" (Berliner, 1994, p. 217).

Dietrich (2004) points out that this implicit automatic process is analogous to Csikszentmihalyi's description of the flow state. According to Csikszentmihalyi, flow is experienced when the following conditions are met:

1. *There are clear goals every step of the way.*

2. *There is immediate feedback to one's actions.*

3. *There is a balance between challenges and skills.*

4. *Action and awareness are merged.*

5. *Distractions are excluded from consciousness.*

6. *There is no worry of failure.*

7. *Self-consciousness disappears.*

8. *The sense of time becomes distorted.*

9. *The activity becomes autotelic.* (Csikszentmihalyi, 1996, pp. 111-113)

Csikszentmihalyi uses music performance as an example of a creative activity where the goal is playing upcoming notes and feedback is the auditory output of the instrument. Berliner (1994, p. 210) describes how improvising musicians use mistakes as inspiration and seamlessly incorporate them into their improvisations. This is in line with Csikszentmihalyi's observation that during flow "there is no worry of failure."

According to Dietrich (2004), the implicit system responsible for the feeling of flow relies on processes that are partly stored in procedural memory. These processes do not rely on the conscious mind and working memory but can be executed through direct links to motor functions. The system is complex and is able to execute several concurrent processes; however, information in the implicit system is tied to specific tasks and is not as flexible as information processed by the explicit system.

Dietrich (2004) outlines how implicit knowledge may be gained through implicit learning. Implicit learning takes place through imitation and without explicit instructions from the conscious mind. This is in line with the learning processes of imitation and enculturation in jazz and oral poetry mentioned earlier. This provides a possible explanation for the empirical phenomenon of being able to perform "without thinking"; that is, without engaging the conscious mind.

A recent functional magnetic resonance imaging (fMRI) study explored the thinking of advanced improvisers during simple and complex improvisational tasks (Limb & Braun, 2008). In both instances the pattern of brain activity featured decreased activation in the lateral prefrontal cortex during the improvisational task in comparison to a control task. The lateral prefrontal cortex has been associated with consciousness (Fuster, 2001), so the results imply the improvisers rely less on conscious processes during improvisation. Though the results of this exploratory study have not yet been duplicated, they do appear to align with the verbal accounts above and with Dietrich's observation that jazz improvisation may be partly controlled by the implicit system.

A Model for Conscious Mental Focus

The other process implied in Ousley's comment concerning "ideas coming from the mind" appears to be explicit, in that the conscious mind directs improvisational behavior. Gellrich (Kenny & Gellrich, 2002) presents a model of conscious mental focus during improvisation that suggests the improviser may focus on short-, medium-, or long-term planning or recall. The improviser may also be consciously focused on what is created in the moment in a state of mind labeled "flow status," inspired by Csikszentmihalyi. Finally, the improviser may be engaged in recall and evaluation of previously improvised output and project how this material may be incorporated into the

current improvisation. Gellrich labels each of these mental focuses as "processes" and states that the improviser "typically shifts from one process to another but cannot combine two or more simultaneously" (Kenny & Gellrich, 2002, p. 124). The mental processes are explained as follows:

1. *Short-term anticipation:* At any point in the improvisation, musical events are anticipated within a time interval we estimate to be around 1 to 3 seconds.

2. *Medium-term anticipation:* Musical events that occur within a 3- to 12- second time span (i.e., the next phrase or period) may be anticipated and projected into the future.

3. *Long-term anticipation:* Projection of long-term plans for the remainder of the improvisation.

4. *Short-term recall:* Musical events that have occurred over the last few seconds can be recalled, in a process where concentration is focused on prior events.

5. *Medium-term recall:* Musical events that have occurred within the last 4, 8 or 16 measures can be recalled so as to provide an accurate recollection of the previous musical phrase.

6. *Long-term recall:* Improvisers are able to recall the entire improvisation from its genesis up to the present moment.

7. *Flow status:* Improvisers are able to concentrate solely on what is being created at that particular moment.

8. *Feedback processes:* Musical ideas for the future projected improvisation may be gathered from that which can be previously recalled. (Kenny & Gellrich, 2002, p. 124)

Gellrich explains that "feedback may be further extended to include the ongoing evaluation of musical events in the light of information held in medium- and long-term recall" (Kenny & Gellrich, 2002, p. 124). The feedback process therefore appears to evaluate material just performed working concurrently with the recall process, though it seems a bit unclear why Gellrich suggests that none of the processes listed above can be combined.

Gellrich states that his model is based on unpublished interviews with expert improvisers and personal analysis of his own improvisations. It is possible that the process listed above as "flow status" is similar to the implicit ongoing process mentioned previously. If this is so, one could argue that this process denotes a lack of conscious focus and should not be categorized as a conscious process.

LEARNING TO IMPROVISE

The current study does not specifically explore how advanced improvisational skill is developed. Nonetheless, several participants did comment on improvisational learning and teaching. The following section details how explicit instruction can develop procedural skills and relates this to jazz improvisation through an introspective account describing how an adult musician learned to improvise. In addition, improvisation with children is explored.

To explain how interaction between the explicit and implicit systems can result in procedural learning, Dietrich (2004) gives the example of how novices learn to drive cars. Learners initially drive following explicit instructions from a teacher, all the while consciously engaged in the activity, coordinating motor movements with visual and verbal cues. With increasing experience and practice, the implicit system takes over

functions such as motor movements controlling the pedals and the wheel and visual recognition activities. Thus, skills learned explicitly become implicit through practice.

The following account of improvisational learning appears to feature a similar progression from explicitly to implicitly guided behavior resulting in the experience of flow (Csikszentmihalyi, 1990; Dietrich, 2004; Sudnow, 2001). Sudnow (2001) provides an introspective analysis of the process of learning to play jazz piano that describes stages leading to the experience of flow in jazz performance. These stages are comparable to the learning stages in jazz and oral poetry described earlier. He describes in the first stage how his conscious mind tried to follow the chords dictated by the referent and how he tried to fit learned chord and scale patterns to each chord by moving his hands. "I began going up with a fast, sputtering, and nervous scale course, and the next chord came up and I had to shoot back down to the middle of the keyboard to get the thing I knew how to do well done for it, and then came the next chord" (Sudnow, 2001, p. 33). Sudnow describes how in the second stage sounds started to control the hand movements, how he "aimed for the sounds of particular notes," and how his hands automatically moved to depress keys that would elicit these sounds (Sudnow, 2001, p. 40). Sudnow found that in the third and final stage he could play melody lines that "interweavingly flow[ed] over the duration of several chords" (Sudnow, 2001, p. 77). He describes the characteristic feeling of automaticity associated with flow as follows: "I'd see a stretch of melody suddenly appear, unlike others I'd seen, seemingly because of something I was doing, though my fingers went to places to which I didn't feel I'd specifically taken them" (Sudnow, 2001, p. 76).

Children's Vocal Improvisations

Sudnow describes how an adult learned jazz improvisation. It appears that all children have a natural aptitude for improvisation that develops even in the absence of improvisational instruction (Brophy, 2005; Dowling, 1982; Kratus, 1995). The phenomenon of spontaneous vocal improvisation develops between the ages of 2-5 years old (Mang, 2005), and a more advanced stage of instrumental improvisation appears to surface around the age of 9 (Brophy, 2005).

Children engage naturally in vocal improvisation (de Vries, 2005; Dowling, 1982; Mang, 2005; Moog, 1976). Two recent longitudinal studies describe stages of vocal improvisatory abilities using two different research paradigms. The first study describes a single subject who received instructional intervention (de Vries, 2005), and the second is based on observation and interview data gathered in children's natural environments (Mang, 2005). de Vries investigated the improvised vocal behavior of his son Jack from ages 25 to 36 months, and Mang investigated the singing of 8 girls ages 2-4 observed in their homes over a 42-month period.

Around 18 months of age, children develop the ability to sing discrete, recognizable pitches and begin to engage in spontaneous singing. Mang (2005) reports that her subjects were able to sing song fragments with words and nonsense syllables at this age but not with a stable pitch center. Children tied melodic content to lyrics, and if they forgot the lyrics they would often stop singing. Examples of improvisatory behavior included novel combinations of songs and the shifting of words from one song to a melody from another. Extensive vocalizations with nonsense syllables alone were not observed (Mang, 2005).

de Vries reports that his son Jack at around 25 months engaged in spontaneous atonal singing in phrases 3 to 8 seconds long. Initially, Jack sang individual phrases.

After his dad mirrored these phrases back to him, Jack started answering with new phrases using the same overall melodic contour. This produced improvised vocal dialogues that lasted from 3 to 12 call-and-response exchanges. At 27 months, de Vries started responding to his son's vocal improvisations using novel patterns. de Vries changed tempo, dynamics, or syllables, and his son answered using the modeled parameter, extending the complexity of the earlier call-and-response patterns.

At 28 months, de Vries started to present recognizable melodic patterns from songs Jack had heard, like the ascending fifth from the beginning of "Twinkle Twinkle Little Star." When Jack successfully mirrored these melodic patterns, he received positive verbal feedback. At 31 months, Jack began to imitate his own melodic patterns in vocal improvisations. In the last stage outlined by de Vries, Jack sang phrases from familiar melodies intertwined with vocal improvisations. This corresponds with the final stage outlined by Mang, who cites an example of a girl who drew while singing words extemporaneously from the song "The Green Grass Grew All Around."

At around the age of 4 years old, children can sing entire phrases in the same tonality, yet may modulate keys between phrases (Moog, 1976). At around age 5, many children have accumulated a repertoire of nursery rhymes they can sing in tune (Moog, 1976). Yet, at this point vocal improvisation may disappear due to a culturally learned fear of error and a focus on performance of pre-composed materials (Sloboda, 1985, p. 206). However, vocal improvisation has been documented in older children's unsupervised play activities in several different cultures (Kartomi, 1991).

The different research paradigms employed by Mang and de Vries highlight the effect of words in songs on improvisational behavior. Jack was specifically encouraged to engage in vocal improvisations with neutral syllables and was not afraid of singing songs without words. Other authors also suggest that, in order to focus on pitch information,

children should hear and learn songs without words (Gordon, 2003). The children in Mang's study did not perform songs for which the words could not be recalled. This was presumably because during the initial internalization of songs each pitch was inextricably linked to a syllable. Mang reported that, though children sometimes changed words and substituted nonsense words, they stopped if they could not remember words to a song.

Children's spontaneous vocal improvisations illustrate several important aspects of improvisation that are present in adult improvisational behavior. Adult improvisers draw upon a knowledge base that consists partly of learned melodic material that can be inserted during improvisations (Nettl, 1974; Pressing, 1984). Similarly, children rely on a knowledge base containing learned material. In some cases, sections of extant songs with words are combined into spontaneously created novel improvisations. In others, melodic fragments from songs are used to create new melodies.

Children's Instrumental Improvisations

Children's instrumental improvisations have been explored in various studies (Brophy, 2005; Burnard, 1999; Flohr, 1985; Moorhead & Pond, 1978). Kratus (1995) proposed seven stages in the development of instrumental improvisation in children. In the first stage, exploration, the child lacks constraints and purposefulness in the improvised behavior and simply explores sounds coming from the instrument. In the second stage, process-oriented improvisation, the child begins to use cohesive patterns but is not aware of a possible audience. In the third stage, product-oriented improvisation, the performer applies structural principles such as tonality and meter and is aware of how the improvisation may be perceived by an audience. The fourth stage, fluid improvisation, is characterized by improved technical proficiency. In the fifth stage, structural improvisation, the performer uses strategies for shaping the overall structure of

the solo. The sixth, stylistic, stage is the level in which an expanding knowledge base tied to a specific style guides improvisational choices. Kratus describes the last stage as personal improvisation in which a new style is developed, but he notes that this stage is rarely reached.

In a longitudinal study of seven- to nine-year-old students, Brophy (2005) explored the first three stages of Kratus's developmental model. Children improvised in the context of a rondo piece performed in a group using Orff instruments. Their eight-measure solo improvisations were played on an alto-xylophone arranged in a C pentatonic scale. Though Orff instruments were used occasionally during regular music classes, the children received no specific improvisational instruction prior to or during the study. Yet Brophy found that significant differences emerged between the ages of 7 and 9 in the content of the improvisations. Older children used antecedent and consequent phrases, repeated rhythmic motives, and showed a stronger adherence to pulse than did the 7 year olds. He speculates that the children in the study moved from the process-oriented to the product-oriented stage in which an awareness of the effect of structure was exhibited by the older children.

It appears children have an innate ability to improvise music both vocally and instrumentally. The children in both the Mang and Brophy studies improvised without prior instruction.

INTERACTION

The design of the current study specifically eliminates the interactional aspect of improvisation to focus on the thinking of the individual improviser. Yet, interaction among performers in jazz is an essential component of ensemble playing in jazz (Berliner, 1994, 1997; Monson, 1996; Sawyer, 1992; Seddon, 2005; C. Smith, 1998).

Interest in studying the interactive creative processes has increased recently (Sawyer, 1997); in jazz, full transcriptions of all musician's output in a particular performance have helped illuminate communicative practices (Berliner, 1994, pp. 680-757; Monson, 1996, pp. 141-169). Interactivity during jazz performance includes observable and audible musical interaction (Monson, 1996), including licks traded between players and changing feels and grooves communicated in the moment through musical cues or signals conveyed from performer to performer.

The rhythm section employs a web of interactive processes that can be compared to the functions of the drummer's hands. Just as the right hand playing the ride cymbal is often linked to the walking bass line, the "freer" left hand mirrors the intermittent chords played by the piano (Monson, 1996, p. 58). The left hand may play the snare drum, toms, or crash cymbal, initiating or responding to interactions with other members of the group. The role of time keeper can suddenly change as the drummer temporarily improvises a fill, often mirrored by the bassist and the piano player. These interjections appear in logical places related to the form of the referent. In addition, if the drummer keeps a steady groove, the bass player may deviate from the common quarter note bass line and play other patterns or pedal points. If the bass player keeps time, the drummer is free to engage in more complicated rhythmic activity (Berliner, 1994, p. 353).

The rhythm section interacts with the soloist by adding contemporaneous musical commentary. Each member of the rhythm section and members of the front line—a saxophonist or trumpet player—can function as soloists during a small group jazz performance. During solos by the front line, the rhythm section may comment on the soloist's playing by responding to licks played by the soloist or may inspire the soloist by providing specific melodic or rhythmic material. At other times the rhythm section

interacts with the soloist by coordinating timbres and dynamics and by playing "comping patterns that overlap or interlock with the soloist's figures" (Berliner, 1994, p. 358).

Observable interaction can be seen in ensemble performance transcriptions in which every instrument is represented. Both Monson (1996) and Berliner (1994) cite specific examples of many of the types of observable interactions mentioned above.

The development of a knowledge base through the study of tradition guides the improvisational process and facilitates the experience of flow. However, in fields such as jazz, where interpersonal interaction is often a part of the performance context, the goal of individual study is to gain control of all the components of the improvisational process so that intentional focus can be directed toward other members of an ensemble. If this focus is established in jazz performance, then "the shape of a musical performance is the product of human beings interacting through music both in time [through interaction] and over time [referencing the tradition]" (Monson, 1996, p. 129 with the current author's comments in brackets).

CONCLUSION

Extant models of improvisational thinking in music attempt to explain the processes through which performers create music extemporaneously. In this study, I explore artist-level jazz musicians' perceptions of their own thinking by interviewing them close in time to the creation of music. Based on the literature reviewed above, I expected to find evidence of improvisers using practiced musical figures retrieved from memory, a division of improvised solos into smaller units or groupings, and explicit thinking processes related to recall, anticipation, and evaluation.

Whereas experimental research exists that explores the early stages of improvisation in music described by Kratus, the later stages of improvisatory

development and the models of the thought processes guiding improvisation have not been systematically investigated. To my knowledge, no experimental research has been conducted to specifically validate the Johnson-Laird, Pressing, Clarke, and Kenny and Gellrich models.

I attempted to further illuminate the thought process guiding improvisation by specifically connecting qualitative interview data to musical examples. In the following chapter, I describe how participants performed an improvised solo and then commented on the improvisational process immediately thereafter. This method eliminated the delay inherent in other investigations between the creation of music and the artists' explanations of their thinking.

Chapter Three

Method

The purpose of this study was to identify thinking processes underlying jazz improvisation. Specifically, I attempted to describe the thinking of artist-level jazz performers during improvisation and determine the consistency in their verbal reports.

Artist-level jazz improvisers were asked to improvise on a known chord progression, and their performances were recorded using audio computer software. The resulting audio files were used to create approximate notation of the improvisations, which were then used as the basis for interviews with the performers. Immediately following each improvisation, I asked the participant to narrate his thinking processes as we both looked at the notation and listened to the audio recording of what was just performed. I pilot tested the procedures along with two senior researchers who participated in the first interview.

The interviews were conducted using responsive interviewing, a protocol in which questions are developed over the course of the interview, rather than relying only on predetermined questions (Rubin & Rubin, 2005). The interviews were transcribed and coded using qualitative data analysis software (Muhr, 2006). After the interviews were concluded, I corrected the approximate notation produced by the computer program, creating exact notation of the actual performances to which I linked the participants' verbal commentary for this report.

Using these analysis procedures, I sought to accomplish the following goals:

1. Describe the thinking of artist-level jazz performers during improvisation.
2. Determine the consistency among different performers in the reports of their improvisational thinking.

PARTICIPANTS

Seven artist-level jazz improvisers participated in the study. Each artist had extensive experience in improvisation both in live settings and in the recording studio. The artists represented different melodic instruments, including alto saxophone, violin, trumpet, trombone, guitar, bass, and piano. The participants were bassist Rufus Reid of the New York Metropolitan Area; violinist Darol Anger of Portland, Oregon; trumpeter Stan Kessler of Kansas City, Missouri; pianist Jeff Hellmer, guitarist Mitch Watkins, saxophonist John Mills, and trombonist Ronald Westray of Austin, Texas. Three additional musicians were invited to participate but declined.

Selection of participants was not random, but was based on availability and willingness to participate. All of the participants are nationally known performers with busy teaching and performing schedules. In addition, the video and audio recording involved in the study demanded that participants be willing to be recorded. The subject matter of the interviews was personal in nature, requiring a level of openness from the interviewees, who were not granted anonymity. The study protocol was approved by The University of Texas at Austin Institutional Review Board.

The participants' status as artist-level improvisers was defined by a number of factors. All participants had produced professional audio recordings (see Table 1); all were active performers with busy performance careers in their local communities; and all

had national and international touring experience. Four were faculty in higher education.

For more information about individual performers, see Appendix A.

Table 1: Professional Recordings Produced

	Instrument	City	Number of recordings as leader	Number of recordings as sideman
Darol Anger	Violin	Portland, OR	13	189
Jeff Hellmer	Piano	Austin, TX	2	5
Stan Kessler	Trumpet	Kansas City, MO	3*	8
John Mills	Saxophone	Austin	0	50
Rufus Reid	Bass	New York Metro	8	310
Mitch Watkins	Guitar	Austin	5	86
Ronald Westray	Trombone	Austin	1**	18

source: Allmusic.com (accessed August 6, 2007)
* source: stantonkessler.com (accessed August 6, 2007)
** source: ronwestray.com (accessed August 6, 2007)
Number of recordings as leader was defined as the number of recordings listed under the
discography tab as "main recordings" at allmusic.com.
Number of recordings as sideman was defined as the number of recordings listed under
the credits tab at allmusic.com where the main instrument was listed in the "credit"
column, not counting recordings where the participant was listed as "artist."

SETTING

All participants were recorded and interviewed in a setting of their choosing. In

all cases except one, the recording took place in the participants' homes or offices. I

recorded Darol Anger in a hotel room where he stayed during a national tour. I conducted

the interview with Rufus Reid in his home in Teaneck, New Jersey, and the interview

with Stan Kessler in his home in Kansas City.

Each session had two major phases, the recording of the improvised solo, and the

interview concerning the solo just performed. The entire procedure was captured on

video. I asked participants to stand or sit in a comfortable position for performance, and placed a microphone approximately two feet away from their instruments. I played a short sample of the accompaniment track, which comprised only a swing rhythm played on drum set, and explained that they would be recorded along with the track. I offered all participants the option of playing without the track if they felt the track would have a negative effect on their performance. All agreed to perform with the track. I then asked participants to play something of their choosing while I set the input levels on the recording devices. Finally, after reading a script describing the musical task, I recorded their improvisations.

After the audio recording was completed I asked the participant to take a short break while I created the approximate notation of the improvised solo. I then positioned the computer screen so that it was easily visible to both the interviewee and me, and I positioned the video camera with the computer screen in view so that participants' gestures towards the screen would appear on the video recording.

The pilot interview with Jeff Hellmer was conducted first and was attended by my two doctoral advisers and me. All three of us asked questions during the interview. This preliminary session was used as a model for later interviews. The verbal script used in later interviews was developed from questions and comments used in the Hellmer interview. In addition, Hellmer did not play to a drum track. The tempo he chose was later analyzed and used to develop the accompaniment track for subsequent sessions.

APPARATUS

Participants were recorded using a Windows-based computer setup. A Shure SM-81 microphone was connected to a USB audio interface, which was connected to a laptop

through the USB port. The audio recording software Samplitude 9 Professional (Tost, 2007) rendered the audio in the wave file format.

At the end of the recording phase of the session, I converted the audio file to a MIDI file using a different computer program, TS-Audio To MIDI Realtime Converter (Egorov, 2004). I then imported the MIDI file into the audio software, which allowed me to display the notation in synchrony with the *original* audio. Audio and video of the entire session was captured using a Canon ZR 60 Mini DV video camera. The camera was positioned with the player in view during the performance and with the computer screen in view during the interview.

The main technical challenges of the current study were (1) to only use portable components, (2) to record the participants' performances in high quality audio, (3) to quickly convert the recorded audio to approximate notation, and (4) to present the approximate notation in synchrony with the original audio file.

The first and second challenges were solved by using a laptop for recording which was connected to a microphone through a high quality preamp and converter. I chose a Toshiba Satellite laptop since the speakers are high quality compared to other laptops, which was important for playing back the recorded solo to the participant. The FastTrack Pro Audio to USB Interface by M-audio provided both high quality microphone preamps and a converter to digital audio that is compatible with the Samplitude audio recording program. The Shure SM-81 microphone is known for its versatility in recording acoustic instruments. It is a small-diaphragm condenser microphone well suited for recording the varied instruments in the study.

The third challenge was to convert the recorded audio to notation. Many computer programs can display a MIDI file as notation. A MIDI file contains information about pitches, onset times, durations, and volume, which is why music notation programs can

easily display the information embedded in MIDI files. The challenge was solved, therefore, by converting the audio file to a MIDI file. Several software converters were tested. The program TS-Audio To MIDI Realtime Converter was selected because of its accuracy and because multiple conversion algorithms are available (Egorov, 2004). One algorithm, the "mono correlator," proved effective for converting the audio of most of the instruments, whereas the "poly sensors" algorithm worked best for violin. To find the best algorithm for each instrument, I recorded the instruments played by the participants in pretests and experimented with the different conversion algorithms prior to the interview dates.

The fourth challenge was to present the notation in synchrony with the original audio. Samplitude software has a MIDI editing function in which a MIDI file can be displayed in both notation and in "piano-roll" format (see Figure 3). The piano roll window depicts pitches as horizontal lines whose length corresponds to the duration of each note. Pitch content is represented by the vertical position of each line. Since Samplitude is a multi-track audio and MIDI editor, it is possible to display the MIDI file from one track while listening to audio from a different track. After rendering the original audio file to MIDI using the TS-Audio To MIDI program, I imported the new MIDI file into Samplitude and visually synchronized the two files. I then muted the track containing the MIDI file so only the audio file was audible. Then I opened the MIDI editor so a display of approximate notation on top of the piano-roll display was visible. I could now start and stop the audio using the MIDI file for visual cues while listening to the original audio. This allowed the participant to refer to the visual representation of the improvised solo while the original audio file provided auditory reference.
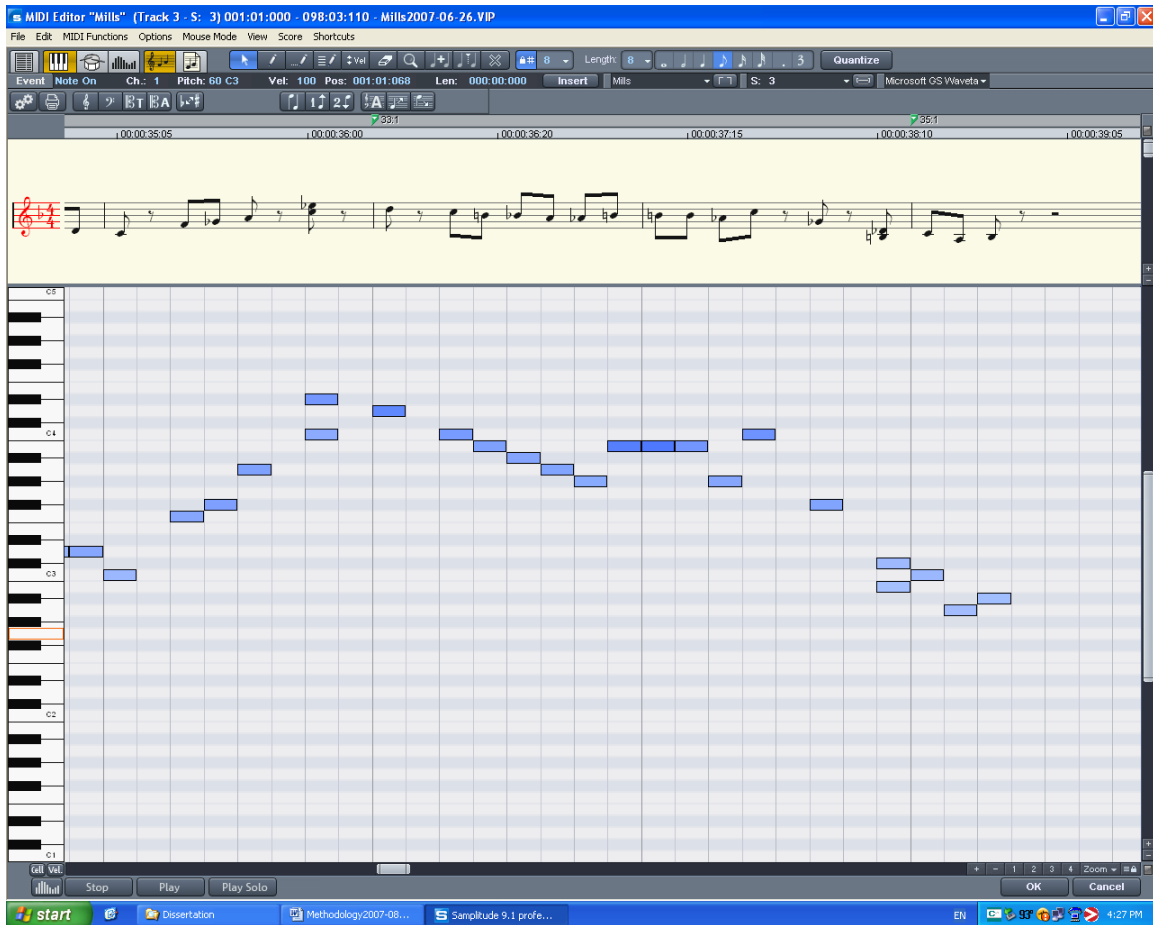
Figure 3:   Visual representation of improvised solo in Samplitude's MIDI editor
             window

For the interview with Jeff Hellmer, the use of the audio to MIDI conversion
program was not necessary. Hellmer performed on a Yamaha Disklavier grand piano
with MIDI; thus, both the audio and MIDI data were recorded into Samplitude
concurrently.

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INTERVIEW PROCEDURE

I asked participants to perform a blues in F major using a melody of their choice, playing the melody first and then improvising a solo. No specific version of the blues chord progression was specified and no sheet music was shown to the participants. I asked the participants to play as many choruses as they wished before concluding their performance. The specific verbal directions were read aloud to the participants and are given below:

> Play a blues in F major in a medium-up tempo (around metronome 200). Play a melody you are very familiar with followed by an improvisation on the blues form. Play so long that you feel the performance has a formal sense to it. In other words, go until you feel like you can finish. You don't have to decide the exact length beforehand.

All the performers in the study, except for Jeff Hellmer, played along with the drum accompaniment during performance. I created the drum track accompaniment prior to the interviews by continuously repeating two measures of a swing drum track taken from an existing recording (Carman) and performed at 212 beats per minute.

There was no chordal accompaniment to the performers' improvised blues solos. This gave the performers the freedom to use any version of the blues chord progression as the basis for their improvisations.

Following the improvised performance, I created the notation for the interview. There is currently no technology that can accurately transcribe music in real-time, but the software that I used seemed adequate for the purposes of the project. Figure 4 shows an example of the notation seen by an interviewee and an accurate transcription of the same music. A close comparison shows that some notes do not appear in the real-time transcription, like the Eb in the first measure. Some notes are displayed as having occurred simultaneously, though in reality they were played consecutively (e.g., the Db

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and B in the third measure). Despite these small errors, the transcriptions were certainly adequate for eliciting verbal comments and providing visual cues.
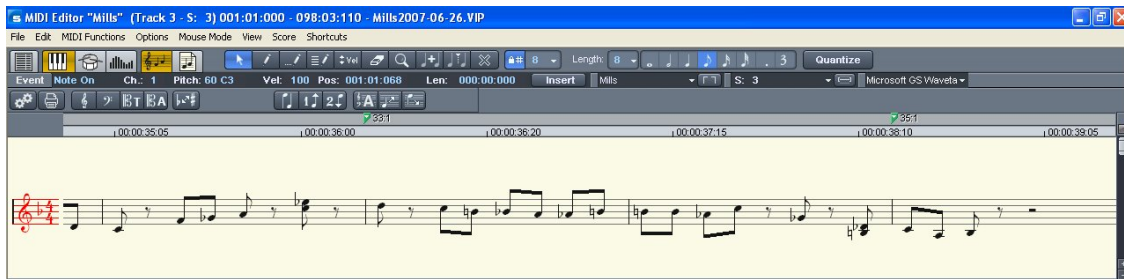
Figure 4:   Real-time transcription (top) compared with exact notation of the same selection (bottom).

I asked each participant to comment on the content of the recorded solo as he listened and looked at the notation, and I directed him to focus his verbal comments on aspects of decision making and structure. I read the following at the beginning of the interview:

> As you are watching and listening to your performance, try to narrate your conscious and unconscious thinking, considering questions like "Where did that come from?" We are looking for a narration similar to a director's commentary on a DVD. We are particularly interested in how much of what you played comes from a repertoire or bank, how much is from a repertoire but modified in some way, and how much is material you never played before that is generated in the moment. We are also interested in the timing of decisions. Where are the decision points and what material does each decision affect?

I then played in sequence short sections of the improvised solo that corresponded to musical phrases. Participants often described each phrase and other aspects of the

performance without prompting. When necessary, I asked questions to clarify the participants' comments using the guidelines of responsive interviewing (Rubin & Rubin, 2005). Those guidelines include "follow-up questions [to] ask for explanation of themes, concepts, or events that the interviewee has introduced [and] probes [to] help manage the conversation by keeping it on topic" (Rubin & Rubin, 2005, p. 129). Other than the instructions described above, no specific questions were prepared in advance.

ANALYSIS PROCEDURE

I began the analysis of the interviews by transcribing all verbal information, though I did not transcribe all utterances in detail. Concerning the level of detail necessary in transcriptions of verbal interviews, Rubin (2005) states: "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" (p. 204). In the current study, pauses, repeated individual words, and utterances such as "hmm" and "ahh" were left out if they did not affect meaning. For example, John Mills said: "Yeah, so so this this time ahh I think I ss sort of ascended the scale and then I maybe resolved down..." In the transcription it appears as follows: "Yeah, so this time I think I sort of ascended the scale and then I maybe resolved down..." (Line 111). Ellipsis points indicate the quote omits material from the original source interview. In addition, ellipses are used in this report when the participant pauses for a long period of time or appears to start a new thought in the middle of a sentence.

The interviews were imported and transcribed using the video transcription software Transana (Woods & Fassnacht, 2008). Prior to transcription, each interview videotape was imported into a PC computer and converted to an MPEG video file. Transana transcription software allows the user to view and listen to a video file while

writing in a separate window. A transcription pedal was used to start and stop the video recording. In addition, Transana allows the user to insert time codes into the transcribed text, which facilitates navigation.

The analysis of interview content was performed with the aid of the qualitative analysis software Atlas.ti 5.2 (Muhr, 2006). After consulting a number of sources concerning qualitative analysis software (Henwood & Pidgeon, 2003; Lewins & Silver, 2007; Lewis, 2004; Muhr, 2006), I chose Atlas.ti because it features easy coding procedures and is the only qualitative analysis software that can integrate text documents and video. This has several advantages related to navigation, a feature that has been cited in recent qualitative music education research as one of the main advantages of using software in qualitative analysis (Campbell, Connell, & Beegle, 2007). For example, if a particular code is assigned to various passages in different interviews, each passage can be accessed and compared with one key press. Considering that the total transcribed text exceeded 210 pages, this feature alone proved extremely useful. In addition, the software can generate various quantitative measures related to the coded text (e.g., see Appendix B).

After the text was transcribed and imported into the Atlas.ti software, the main analysis began. The first step consisted of my initial coding of utterances by the interviewees. After reading a sentence or short paragraph, I considered the following question: "What is the major idea brought out in this sentence or paragraph?" (Strauss & Corbin, 1998, p. 120). This idea was then translated to a short code and assigned to the quotation. If the quotation concerned several ideas, multiple codes were assigned to the same text.

The following example illustrates how codes were assigned to text quotations. This paragraph is excerpted from the interview with Rufus Reid:

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Reid: Yeah see like right in there [points] I got there too soon or sooner than I would have liked so you have to be a helicopter and kind of hover around or... To me I had to... I had to fix that whatever that is. It's not wrong but I think that little idea was either earlier than I wanted or... wanted to be... that's all I thought of but I'm thinking of that now I wasn't thinking it... but I can hear it immediately that I "oops" you know when you're in your car something goes off the road you're immediately there... you're "hum, how did I do that" and you have to recover. (line 229)

The paragraph contains two main ideas. The first idea has to do with Reid playing something unexpected that he doesn't seem to like. I labeled this first idea as "error." The second idea has to do with Reid's description of "hovering around," which I labeled "monitoring." Thus, this paragraph was assigned two codes: error and monitoring.

As further sections were analyzed using this method, the previously derived codes were consulted. If a new paragraph concerned an idea labeled previously, the same code was assigned a second time. In cases where a code was used repeatedly, a judgment was made concerning fit. If a previously used code did not describe the new idea accurately, a new code was created.

Considerable controversy exists concerning coding of qualitative data. In their classic book introducing grounded theory, Glaser and Strauss argued that coding should be guided exclusively by the data (Glaser & Strauss, 1967). To this end, methodologies based on grounded theory recommend analyzing all data independent of the existing literature (Charmaz, 2006; Strauss & Corbin, 1998). The argument is based on the notion that data analysis may be biased if the researcher approaches the task analysis with pre-conceived ideas derived from existing theory. Due to the interpretative nature of qualitative research, Glaser and Strauss sought to eliminate this bias by approaching the data from a naïve perspective and only later comparing results to the existing literature.

The current study follows recent recommendations that allow for a prior literature review as a means of framing research questions (Charmaz, 2006; Henwood & Pidgeon, 2003). Yet, care was taken to code the current data independent of existing theories of improvisation. Each main theme derived from the current study is therefore based directly on the verbal data gathered from the interviewees.

In addition to coding individual words and paragraphs, I also wrote analytic memos during the coding process. Writing extensive memos is an important part of qualitative research analysis (Charmaz, 2006; Glaser, 1998; Lewins & Silver, 2007; Turner, 1981). Analytic memos serve "as a place to theorize and comment about codes (concepts) and the coding process" (Lewins & Silver, 2007, p. 166). I noted any insights I had about the analysis of the data, irrespective of their immediate relevance, and linked the memos to the corresponding text.

During the qualitative analysis, I assigned a total of 121 codes to 563 quotations within the seven interviews. I wrote 62 analytic memos.

I helped organize my coding by tagging some codes with headings. For example, all codes relating specifically to generative strategies contained "GS:" at the beginning of the code label. A table listing all codes and their frequencies of occurrence in each interview is included in Appendix B.

Following the initial coding I created a narrative analysis of each interview that described the most important observations and themes. After each narrative was written, I verified my general observations by identifying specific comments made by the participants that described paricular sections of the solo transcriptions. I selected comments that illuminated the main themes and that the participants related to specific musical material. I also transcribed the improvised solos into fully accurate music notation. Finally, I linked the comments to the musical material with which they were

associated. These links are illustrated in the solo transcriptions in the Results. Only the participants' most salient verbalizations are linked to musical material in the transcriptions.

I consulted several qualitative studies in music education to identify a methodology for the identification of conceptual categories. In two recent studies, the method of categorization was not specified by the authors (Campbell, Connell, & Beegle, 2007; Price, 2006). Price (2006), for example, simply describes the categorization process as "collapsing of codes."

The process of identifying conceptual categories has been described as a creative, interpretive process (Charmaz, 2006; Glaser, 1998) in which no standard form of analysis exists (Henwood & Pidgeon, 2003). According to Henwood and Pidgeon (2003), to identify conceptual categories, the researcher "compares codes with codes, and then codes with data, and data with data" in a creative process (Henwood & Pidgeon, 2003, p. 148). Even studies strictly based on grounded theory require "creativity of every stage" (Glaser, 1998, p. 187). I came to the more encompassing concepts in the current study through extensive analysis and discussions with members of my committee.

During data analysis and concurrent with the writing of the summaries, conceptual categories of codes emerged (Strauss & Corbin, 1998). The writing of the summaries provided an opportunity to highlight the most salient features of each interview. As I compared these features, I realized that often different labels used by various participants described the same phenomenon. For example, the labels initially attached to comments referring to a focus on the melodic quality of the improvised line were: "line dictates note choices," "playing bluesy stuff" and "singing." While writing the summaries I realized that these three labels referred to the same way of thinking and these codes were therefore collapsed into the main concept of melodic priority.

The beginning of the Results describes the most important concepts derived from the interviews that were mentioned by three or more participants. This is followed by summaries of each interview describing examples of these concepts. In addition, the summaries detail observations by individual participants that did not show a consistent pattern across interviewees.

Chapter Four

Results

The results of the current study were derived from a qualitative analysis of data gathered from seven interviews with artist-level jazz musicians. This analysis included coding of interview responses by participants and linking key comments to specific musical material. In this chapter I describe six main themes derived from the interviews and provide summaries of each interview in which the main ideas of each participant are highlighted. In addition, full transcriptions of each improvised solo are provided, with key comments linked to the musical material that prompted the comment during the interview.

The results include a description of two major ongoing processes that are evident in the thinking of a majority of the seven improvisers: a sketch planning process and an evaluative monitoring process. These pertain to the forward-looking act of planning and the backward-looking act of monitoring what has been played in the past. In addition, I identify four major strategies that serve as the basis for the generation of musical material: The use of memorized music, which I call an idea bank; selecting notes with particular attention to the harmonic structure of the music, which I call harmonic priority; selecting notes with particular attention to the shape of the melodic line, which I refer to as melodic priority; and the recall of music played earlier in the solo, which is then incorporated into the ongoing music.

Sketch Planning

One or more musical features of upcoming passages are sketched out by the improviser before the passages' execution. Musical features include architectural elements like note density, use of various registers on the instrument, or harmonic structure. In all cases, the improviser is aware of these features before the actual passage is executed. The sketch planning concept was derived from verbal comments initially coded with labels related to architecture (see Appendix B).

Improvisers often sketch out certain features of an entire section. Ron Westray, for example, describes knowing that his second solo chorus would "string more linear stuff together." During the chorus, Westray plays longer eighth-note lines, departing from the shorter, simpler rhythmic figure that dominated his first improvised chorus (see Figure 5). Westray clearly had a plan for the second chorus, but it included only incomplete information. He had a sketch in mind that referred to the use of eighth-note lines, but the sketch did not dictate the duration or pitch content of the lines.

Solo Chorus 1: Melodic fragments

Solo Chorus 2: More linear material

Figure 5:   Illustration of sketch planning. Excerpt from Westray's solo, mm. 25-48. In the first solo chorus he uses primarily "melodic fragments." In the second chorus he introduces "more linear material."

The sketches include a limited number of decisions about the music to be played, but those decisions may reflect the essential features of the music, with the details determined later. Westray's decision about the second chorus determined one feature of the upcoming chorus, namely note density, without specifying pitch content, articulations, and contour. According to Westray, note density was an important aspect of the second chorus and was an essential feature of the architecture of the solo.

In some instances, improvisers describe sketching out upcoming passages in several stages that become progressively more detailed with the passage of time. Mitch Watkins, for example, explains how he planned to "push the listener's ear" at one point in his solo, a term that refers to adding tension by using pitches from outside the key. In the interview, Watkins clearly states that the device for adding tension was not known at the time the decision to add tension was made. Watkins identifies the point at which the

device was chosen, which occurred several beats after the decision to add tension (Figure 6).

Figure 6:   Illustration of sketch planning in stages. Excerpt from Watkins' solo, mm. 25-28 with decision points indicated.

Watkins chose to add harmonic tension by using pitches derived from the altered scale before deciding which pitches to use. He explains that the actual notes were chosen in the moment while the passage was being performed. In this example, the sketch planning process developed in three stages that are progressively more detailed: add tension, use a dissonant scale, and select pitches from the scale.

In some cases, the planning process seems to be less deliberate. The improvisers describe knowing certain features of upcoming passages but do not refer to any explicit planning process. In one example, Westray describes how he "heard" a passing chord just prior to playing it. Westray planned to use the B diminished chord in the sixth measure of a chorus. Though this chord is a commonly-used passing chord, the Bb minor chord is an equally viable option in this measure. In first measure of the example below, Westray played a simple rhythmic figure (Figure 7). Anticipating the upcoming chord caused him to change the rhythmic figure in the subsequent measure to fit the new chord. In this case, Westray knew the chordal underpinnings of the upcoming measure prior to playing it, but

chose the actual melodic figure that fit the harmony in the moment. Westray does not refer to any explicit planning in this example.

PLAN: "the first thing that came to mind was B fully diminished, that's just how that progression looks, you know like that. And then I just basically repeated the rhythm from the previous phrase within the logic of that" [626]

Figure 7:   Illustration of sketch planning just prior to execution. Excerpt from Westray's solo, mm. 101-104 with relevant commentary from his interview.

In all the instances of sketch planning described by the improvisers, the planned features do not include all the information necessary to execute the upcoming passage. But the features that comprise the sketch certainly limit the possible note choices in the upcoming section of the solo.

The examples above illustrate a selection process that progresses in stages. Each stage represents the selection of musical features that become progressively more specific. In some cases, the improviser describes simply knowing some features prior to making the final note choices, in other cases the improviser specifically plans some aspects of an upcoming passage.

Evaluative Monitoring Process

The second ongoing process identified in the current study is an evaluative monitoring process. Improvisers describe monitoring and evaluating their own playing as they perform. Interestingly, unexpected choices can occur, which suggests that

improvisers are at times not fully aware of the sound of their own output prior to playing it.

Several improvisers allude to the monitoring process in their general comments. Darol Anger, for example, explains how he monitors his playing to identify interesting material: "The hand is gonna crawl around... and the brain is gonna like try to... pick out something that the hand is doing." Jeff Hellmer describes a similar process: "Hopefully something... pops up that's worth doing something with." In all cases, it appears that the process the improvisers are describing is separate from the control of physical movements. When Anger describes the hand as "crawling around" and "the brain" as picking out material, he gives the impression that "the brain" is monitoring what the hand is doing and is not deliberately controlling the hand.

The monitoring process appears to affect subsequent output. In one example, Rufus Reid referred to a melodic variation by saying, "I hear myself doing that." His comment refers to the improvised bass line in the first measure of his second chorus, where the pitches do not appear to match the underlying F chord (see Figure 8). The figure is based on the F triad but the placement is "shifted" rhythmically. The figure starts with a chromatic approach note on beat 1, and the root, F, does not appear until the third beat. This creates melodic tension that Reid resolves five measures later on the Bb chord by placing the root on the first beat. Reid's comment implies that this effect was not planned but occurred without deliberate thought, and that Reid was reacting to his own output. He hears how his own line has added tension and therefore needs to "be resolved."

Figure 8:   Illustration of monitoring. Excerpt from Reid's solo, mm. 12-17 with relevant comment from his interview. The dissonant chromatic approach note in m. 13 and the root on the first beat of m. 17 are indicated.

Improvisers often use evaluative terms to describe elements of their improvisations, expressing that they are "happy with" what they just performed or describing it as "mundane." These evaluations often take place while the improviser is concurrently performing new material. Anger remembers being happy with a particular section while it was being performed. Stan Kessler speaks of continuously evaluating his own output as if he were "the listener," explaining that he wants to play material that he would enjoy hearing if he were in a club listening to his own performance. It appears that the evaluative monitoring process can occur while output is being created. This suggests that the evaluation occurs in a process somewhat separate from the process of creating.

Several interviewees speak about being surprised by their own output. Reid, for example, describes an instance when a rhythmic displacement adds an element of surprise, "even to myself." The automatized processes that control the hands at times lead to outcomes that are not predicted by the improviser. Thus, the improviser is not always consciously in control of improvisational outcomes.

The lack of control sometimes results in improvisational outcomes that improvisers label as errors. In one example, Reid points out how an improvised line ended unexpectedly (Figure 9). "I got there too soon or sooner than I would have liked,

so you have to be a helicopter and kind of hover around... I had to fix that, whatever that is." The unexpected occurrence had to be mediated by altering subsequent improvised material. In the current example, Reid simply incorporated the end of the melodic line that ended unexpectedly in the following phrase. The result is improvised material that appears perfectly coherent. This illustrates how the monitoring process can affect subsequent material.

Figure 9:   Illustration of error correction. Excerpt from Reid's solo, mm. 57-60 with relevant comments from his interview.

The two processes described above represent thinking that appears to be ongoing throughout the creation of each improvisation. However, the processes do not describe how musical material is initially created. Four major generative strategies encompass the majority of comments by the improvisers concerning how material is generated.

GENERATIVE STRATEGIES

The four generative strategies (GS) describe ways of thinking that lead to the creation of improvised material, the various ways in which note choices are made. Unlike the ongoing sketch planning and monitoring processes, the generative strategies do not

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affect all improvised material and are therefore not engaged at all times. Improvisers switch from one generative strategy to another at different times during their solos. In addition, the amount of material created using each generative strategy differs widely among participants.

Four main generative strategies were mentioned by the participants: incorporating material from an idea bank (IB), choosing notes based on a harmonic priority (HP), choosing notes based on a melodic priority (MP), and incorporating material played previously into subsequent sections of the improvisation (INC).

I derived the four generative strategies from the analysis of the interviews, and they reflect the wording used by the participants to describe how notes were chosen. In the sections below, excerpts of participants' comments are given with musical material to which they refer in the transcription preceding each summary. These comments are labeled according to the codes listed above.

The Idea Bank

Using material from an idea bank (IB) is a flexible way of incorporating practiced musical elements into a solo. Ideas as referred to here are coherent musical structures that vary in explicitness and extent. The term bank refers to the procedural and auditory memories of these ideas. When an improviser uses an idea from the idea bank, it is accessed from long term memory in intact form. This means the beginning and end points are easily identifiable by the improviser and the entire structure is defined by one or more unifying principles. Comments initially coded with the label "nuggets of stuff" (see Appendix B) were associated with the idea bank concept.

The information contained in the structure derived from the idea bank varies on a continuum from very explicit to extremely abstract. Explicit ideas that contain all the

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pitch and rhythmic information necessary to perform a specific melodic figure lie at one end of the continuum. Around the middle of the continuum are templates that may include melodic contour or rhythmic information without defining explicit note content. On the other end of the continuum are ideas that contain only very abstract information such as architectural shapes or stylistic features. In addition to varying in explicitness, the ideas from the bank vary in their extent. The shortest ideas identified by the participants during the interviews were five- to seven-note figures; the longest were ideas containing information about architectural plans for entire solos.

Explicitness

Some ideas from the idea bank are inserted as they are recalled, with no modifications from the original stored in memory. Hellmer, for example, describes inserting complete, remembered ideas in parts of his solo (Figure 10). He labels these figures as "units," which he can replicate exactly in other contexts. In the excerpt below, Hellmer described his improvisational thinking as connecting smaller units to form longer lines. He compared this to building with Legos, in which creation is a process of connecting pre-formed blocks.

UNITS: "that is basically an F6 chord... that is one unit and then starting... that links up that C... to the next unit" [265]

UNITS: "It's like having a bunch of Legos around and how the Legos can fit together" [273]
"I can pivot off of... the C's and the F's in all kinds of different ways" [279]

UNITS DEFINITION: "If I could recreate this whole two bars and play it all exactly the same way every time, then I would say "yeah, that is a unit that I have learned and I'm plugging that into my improvisation right here." But it is not that way, you know... but I know I can plug, I can (play)... this is a unit and this is a unit and this is a unit, and this is how they are put together." [279]

Figure 10:   Illustration shows explicit ideas or "units" from the idea bank. The units are marked with brackets. Excerpt from Hellmer's solo, mm. 57-60 with relevant comments from his interview.

Several interviewees mentioned using melodic figures that were unique iterations of learned models, accessing a learned melodic figure from long-term memory, and adapting it to fit the current context. Interviewees refer to this phenomenon as using a model. The model may have all the information needed to perform an actual melodic figure, but the context requires the improviser to modify the version stored in memory. Westray, for example, describes how he learned to play over a particular set of chords in the seventh and eighth bar of the blues by memorizing a model played by Kenny Dorham that uses an advanced harmonic device referred to as a tritone substitution. Westray describes a melodic figure in his solo as an adaptation of the model as played by Dorham (Figure 11). In the following chorus, Westray uses the same model, but this time he describes the iteration as an exact replication of the original idea (Figure 12).

IB: "this one is kind of like mine [version of a Kenny Dorham figure]" [389]
"Kenny Dorham who showed me how to do that on that part of the blues" [381]

Figure 11:   Illustration shows a figure adapted from a model. Excerpt from Westray's solo, mm. 54-56 with relevant comments from his interview.

IB: "Kenny Dorham's little snippet there that I often use there" [474]

Figure 12:   Illustration shows an exact replication of the original idea. Excerpt from Westray's solo, mm. 66-68 with relevant comment from his interview.

In some cases, the ideas recalled from the idea bank are only templates or outlines. John Mills, for example, explains how he constructed a melodic figure using a template that mainly included melodic contour information (Figure 13). "I'm using a rising scale and then... when the five chord hits... that diminished triad that we map on to the dominant chord." The version of the template in this example is unique and had not been played by Mills previously.

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IB: "there is a harmonic formula there that's going on more than the specific lick" [83]
"I'm using a rising scale and then... when the five chord hits... that diminished triad that we map on to the dominant chord" [83]
"it is a general shape... that's been done a billion different ways... but that idea that... say a... scale orientation of the two chord and an arpeggiated version of the five chord... that's a sort of **model**" [107]

Figure 13:   Illustration shows a melodic idea constructed in the moment from an underlying template. Excerpt from Mills' solo, mm. 9-12 with relevant comments from his interview.

Improvisers sometimes refer to vague stylistic features as the idea that guides their creation of musical figures. In such cases, only a set of guidelines are retrieved from long-term memory. In one instance, Westray describes how a melodic figure ends "the way Parker ends phrases" (Figure 14). Yet, when asked to define these features, Westray referred only to inexplicit labels like "cool" and "laid-back."

IB: "the ends of my phrases I think I'm still pretty much hearing Bird like I like the way he closes out phrases" [407]

Figure 14:   Illustration shows stylistic guidelines as basis for idea. Excerpt from Westray's solo, mm. 57-60 with relevant comment from his interview.

Extent

Ideas from the idea bank also vary in extent. Shorter ideas that extend from a couple of notes to short phrases are commonly referred to by the improvisers as licks.

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These licks often fit specific chord progressions and may comprise specific, defining features. Westray refers to several two-measure ideas as "tritone sub licks," for example, because they all imply a chord structure referred to as a tritone substitution. All the examples cited earlier from the solos of Hellmer, Westray, and Mills are licks in the sense that they are brief figures, even though they vary in their explicitness.

Longer ideas are often less explicit. Mills decided, for example, what version of the blues progression he would use in an upcoming chorus, and he used that chord template to shape his note choices. There are many versions of the 12-bar blues progression and when an improviser selects one of these versions from the idea bank, it provides an outline for the notes that will make up his improvisation.

Ideas may also refer to phrase lengths. Mills, for example, started his solo by improvising two choruses he refers to as "improvised blues heads," employing features commonly seen in blues melodies. The idea in this case was 12 measures long and included information about phrase length and repetition (Figure 15). The idea dictated: "Start with several repeated shorter phrases and finish the chorus with one longer phrase in the last four measures."

Figure 15:   Illustration shows a 12-measure idea that includes information about phrase length. Excerpt from Mills' solo, mm. 1-12 with relevant comments from his interview.

The most extensive ideas contain architectural information that shape larger structures including the shape of the entire solo. Hellmer describes how he often starts a blues improvisation by visualizing a "solo curve." Hellmer explained the idea as follows: "Start the solo with sparse melodic material, develop this material in subsequent choruses building to an emotional peak in the second to last chorus and finally 'wind down' in the last chorus."

Intact Form

All of the labeled ideas have clear beginning and end points that are identifiable based on the participants' comments. Westray, for example, identifies an idea as a direct quote from Charlie Parker. In the actual solo, Westray approaches the lick with an

ascending scale and follows the lick with a continuous string of eighth notes. In the interview, Westray clearly identifies where the quote from Charlie Parker begins and ends (Figure 16).
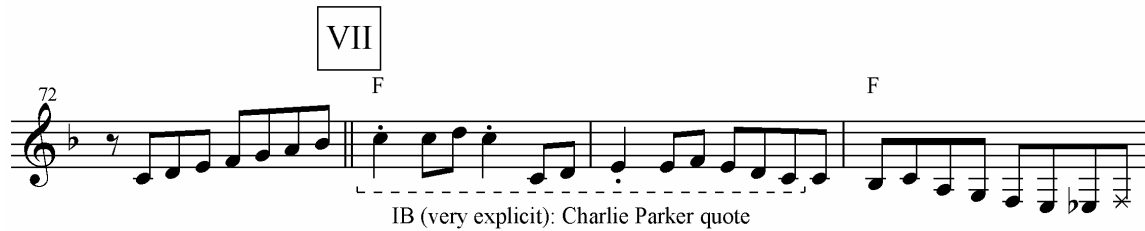
Figure 16:   Illustration shows exact beginning and end points of Charlie Parker quote. Excerpt from Westray's solo, mm. 72-75.

Harmonic Priority

The second generative strategy is labeled Harmonic Priority (HP) and represents a focus on the vertical structure of the music. When improvising with harmonic priority, the improviser creates a melodic line by thinking primarily about the underlying chord progression and specifically shapes melodic material accordingly, identifying important chord "target notes" and creating melodic passages that place these targets on the strong beats of the measure. Participants' comments initially coded with the labels "math construction" and "melodic choices linked to progression" (see Appendix B) were later associated with harmonic priority.

The initial instructions given to participants were to "improvise on a blues progression in the key of F major." The basic blues form is a 12-measure progression that was specifically chosen because it allows the improviser to use various versions of the basic chord progression. The initial chord, F major, can be played in many versions (F,

F7, F maj7, F6), and the entire progression can be altered in numerous ways by substituting chords and adding passing chords. An example of an altered version of the basic blues progression is listed below.

Basic blues progression:

F7	F7	F7	F7
Bb7	Bb7	F7	F7
C7	Bb7	F7	F7

One example of a modified version of the blues progression:

Fmaj7	Gm7/C7	Fmaj7	F7b9
Bbmaj7	Bdim	Fmaj7	D7b9
Gm7	C7	Fmaj7	Gm7/C7

When playing primarily eighth-note lines, improvisers describe "shooting for" important target chord tones. These lines are often constructed using the harmonic priority generative strategy. In these cases improvisers describe how the notes on the strong beats (beat 1 and 3) were identified ahead of time, but after the note on the previous strong beat was played. In other words, they played a chord tone on a strong beat, then identified the next chord note on the following strong beat, and finally "filled in" the notes in between.

Figure 17:   Connecting chord tones on beat 1 and 3 with an eighth note line.

Figure 17 illustrates how chord tones can be connected in different ways. The task in this example is connecting the third of the G major triad on Beat 1 to the fifth of the triad on Beat 3. In Example 1, the notes are connected using scalar motion with repeated notes. In Example 2, scalar motion is also used, but since there is only one scale step between the two notes in question, the figure initially descends before ascending to reach the targeted note on Beat 3. The third example illustrates the use of chromatic motion. Again an adjustment is made by adding an upper neighbor before the target note. The final example shows how the notes can be connected using an arpeggio figure.

Figure 18 shows a long eighth-note line that, according to Watkins, was created using harmonic priority as a generative strategy. In the example, all the chord tones are circled and the chord tones that appear on Beats 1 and 3 are marked with arrows. The example illustrates the prevalence of chord tones on strong beats. The few measures that feature nonchord tones on the strong beats introduce tension that is resolved in subsequent measures with chord tones again placed on the strong beats. Watkins describes his thinking process as "weaving through the changes."

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Figure 18:   Illustration shows an eighth note line created with the harmonic priority principle. The circled notes denote chord tones and the arrows point to chord tones on Beats 1 and 3. Excerpt from Watkins' solo, mm. 29-36. Note the F major chord in m. 35 is anticipated in the end of m. 34.

Watkins referred to many of the chord tones on the strong beats as pivot notes, explaining that those notes represent "pivot points where you could have gone somewhere else." This indicates that Watkins prefers to change direction only after the target note on the strong beat is reached.

Stan Kessler explains that he often shoots for the third and the seventh of the chord and calls those notes the "hot notes" that outline the chord progression. Watkins describes how he focused on key notes of a diminished chord in one instance, to be able to create a melodic line that clearly reflected the chord to the listener. In all instances in which the improviser is using harmonic priority, the link between the improvised line and the implied chordal structure appears to guide the improviser's note choices.

Melodic Priority

I call the third generative strategy melodic priority (MP). In this mode, the improviser appears focused primarily on the horizontal features of the improvised material and less concerned with the underlying chord progression. The result is often melodies based on a single scale that span several chords. This approach is described by several participants as "blanketing over the changes." The scales used include the F major scale and the F-blues scale. Participants' comments initially coded with the labels "line dictated note choices," "playing bluesy stuff" and "singing" were later associated with melodic priority.

When discussing the use of melodic priority, the improvisers often mention disregarding the harmonic underpinnings of the blues progression. Westray states at one point that he is "not thinking about chords" but instead is "just playing blues stuff" (Figure 19). In another example, Westray describes this linear process as "singing," again denying that he consciously considers chord information in the creational process (Figure 20).

MP: "now I'm not thinking about chords, and I'm not thinking about
what I'm about to play. I'm just playing like blues... blues stuff" [345]

Figure 19:   Illustration of melodic priority. Excerpt from Westray's solo, mm. 48-53 with relevant commentary from his solo.

MP: "I'm just hearing a phrase, there is no [chordal] map behind that part of the phrase right there" [592]

Figure 20:   Illustration of melodic priority. Excerpt from Westray's solo, mm. 92-95 with relevant commentary from his solo.

Analysis of excerpts in Figures 19 and 20 shows how the note choices are tonal but do not imply the underlying chord progression. The note choices in the latter example form a melodic figure that would be easy to sing, yet mainly employ the notes of the F major triad, this despite the fact that the phrase is played during the last line of the blues that contains a harmonic cadence common in jazz: the chords Gm7, C7, and F. The result is a phrase that does not outline a specific group of changes in the blues form, but, played in the context of an accompanied jazz performance, sounds entirely appropriate due to its melodic coherence.
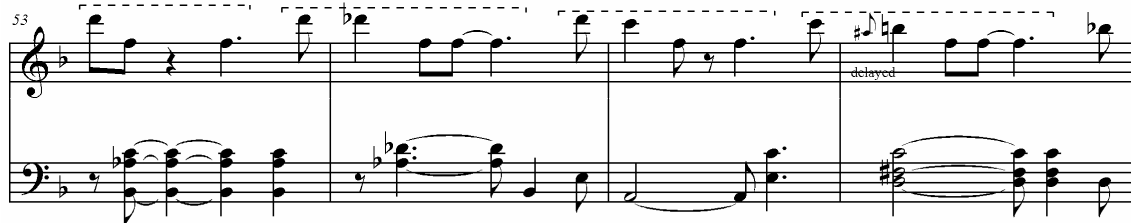
Improvisers at times describe melodic priority explicitly, even though their improvisation clearly follows the harmonic structure of the blues. In such cases, I labeled the episodes as melodic priority, based on the improvisers' description of how the material was conceived. Rufus Reid, for example, clearly states that in general he is "not playing changes" but instead is "thinking more about the line being melodic." He labels his improvisations "functional," meaning that the harmonic progression is often implied. Yet, the implied chordal progressions appear to be a by-product of the improvised line rather than the reverse. Reid explains that this is possible because of many years of experience improvising over this particular chordal form.

Incorporating Material Played Previously

The fourth generative strategy, labeled "incorporating material played previously" (INC), refers to instances in which the improviser repeats, either exactly or with modifications, material used earlier in the solo. Sometimes material is repeated immediately, creating a string of related figures. At other times, the improviser re-uses material played in previous choruses.

Improvisers may develop a short melodic figure in a string of related ideas. Several improvised solos include examples where melodic figures are clearly repeated with minor modifications. In one example, Hellmer repeats a short rhythmic figure four times with alterations that imply the underlying chord progression (Figure 21). In another example, Reid plays a longer four-measure phrase and then repeats the opening part of the phrase in slightly modified form, followed by a completely different ending (Figure 22).

INC: "I'm thinking about how can I twist this [sequence] to make it interesting over what the harmonies are underneath" [239]

Figure 21:   Illustration shows a melodic figure repeated with minor modifications. Excerpt from Hellmer's solo, mm. 53-56 with relevant commentary from his interview.

Melodic figure

Melodic figure modified

INC: "that's sequence... that's a deliberate call... responding to the rhythmic [sings] and then just making the Ab which is in the seventh chord... the symmetry of that I think is important that keeps the listener with me." [221]

Figure 22:   Illustration shows a longer figure repeated in modified form and with a different ending. Excerpt from Reid's solo, mm. 49-56 with relevant commentary from his interview.

Darol Anger speaks about relating his entire solo to a short melodic theme that he identified in the second solo chorus. Throughout the rest of the solo, Anger points out instances where he incorporates this theme. The excerpt in Figure 23 indicates where Anger identifies the melodic figure that becomes "the theme" for the rest of his solo. Figure 24 illustrates how this figure is used several choruses later.

THEME: identified theme. "I start to figure out what the solo is gonna be about" [165]

Figure 23:   Illustration shows where the "theme" of the solo (circled above) is identified. Excerpt from Anger's solo, mm. 37-40 with relevant commentary from his interview.

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INC: "I remember being really happy about that because... it's like the combining the earthy stuff and the kind of bluesy licks with [the theme]" [348]
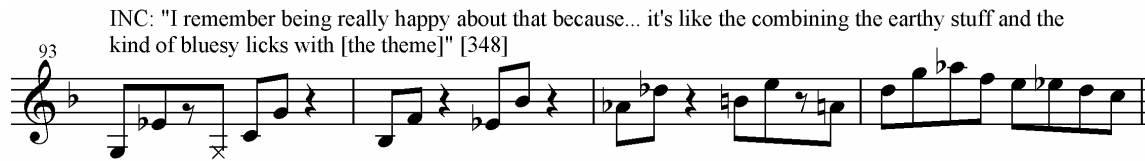
Figure 24:   Illustration shows later use of the thematic figure. Excerpt from Anger's solo, mm. 93-96 with relevant commentary from his solo.

In many of the examples of the INC principle, improvisers describe using the monitoring process to identify material for development. Hellmer states that he often plays figures and then, after hearing them, decides whether they are "worth developing" further. Anger describes how he consciously was looking to identify a thematic figure in the beginning of his improvisation. In both cases, it appears that the decision to incorporate a figure later in the improvisation was made after the figure was performed. This suggests that the evaluative monitoring process mentioned above plays a central role in the INC principle.

Combining the Generative Strategies

The combination of generative strategies is described by several participants. For example, if only a contour shape is accessed from the idea bank, then the actual notes must be chosen using another generative strategy. Mills mentions how a phrase was formed using such a combination. Initially, an idea was accessed that contained a chord template of an unusual turnaround progression (Figure 25). Since the idea included only a chordal template, the actual notes choices were guided by harmonic priority.

IB (chordal formula): "I'm definitely was doing a formula there in the last... turnaround. I was using the I bIII bVI bII thing, again not with a pre-set melodic shape to it... but deliberately chose that harmonic element" [351]

HP (actual notes): "I may not have even decided that [the I bIII bVI bII progression] until I truly landed on the very first chord and then I'm thinking those scale degrees, those chord outlines, but I'm not... playing a... preset figure... I'm just trying to create a line that's using... that harmonic underpinning" [359]
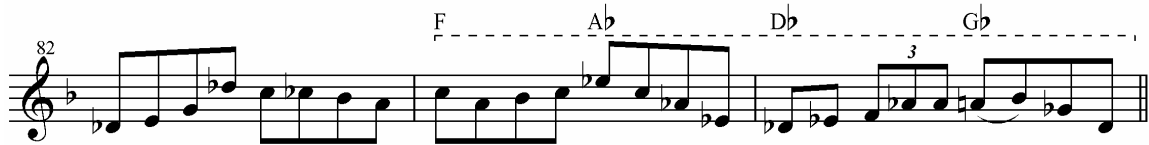
Figure 25:   Illustration shows a combination of the idea bank and harmonic priority strategies. Excerpt from Mills' solo, mm. 82-84 with relevant commentary from his interview.

The following section includes the summaries of each interview and the musical transcriptions in which participants' comments are linked to specific musical material.

TRANSCRIPTIONS AND SUMMARIES

Ongoing process labels:

MON: Monitoring process: Pertain to the backward-looking act of monitoring what has been played.

PLAN: Sketch planning process: Pertain to the forward-looking act of planning.

Generative strategy labels:

IB: Idea bank: The use of memorized music within the improvised solo.

HP: Harmonic priority: Selecting notes with particular attention to the harmonic structure of the music.

MP: Melodic priority: Selecting notes with particular attention to the shape of the melodic line.

INC: Incorporating material played previously: The recall of music played earlier in the solo, which is then incorporated into the ongoing music.

Other code labels:

AUDIENCE: Comments related to the audience in a performance situation.

ERROR: Comments describing unplanned choices made by the improviser.

PRACTICE: Comments related to practicing.

RHYTHM: Comments related to rhythm.

TECH: Comments related to the technical and physical aspects of playing an instrument.

THINKING FORMAT: Comments related to the way notes are represented in the thinking of the improviser.

TIMING: Comments related to the timing of decisions.

Other symbols in the following transcriptions:

[ ]: The number inside the brackets in the transcriptions lists the line number in the original interview from which the comment is excerpted.

×: Ghost note: When a regular note head is replaced by an ×, the note is presumably played by the improviser but the sound is not clearly apparent in the audio recording.

-: A line before or after a note head indicates a pitch slide to or from the note.

Table 2:   An index listing the number of times each main theme and selected codes are illustrated in the following transcriptions. The concepts were described earlier. The selected codes are described in the individual summaries of each interview following the notation.

		Anger	Hellmer	Kessler	Mills	Reid	Watkins	Westray
Main Themes	MON	10	3	2	5	3		
	PLAN	9	17	2	4	1	5	5
	IB	11	19	7	13	3	6	17
	HP		14	12	13	3	21	28
	MP					4	1	4
	INC	8	6		5	3		5
Selected Codes	Timing		11	1	3		4	4
	Error	3	5			2		1
	Rhythm	1		1	3	1	2	1
	Thinking format	1			1		2	
	Tech	2		1			1	
	Practice			3	1		1	
	Audience					3		

Ron Westray Transcription and Summary

Ron Westray's solo on Straight No Chaser

I

Transcribed by M. Norgaard
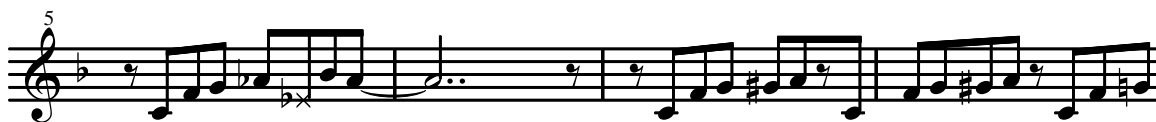
HP: "I'm just picking... the sharp five
[eleven, the note B] of the chord" [139]
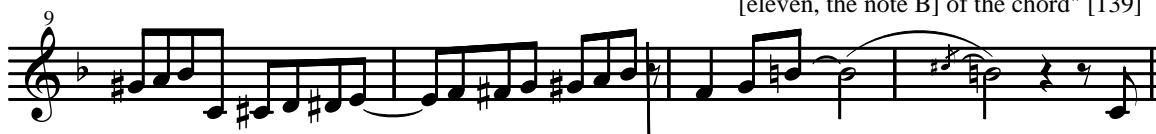
TIMING: "right when I kind of botched that chromatic line, once that line stopped,
my mind just took me to that note [the sharp 11, B natural]" [147]

II
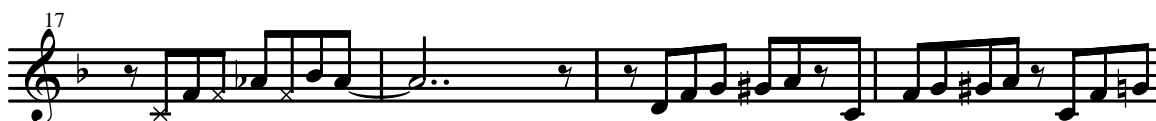
HP: "I just knew where that
sharp five was [C#]" [173]

TIMING: heard the C# "right in there" [points] [165]

III

PLAN: succinct quality picked earlier, actual notes chosen in the moment [205]

HP: "I'm playing... the most simple aspect of the chord so that you can hear the one to the four [chord progression]" [193]

IB: "I was thinking about the melodies like 'Now's the Time'" [205]

HP: "So really here, what you have is like the implication of a natural four, the church resolution,
natural four to minor four chord to one" [221]

rushed

IB LESS EXPLICIT: "That's the type of phrasing that reminds me of Bird, OK. That's not to say that you
would be able to go out and find this exact phrase because it probably has a little bit of my own things
somewhere in it, but I would say that the real source for... a phrase like that would be say Charlie Parker"
[213]

HP: "that's just articulating the five and the three of the
one chord because... I know the effect that each pitch is
gonna have as a personality" [231]

HP: "that's the root of the two" [227]

MP: "I'm following just the shape of my line.
I really don't know where it's gonna take me" [235]

IV PLAN: "I'm definitely conscious of... the second chorus. I know that I'm gonna string more linear stuff together" [275]

HP: "I'm creating my own little harmony and then that grounded me in the mixolydian mode" [263]

HP: "I wanted to sound that four three suspension [sings], so I'm conscious that I'm gonna start my phrase like that" [259]

IB: "This is a pattern that... I have in my toolbox" [289] [have you played it exactly like this before?] "Probably not exactly like that, but just the general implication" [293]

HP: "I'm very conscious at this point of... true mathematical principles, I know that I want the sound of the six" [301]

HP: "back to the one chord" [297]
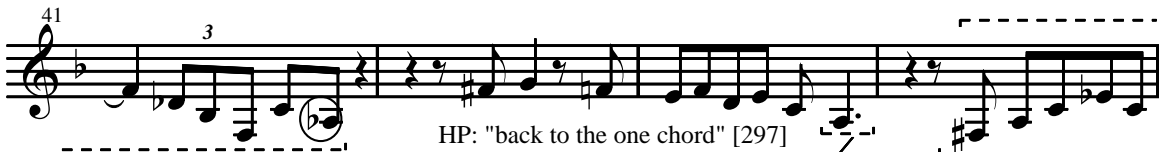
HP: "I'm conscious of landing on that Ab which is the seventh the chord... because I... want that four chord to be realized on... in a single line" [277]

TIMING: "Certainly during the longer value [points]... I probably was beginning to hear... the specific [upcoming] lick" [309]

PLAN: "[prior to starting] I know that that phrase is gonna ride me all the way... to the end of the form" [331] "[but] I didn't necessarily know that I'd play [the] diminished stuff here" [339]

delayed

HP & IB: "I just made that cliche decision to trickle down the five chord by way of the diminished scale" [315]

IB EXPLICIT: "in this case I was hearing the specific thing that I got from JJ [Johnson]" [313]

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V

MP: "now I'm not thinking about chords and I'm not thinking about what I'm about to play. I'm just playing like... blues stuff" [345]

MP to HP: "there is a split here... my mind went back to... hearing the Bird changes" [371]

HP: "I'm going up A minor and... down inside of Ab minor" [371]

IB & ERROR: "It didn't come out perfect... [but it] is not so much a big deal to me because I... was... going for is the sound of... the harmonic implication... so in a sense... this one is like mine [version of a Kenny Dorham lick]" [385-389]

IB: "the ends of my phrases I think I'm still pretty much hearing Bird. I like the way he closes out phrases" [407]

VI

HP: "I'm just hearing one four again" [427]
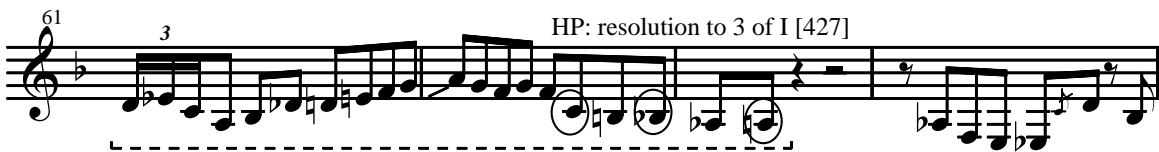
HP: resolution to 3 of I [427]

IB: "it is definitely... an opening phrase that I've used before on a blues" [435]

HP: "I'm just finishing the function of the one seven" [446]

IB: "I tagged that on, it's like I just went 'bkrr" [486]

IB: "I played the quote [from Kenny Dorham]" [389]
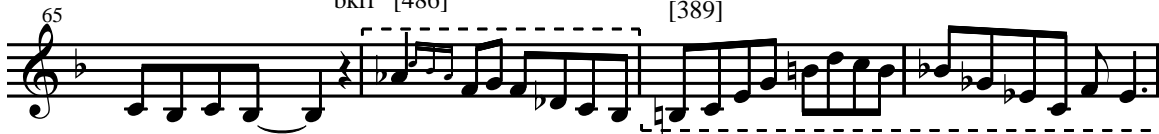
INC: response to measures 55 & 56: [so you're keeping a record of what you played in the chorus before?] "it's not verbatum but I'm aware of... really key things that I played, so I'm either gonna avoid it or do it again" [466]

TIMING: "I knew melodically and rhythmically what was gonna happen, cause I knew I had to place it in a certain part ahead of the downbeat" [506]

IB: "if I feel like... I need a stabilizing effect... I'll play something that's really traditional"[496]

HP: "using... the power of that dominant implication in its linear form" [502]

VII

IB & HP: "like that opening phrase where I knew rhythmically and melodically... it was more like a composition... But this... that second phrase, yeah, it's a little more risky" [542]

IB: "Charlie Parker" [498]

HP: "I'm just weaving that line in time buying time with passing tones and just kind of traditional rhythmic momentum" [538]

HP: "basic harmonic principles that I want to speak" [544]

INC: "we're just gaining momentum, so I think that the phrasing just took me... to the beginning of the [next chorus]... It's a natural build" [568]
"It's [phrase lenght] just a consequence of whatever came before... [not] premeditated" [572]

81

HP: "I mean... Am7 Abm7... G and Gb7 or C7 and so I'm conscious of that cycle" [544]

VIII

IB: "I'm on the out now, so this chorus sounds a lot like that first one because it is like, OK, beginning, middle, recap, head out" [582]

85

89

HP: "Four chord" [578]

IB: "that's Lester Young's phrasing" [604]

93
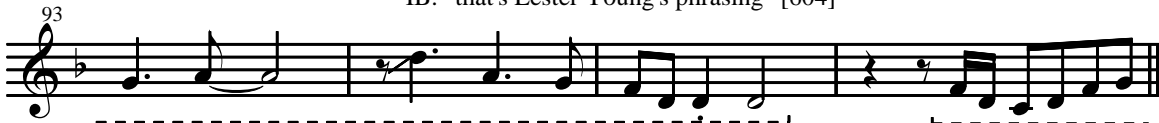
MP: "I'm just singing... I don't know where it's gonna take me... I'm just hearing a phrase, there is no map behind that part of the phrase" [592]

94

97

INC & IB: "because of the way this phrase ended [measure 95]... that's Lester Young's phrasing and so it put me in this kind of forties fifties nineteen fourties vibe" [604]

HP & IB: "I just like the way that Trane sets up the four chord with a six which was the ninth" [608]

PLAN: "the first thing that came to mind was B fully diminished, that's just how that progression looks... and then I just basically repeated the rhythm from the previous phrase within the logic of that" [626]

PLAN: hear diminished sound [618]

101

HP: "I'm four then fully diminished" [610]

INC: m. 102 is the consequense rhythmically of m. 101 [622]

HP: "that's my six chord so I'm conscious [of] Am D7 [sings] sharp eleven" [632]

105

RHYTHM: "I'm trying to vibe with drum machine there" [644]

109
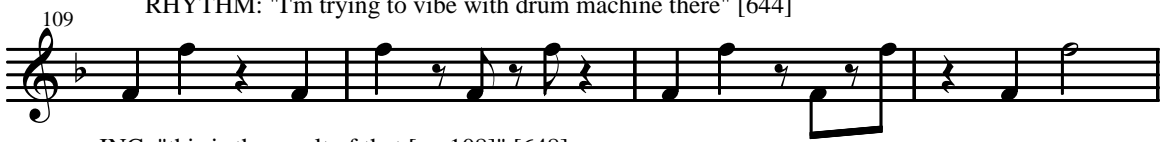
INC: "this is the result of that [m. 108]" [648]

113

HP: emphasizing VI, shooting for F# [654]

95

XI

delayed

XII
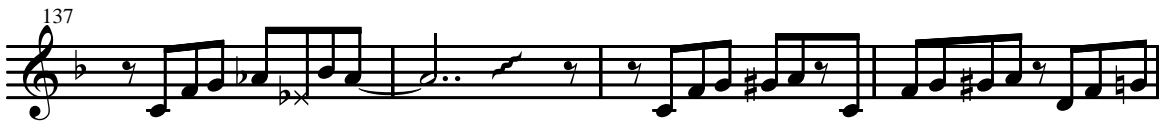
HP: "Flat six, sharp five" [674]

RON WESTRAY:

EXAMPLES OF THE SKETCH PLANNING PROCESS AND THE FOUR GENERATIVE STRATEGIES

The interview with Ron Westray is presented first, as it includes clear examples of all four generative strategies. In addition, the solo transcription also illustrates several instances of the sketch planning process. Westray's solo transcription does not include examples of the monitoring process.

The Sketch Planning Process

One of the most intriguing aspects of thinking described by Westray is the nature and timing of his decision making. Comments reflecting his process of sketch planning appear in the transcription of Westray's solo in measures 25, 37, 45, and 101. Two of these examples were described earlier and are depicted in Figures 5 and 7. Westray's description of sketch planning is similar to descriptions by other participants in the study.

As Westray approaches a phrase, only outlines and melodic contours are determined. As the actual starting point of the passage nears, he makes decisions concerning specific, structurally important notes. Lastly, right before the planned passage is performed, the notes in the middle are filled in. It is as if the improvised material gradually "comes into focus" in the mind of the improviser.

On a higher temporal level, Westray describes an initial sketch plan for the entire improvisation that influences all of his note choices. This plan includes starting the solo with sparse, rhythmically simple material that "grounds" both the listener and the performer, continuing with a development and a peak, and ending with "winding down"

the solo. It also appears that Westray had a sketch plan for individual choruses, as each chorus has a particular theme. Westray describes this local plan as being formed just prior to each individual chorus.

The Four Generative Strategies

Westray is a trombonist who plays in the bebop tradition. This is reflected in his frequent mention of the use of ideas learned through his study of the jazz tradition. He refers to these learned passages as "nuggets."

While discussing his decision making process, Westray refers to four different generative strategies: inserting "nuggets of stuff" (idea bank, IB), choosing notes using "logical mathematical" principles (harmonic priority, HP), "singing" melodies internally that are then transferred to the instrument (melodic priority, MP), and incorporating material played earlier in the solo (INC). At some points in the interview, Westray describes how one of these principles guides the creation of a phrase; at other times it appears that several of the principles are used in combination.

The Idea Bank: "Nuggets"

Westray describes how he sometimes inserts a learned melodic figure or nugget into his improvisation. He describes these "nuggets of stuff" as being derived from the jazz tradition, and he occasionally traces particular figures to specific performers, like trumpeter Kenny Dorham or saxophonist Charlie Parker. Comments reflecting this strategy are noted in the transcription of Westray's solo in measures 30, 45, 55, 59, 67, 73, 97, and 100. In some instances, Westray describes how he decided to play entire figures well before they appear in the solo. Though he is unable to pinpoint specifically

when a decision was made to play one of these figures, he appears to know the specific melodic and rhythmic features of the figure ahead of time.

According to Westray, the decision to insert a figure from the idea bank is guided by a desire to communicate a historical reference and to link the melodic content to the chord structure of the blues form. By using figures that have a historical origin, Westray connects his improvisation with the history of jazz. In addition, he mentions several times how particular melodic figures are examples of ways to link melodic choices to the chord progression (mm. 55, 67). He speaks of learning to imply chords in his single lines by studying these phrases.

The idea bank can refer to both note-for-note replications of learned material and the use of stylistic features from a particular person or era. In one instance, Westray speaks of "the way Charlie Parker ended phrases" (m. 59). Westray points out that he likes to end phrases in the same way and identifies specific examples of him doing so. Asked to define features of Parker's phrase endings, Westray refers only to general descriptive labels like "cool" and "laid-back," apparently unable to articulate specifically the embedded information in the templates he recalls. The fact that these templates do not guide specific note choices implies that other generative strategies may come into play.

Harmonic Priority: "Math"

Westray describes a second generative strategy as being "logical" and "mathematical," which I label harmonic priority (mm. 11, 23, 25, 30, 33, 34, 37, 39, 41, 43, 46, 55, 63, 64, 67, 72, 75, 79, 83, and 101). In this mode, which Westray used more often than drawing material from his idea bank, he seems very conscious of the underlying chord progression and appears to be choosing specific notes according to their chord function. He describes how various chord tones have "personalities" (m. 34), and

explains that he knows what a particular note will sound like based on its function in the accompanying chord. Nevertheless, he describes note choices as being made in the moment and happening so quickly that he does not know where "the line will lead."

Westray often use harmonic priority to create longer eighth-note lines (mm. 46, 55, 75, 79), explaining that he often "shoots" for particular chord tones. In other words, he may be aware of a particular upcoming target note that is structurally significant, though the notes preceding the target note are chosen in the moment.

In one example, Westray describes how a phrase is created by combining material from his idea bank and harmonic priority (mm. 72-77). The beginning of the cited phrase was generated based on harmonic priority, and the latter part was a direct quote from Charlie Parker. Interestingly, Westray contrasts selecting recalled material from the idea bank and creating new melodies based on harmonic priority in terms of risk, explaining that quoting from known material is the less risky of the two options.

Melodic Priority: "Singing" and "Playing Bluesy Stuff"

Westray generates material based on melodic priority (mm. 34, 49, 53, 92) much less often than he creates based on harmonic priority or selects materials from his idea bank. In one instance, Westray refers to melodic priority as "singing" (m. 92), describing this way of thinking as more intuitive than harmonic priority, as it does not require conscious awareness of the underlying chord progression. He describes, in reference to one passage, simply hearing the notes in his head before playing them. In one instance, Westray contrasts what he calls "singing" (which I label melodic priority) with a "mathematical" approach to note selection (which I label harmonic priority). He asserts that some musicians rely solely on their ability to "sing" or "pre-hear" all notes while improvising, but, according to Westray, this ability is not sufficient to carry the

improviser through all situations. He claims that improvisers must be able to choose notes according to "mathematical" chord logic as well.

Another example of creating with melodic priority is referred to by Westray as "playing bluesy stuff" (mm. 49-53). Doing so in this instance involves choosing notes from the blues scale, all of which fit the entire blues progression, eliminating the need for concentrating on the chord changes.

Incorporating Material Played Earlier

The generative strategy of incorporating material played earlier (INC) is employed infrequently in Westray's solo (mm. 67, 81, 97, 102, and 109). Westray discusses how he remembers material as it is created during his improvisation, which allows him later in the solo to either repeat and develop the material or specifically avoid repeating it. He recounts how he keeps track of this material by remembering "general chordal features."

Rufus Reid Transcription and Summary

Rufus Reid's solo on One For Amos

Transcribed by M. Norgaard

I

HP: "That is a confirmation of, also
solidifying, the tonality" [83]

MP: "It's very melodic... it goes up and it comes down... it is very diatonic... you can hear the
seventh... but I'm not thinking that, I just hear that sound."[99]

5

HP: "I was on the four chord and the third
and then of course I had to resolve it right
to the Bb" [123]

9

IB: "part of my arsenal of ideas" [127]
MP: "I'm really thinking more about... the line being melodic... give it to a classical person and
(he'd) say well this is something that Mozart or Bach could... because of the strength of those
notes... a sense of completion"[131]

II

13

MON: "it feels like everything is shifted but to me... if I do that and **I hear myself doing that** then I
have to somehow figure a way to level it off so that the next point of departure or next main section of
the blues I gotta be there"[143]
"I have to somehow rectify that soon you know otherwise someone says oh oh" [151]
Line "rectified" by a resolution on the Bb chord in m. 17 [155]

IB: "now that was a very typical... straight ahead kind of cadence thing, maybe I'm just settling it down so that's when the solo starts" [163]

45

V   PLAN: "I need to settle myself [in the beginning of a solo]" [195]
     AUDIENCE: "Even people who say "ahhh it's OK at least he did start strong" [199]

49

MP: "you can just keep going [with the triadic descending idea] but it is very simple but it is
like... it really just... solidifies.. where I am" [195]
 "I didn't really think about how I was gonna complete that but... cause I could have
 done many different other things [sings alternate endings]" [199]

53

INC & AUDIENCE: "that's sequence... that's a deliberate call... responding to the rhythmic
[sings] and then just making the Ab which is in the seventh chord... the symmetry of that I
think is important that keeps the listener with me." [221]

ERROR: "I can be playing great notes but if there are in the
57   "that little idea"   wrong place then it messes up stuff" [233]

ERROR & MON: "I got there to soon or sooner than I would have liked so you have to
be a helicopter and kind of over around or... To me I had to... I had to fix that whatever
that is. It's not wrong but I think that little idea was either earlier than I wanted or... "
[229]

105

VI

61

INC: "it is still kind of utilizing that same little
germ of an idea [from m. 57]" [289]

65

MON: "rhythmically it is displaced though and that to me establishes kind of the element of surprise, even
to myself I said "oh, OK" so I have two choices I can either try to continue that and... or try to get back on
track myself to something" [313]

69

delayed
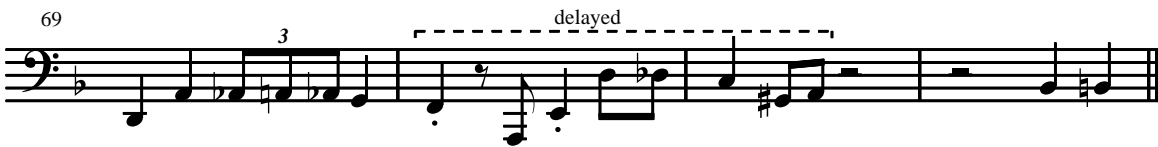
VII

73
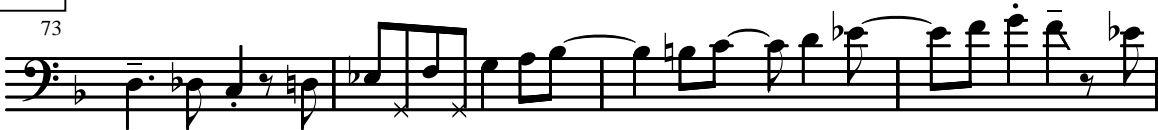
MP: high note chosen to complete "phrase of the line" [337]

77

81

ahead

IB: "that whole idea was all [a] bebop idea" [325]
"I think it was from the vocabulary but not something that I literally extracted" [329]

106

VIII

85

HP: "adding maybe an altered kind of
approach to the next chord" [373]

89

93

IX

97

INC & RHYTHM: "See that is a rhythmic symmetry there. I'm thinking more about the rhythm..." [377]
AUDIENCE: "we always want our playing to be accessible but it is accessible because people can... they can
recall that they heard something rhythmically and that just keeps them engaged" [377]

101

3

3

105

delayed

107

RUFUS REID:

MELODY RULES

      Rufus Reid is a world renowned bassist who has performed with some of the biggest names in jazz (see Appendix A). His experience is reflected in his approach to improvisation. Specifically, his priority appears to be a focus on creating melodic lines and avoiding the use of well-practiced material, an aesthetic that is in line with the modern post-bebop tradition (Jost, 1974).

      Reid speaks mainly of two generative strategies: the intrinsic logic of "the line" dictates upcoming note choices (which I label melodic priority) and the use of material from an "arsenal of ideas" (which I label Reid's idea bank). Reid appears very conscious of the effect his playing has on the audience and on other players, and he often relates the generative strategies to their communicative effect. Reid's thinking about improvisation is heavily influenced by the people he has played with in the past and his current focus on composition.

      Reid often refers to "the line" as dictating note choices, as if notes are chosen following a linear melodic logic (mm. 1, 9, 49, and 76). The reasoning behind this process seems very tangible to Reid. Notes are chosen to "make the line satisfy itself" due to "the strength of the individual note relationships." The line will have "a physical shape," convey "a sense of completion," and "should work when played solo." Reid's goal is to create lines that are so melodic that you can "give it to a classical person and he'd say well this is something that Mozart or Bach could [have written] just because of the strength of those notes in relating to [each other]."

Reid describes "satisfying the line" as being totally improvised and guided by "sounds" as opposed to harmonic functions. Other improvisers in the current study often explain note choices according to their harmonic function. Reid states that, "I'm not playing the chord changes; I'm playing the sound, which I think is different," although Reid contends that he did think about the harmonic functions of improvised notes at an earlier stage in his career. He explains that his improvisation is nevertheless harmonically "functional." At one point in the solo, Reid states that "you can hear the seventh but I'm not thinking that, I just hear that sound." Yet, he continues "I guess at one time I did think that." This may be the case only with very common progressions like the blues, which Reid states he has improvised over for "umpteen years."

The only aspects of "the line" that may be chosen consciously are the beginnings and ends of phrases, because these points relate to specific chord functions and rhythmic placement. Reid explains, "I think I am conscious about starting and finishing in a place that is very satisfying... rhythmically and also with the right note that will fit... I mean it doesn't have to be the root but something that actually completes the line or satisfies the last note of the line." These entry and exit points are also closely related to structural considerations.

Incorporating Material Played Earlier to Create Symmetry

The second generative strategy that Reid discusses is incorporating material played earlier (INC). As an example, he explains how "symmetry" is achieved when an improvised figure in the beginning of the solo is later repeated (mm. 49-57). Both iterations of the figure begin longer four-measure phrases with different endings, yet the emerging structure is clearly apparent in each. Reid explains his focus on structure as a way of communicating with the audience: "You have to think about satisfying something

that will take the listener somewhere." In another example, a short melodic idea from a previous chorus becomes the "germ" around which the entire subsequent chorus is constructed (mm. 60-61). Though Reid insists that individual notes are chosen in a subconscious process, he states that "I'm always conscious of symmetry, though." Reid explains this focus on structure as stemming from his current work as a composer. "I've been composing a lot more and so consequently I think how I start and how I finish or how I shape... I'm more conscious of those things as opposed to what I'm playing."

Avoiding the Idea Bank

The third generative strategy concerns using previously learned material that is part of "the vocabulary," the idea bank (mm. 9, 53, 61, 81). Reid explains how he incorporates material from his "arsenal of ideas," but he is quick to point out that each idea is a unique version of the internal model stored in his idea bank. Unlike some other participants in the current study, Reid claims that he avoids using remembered ideas as much as possible, and he very seldom refers to learned material when commenting on his improvisation.

In addition to choosing notes by "following line," Reid apparently evaluates how the line fits the underlying chord progression as he plays (ongoing monitoring). At one point in the solo, Reid points out how his line did not work out the way he had intended (m. 57). Apparently he arrived at a particular spot too soon. Reid explains, "I can be playing great notes but if they are in the wrong place then it messes up stuff." It appears that the "internal logic of the line" may become disconnected from the underlying chord progression. Reid evaluates whether the improvised line is synchronized with the chords. In the current example, the "logic of the line" created note choices that were out of sync with the chord progression. Reid explains, "I can hear it immediately that I 'oops' you

know [like] when you're in your car something goes off the road you're immediately there... you're 'hmm, how did I do that' and you have to recover."

Reid credits the many players that he has accompanied with shaping his approach to improvisation. Specifically, he credits Eddie Harris with teaching him to use bebop vocabulary only in the appropriate context. "Eddie Harris was one of those who taught me, all of us on the bandstand, to basically not be afraid of any kind of music. We played bebop, he wanted to hear bebop, he didn't want to hear anything out. When we played really out, he didn't want to hear a triad, you know, and if we played a ballad, he wanted it to really be just beautiful he didn't want to hear bebop on a ballad." Later Andrew Hill challenged Reid to avoid bebop vocabulary all together. "Then I got a chance to play with Andrew Hill and everything I played didn't work with him, and I tried but it was ugly so I had to really go [whistles] clean slate and just react to what I heard."

Darol Anger Transcription and Summary

Darol Anger's solo on Sonnymoon for Two

I

Transcribed by M. Norgaard

5

9

PLAN: second head will be up an octave and contain double stops [73]

IB: "a little bit of variation there. It's just a standard blues lick that came
over me at the moment" [27]

II

13

MON & ERROR: "I attempted to play double stops and
realized that the drum step was going too fast to actually pull
the double stops of correctly" [31]
MON: "**as I was playing**... attempting to play the
double stops I was realizing 'oh, yeah, this isn't gonna
really work like I hoped it would" [35]

17

MON & ERROR: "I had to punt a little bit and sort of change the melody
in order to catch up with myself" [31]

114

INC: uses double stops to lead into the solo [99]

III

PLAN: "at the beginning of a solo I'll generally tend to open things up a little bit and, you know, present... OK presenting the solo" [111]

MON: "this is what I do a lot, it is like, I, you know, go into like no brain, no thought land in the beginning and see what happens, and that's gonna dictate a lot of how the solo goes" [113]

IB: "I was doing those little broken things, just stepping down through, you know, the diatonicly and creating arpeggios, and... that's something that I have played" [113]
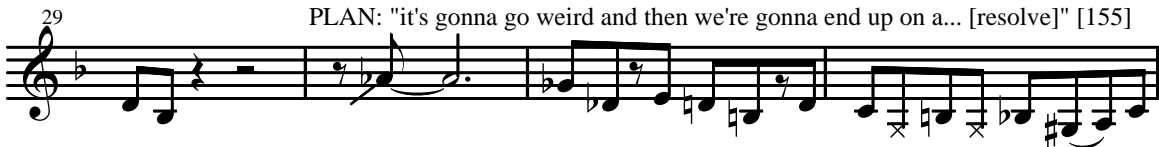
PLAN: "it's gonna go weird and then we're gonna end up on a... [resolve]" [155]

INC: "It's... almost like a double conversation. It's like blah blah blah and then the snide guy goes wa wa wa... I'm thinking... more theatrically." [143]

IB: Parker phrase [165]

IB: "stock jazz phrase" [159]

IV

MON: identified theme. "I start to figure out what the solo is gonna be about" [165]

"[fourths] it takes you out really quickly but it is not that hard to get back in. You know, at some point you are just gonna come to something that is in" [171]

115

IB: "domain material" [181]

early

INC: building on theme [205]

IB: "stock jazz phrase... a little bit bluesy... I'm a big fan of...
the Adderley brothers" [213]

INC: "oh, yeah, that's right I got [sings]
I got that stuff going" [237]

V

TECH: about leap up to D: "it's almost like a physical...
where the hand just goes up" [233]

IB: "I had a temporary lapse of brain power so I went back into public
domain material" [243]

MON: about end of lick in m. 59: "OK, let's just end this. Like just
take a second, you know, let's get this back on track here [by playing
something more creative]" [258]

IB: "[lapse] of creativity so I reverted to public domain material which was
sort of... I went on automatic here and played some jazz licks" [252]

VI

PLAN: "let's do this right play, you know, kind of something close to a regular jazz chorus" [270]

INC: Sequence [276]

PLAN: "A lot of times I try to cover... a large range of the fiddle. The fiddle is really a
nice instrument for having a big range and so... start... close to the top somewhere and
then go all down and then come up" [284]

IB: "This is also to some extend stuff that I've played before... jazz lick kind of stuff but... it can be nice and I
wasn't particularly trying to recover I was... just trying to hear the drums and stay with the drums.

INC & MON: "**just hearing that** will trigger something very quickly and... you're back
into thematic... stuff" [294]

TECH: "it's kind of a fiddle thing [string crossing] just
keep the bow moving" [310]

VII

INC: new version of theme [320]

PLAN: "I kind of jumped off the edge" [324]

VIII | PLAN: "enough of... the altered shit, let's play a blues lick, and then that brought me back to the melody" [336]

MON: improvised lick trigger memory of melody [340 & 342]

MON: "I remember being really happy about that because... it's like the combining the earthy stuff and the kind of bluesy licks with [the theme]" [348]

IX | MON & ERROR: "when I get into those flops I want to... I want to clear that up, you know, as soon as possible so then that's where I'll go to my sort of like brave sounding shit" [354]

RHYTHM: "off with the drums and kind of flopping" [354]

"brave sounding" [354}

105

X

INC: melody [362]

109

PLAN: "I remember the word that went through my mind: oh, pentatonic, right yeah [sings]. So let's do some pentatonics" [364]

113

THINKING FORMAT: "it's a lot about shapes, you know, for me. Shapes on the fingerboard and just shapes that... conceptual... it's hard to even describe really but, you know, the way that... yeah, just a note... an arc, you know... a melody will make a shape in space and time" [376]

117

XI

PLAN: "feeling the neeed to come back to something a little bit more melodic" [400]

121

XII

IB: "I know it works and feels good and it does go with the melody" [402]

IB: "there is a sort of a pattern... Stuff [Smith] would do that too and he'd be like... the band would sort of like go into the [plays] you know, the big double stops and just, you know, that just kind of raps everything up" [406]

XIII

slower out of time

DAROL ANGER:

THE THEME DOMINATES

Darol Anger is a fiddle player who has straddled the line between jazz and fiddling throughout his entire career. Interestingly, his solo is the most harmonically adventurous among all the solos recorded for the current study. He includes advanced harmonic devices such as intervallic playing based on fourths, and pentatonics, to introduce dissonance.

Darol Anger's main priority is building his solo around a "theme." He identifies this theme by monitoring his own improvisation and then latching on to an idea that he can develop throughout the solo. Though he is always aware of where he is within the blues form, he appears less concerned with implying the chord progression than with creating an interesting melodic improvisation. These priorities are reflected in his use of generative strategies. Of the two main generative strategies discussed by Anger, the principle of "incorporating stuff played previously" appears most prominently. Anger also talks about incorporating ideas from his idea bank and describes how "physical movements" can guide note choices.

Searching for a Theme

Anger explains how he starts his solo without a plan, hoping to identify a theme he can later develop. He describes his thought process in the first chorus as follows: "I go into like no brain... land in the beginning [to] see what happens." Personal "habits" guide his note choices as he relies on material he has used before while monitoring his output. Anger states that, by the second chorus, "I start to figure out what the solo is gonna be

122

about… whatever happens at the beginning, you know, you're gonna build on that thematically to some extent." In the middle of the second chorus, he starts repeating a rhythmic figure using the interval of an ascending fourth (m. 38). "So this is where... this is the thing that's gonna [give] shape to... some large extent [of the] solo."

After he identifies the theme, he continues to incorporate the idea throughout the remainder of the solo (mm. 46, 51, 69, 73). Anger describes the thinking process behind a later iteration of the solo theme: "I was thinking and then saying 'oh, yeah, that's right... I got that stuff going so let's continue that." Asked whether he could have selected some other figure to serve as the theme, Anger responded, "definitely could have been something else. I like fourths, you know, I do tend to go there, but I think it definitely could have been different depending on if I was playing with somebody different." In an example of the sketch planning process, Anger describes in one instance how he knew beforehand that he wanted to use the rhythm of the theme but did not know the exact pitch content.

Various Ways of Responding

Within phrases, Anger incorporates earlier material in three main ways: to create sequences, to create permutations, and to create a "conversation." First, an initial idea may be repeated on multiple pitch levels to create a sequence (m. 61). "I've always been into sequences, even before I... even knew there was improvising or fiddling... I always enjoyed... those sequence exercises." Anger also describes how an idea derived from the melody is used to create permutations. Since the idea consists of notes from the pentatonic scale in this case, Anger "responds" to the initial idea by playing new permutations using notes from the same scale (m. 113). Lastly, Anger describes "responding" to a phrase using a different voice: "It's... almost like a double conversation.

123

It's like 'blah blah blah' and then the snide guy goes 'wa wa wa'... I'm thinking... more theatrically" (m. 30). Anger sums up the ways of responding by simply stating "I'm a pretty reactive player." His self identification as "reactive" further points to the repetition and development of material as being central to Anger's improvisational thinking.

The Hand Leads

Anger describes how physical movements guide note choices as the left hand is going somewhere automatically, relying on learned material from the idea bank. In one instance, he states "the hand just goes up... that's just the next thing that happens" (m. 49). In another instance, he describes how he simply "starts moving the hand around trying different things." It appears that Anger sometimes thinks in various shapes, including physical shapes related to violin left-hand fingering. "That has to do with the fact that I play out of [violin left-hand] positions a lot. I like to stay in position... and move across the strings rather than up and down." Anger relates the physical aspects of choosing notes to practicing: "All those years of practicing Charlie Parker licks and everything else... you really go into your... hand memory."

Like other participants in the current study, Anger describes various uses of learned material (mm. 10, 25, 36, 42, 50, 54, 65, and 134) and how he inserts material of his own creation as well as versions of "licks" learned from others. The beginning of the improvisation contains material that is an example of the first use: "I was doing [sings]... those little broken things, just stepping down through... diatonically and creating arpeggios, and... that's something that I have played" (mm. 26-29).

At other times, Anger describes inserting specific figures that he may have learned from other players: "I started with... another stock jazz phrase with the Lydian... that is kind of a Charlie Parker thing" (m. 36).

Lapse of Brain Power

Anger views the process of using learned material as less creative than the other strategies mentioned. It is interesting how the vocabulary used to describe inserting learned material into an improvisation reflects the performer's attitude toward the strategy. Westray refers to learned material as "nuggets" that link his improvisation to "the history of jazz." In contrast, Anger refers to the same generative strategy as using "public domain material" and "stock jazz phrases," both labels that have a negative connotation. In one instance, Anger states "and then it ends with like another stock jazz phrase." In another example, he describes how using "public domain material" is "not really creative." "So I had a temporary lapse of brain power so I went back into public domain material."

In addition to the strategies described above, Anger mentions an example of error correction and monitoring and how certain architectural decisions are guided by personal "habits." During the second iteration of the melody, Anger attempted to play the second part of the first melody riff in double stops (mm. 15-16). As he was doing so, he determined that the double stop technique was not possible at the tempo he was playing. He abandoned the double stops but "got behind" in the execution of the melody. He then improvised a rhythmic variation to the melody, simply to "catch up" (m. 17). To the listener the result appears perfectly coherent. Yet, according to Anger, an initial plan had to be abandoned due to "error."

Anger asserts that many architectural decisions are not pre-planned but may be a result of "habits." These "habits" include how to start a solo, using the full range of the violin, how to cycle from "earthy" to "out" and back to "earthy," how to use predominantly descending melodic lines, and how to play melodically after harmonically complex material. Asked whether the up and down contour of a particular chorus was

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preplanned, Anger explained, "It's just a contour thing that I do a lot... It's just habitual, you know, it sounds good... feels good to me."

Mitch Watkins Transcription and Summary

Mitch Watkins' solo on Sonnymoon for Two

I

5

9

3

II

HP: "I'm already sort of thinking ahead for the Bb7 chord" [87]

PLAN: "I did have an idea that I wanted to start the solo with sparse elements leaving lots of space." [15]

13

HP: "I'm just outlining the F and the Bb chord" [49]

IB: "rhythmic idea which probably unconsciously I'd devised from another blues melody" [57]

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THINKING FORMAT: C in m. 19: "I was probably seeing it as a sound" [271] [not a light as mentioned in 259]

HP: "that's basically outlining a... Bb nine chord interjecting some chromatic elements between... the thirteenth, flat thirteen, fifth down to the third." [85]
"At that point I was thinking chords and chromaticism." [95]

HP: "it's reflecting F7... [see correction 199] Am7, D7 to go to the G minor seven sound, so I'm thinking..." [139]

IB: "Cell" [131]

HP: "that... figure is definitely outlining a B diminished sound" [103]
TECH: fingering set but string could vary [283]

TIMING: "during that space right there is probably where I would have reached for something like that" [111]
IB: "... in my vocabulary that will outline that diminished chord" [111]
"that's been played, you know, thousands of times by lots of people." [131]
PLAN: "I think you'd be safe to say that that on a broader scale I just wanna create something out of the diminished seventh that will imply some key notes, target notes, of that diminished seventh voicing so that the listener will hear that it is a diminished chord build on B, and the actual mechanics of how that takes place is probably decided a little bit later at the last... sort of the last split second." [115]

HP: "Well at that point I'm probably shooting for that F natural" [223]

HP: "I was going for the Bb... and I just... surrounded it with two chromatic notes on either side" [167]

HP: "turnaround figure that reflected the F7, D7... Gm7, C7" [227]

HP: "Gm9... sound... with a leading tone" [175]

HP & TIMING: "a lot is sort of dictated right at the last minute on the spot" [179]

PLAN: harmonic alterations in m. 28 decided in 3 stages:
1) need to "stretch" listener [303]
2) decided to use alt scale [307]
3) notes chosen in the moment from eligible "lights"

III

25

HP: "I ended up using an
arpeggio build on Gb melodic
minor over F" [151]

PLAN: about m. 28 - "I have a bunch of lights on my
fingerboard that light up for, you know, all the eligible notes
at a given point in time and then it is up to me to sort of
choose which ones" [259]

THINKING FORMAT: difficulty of material determines thinking format light/sound [287]

HP & TIMING: " the note after would have
been a little bit more difficult to [go
somewhere else] cause at that point I'd
probably already sort of got the shape together
in my head... the contour shape... and the
shape of my hand I mean those are sort of
related" [433-437]

HP: "I'm actually
reflecting a little bit of
Bb minor" [321]

29

HP: "... that A natural... could have been an easy... pivot point
to where you could have gone somewhere else" [421]

HP: "I'm probably thinking about that as kind of one pretty long thing that's sort of
weaving it's way through the changes" [353]

HP: "I'm ashamed to say that... I used just about the same
device on the two chord" [335]

33

HP: pivot point [462]

IB: "I use a device I like to use a lot, I think it is
real expressive" [361]

HP & TIMING: no conscious decision was made to not alter this V chord -
note choices were made in the moment as opposed to the V/IV in m. 28.
[363-381]

130

IV

HP: "I'm shooting for that F on the downbeat" [466]

HP: "F diminished scale" [474]

HP: "all very simple Bb7 material... I'm thinking chords" [498-502]

PLAN: "Now at this point... I just decided to... get funky... build the dynamics not by playing more or faster notes but by [using] more rhythmic and bluesy kind of devices" [506]

V

IB: "there is a number of tried and true devices that will build excitement" [518]

IB: " that's just some of my stuff" [522]

131

VI

MP & RHYTHM: "I was trying to play with some rhythmic ideas there" [528]
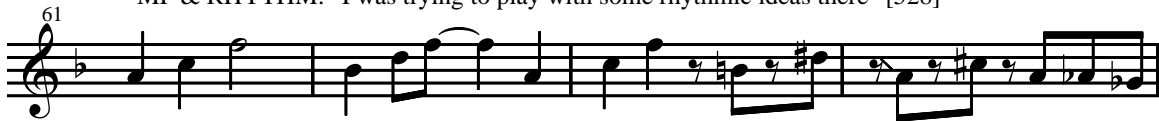
RHYTHM: "the changes didn't move for me, I just... I just played a rhythmic idea that sort of forced itself against what the changes" [554]

PRACTICE: "you can spend some time in your practice just seeing how... a pattern in seven relates to four four time... I only can do that because I've practiced it" [562]
"[I did not practice] particularly those notes but I've probably worked that rhythm out against something like that... without making the changes move with the chords" [566]

MITCH WATKINS:

SPELLING OUT THE CHORDS

Mitch Watkins is a jazz guitarist with deep roots in the bebop tradition. In addition to numerous local performances in and around the Austin area, Watkins also performs with national touring artist Lyle Lovett. Watkins's roots in tonal jazz are reflected in his solo, which very clearly outlines the underlying blues chord progression.

To communicate the underlying chord progression to the listener, Watkins uses primarily two generative strategies: harmonic priority and inserting material from his idea bank. The guitar adds a unique visual aspect to Watkins' thinking process. He describes choices made between notes that are visually represented to him as "lights" on the fingerboard. His interview further reveals when decisions are made during improvisation. Watkins often speaks of notes being chosen in the moment, but in some instances he describes how rhythmic and melodic features of upcoming passages are planned in advance. Watkins also describes how he has practiced harmonic devices that are applicable in many situations. The most interesting observation derived from the Watkins interview is a possible parallel between practice and the thinking process underlying note choices during performance.

Using the Idea Bank and Harmonic Priority

Similar to other interviewees, Watkins describes how he often uses material from a personal idea bank (mm. 13, 18, 34, and 49). In some cases this material is derived from the jazz tradition, and in other cases Watkins uses devices he calls his own. In one example, Watkins describes using a melodic figure common in jazz improvisation: "I had

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played that before... and so has Charlie Parker and... thousands of jazz players, so there is certainly nothing innovative about that line" (m. 18). In a different example, Watkins explains how he plays material he has played before but that he describes as "my stuff" (m. 54).

Watkins often chooses notes based on their harmonic function (mm. 14, 17-24, 27-33, and 37-43). He explains at one point, "I'd probably made the decision to play a real simple little turnaround figure that reflected the F7, D7, Gm7, C7" (m. 23). Specifically, the notes on the strong beats of the bar, labeled "key notes" by Watkins, appear to be guiding this generative strategy. Key notes or guide tones are the chord tones placed on the strong beats when creating using a harmonic priority. Describing his thinking during the execution of a longer string of eighth notes, Watkins explains that "…at that point I'm probably shooting for that F natural" (m. 37). Concerning the placement of these key notes he explains, "Generally I think they will probably be chord tones and they will probably be on a strong part of the bar."

Watkins changes direction on the key notes within long lines of eighth notes in places he refers to as "pivot points" (mm. 31, 33). "[For] some of those notes it would have been easier to go a different way than others," says Watkins, describing how the improvised line can change direction following the pivot notes. In reference to one example, Watkins says, "I mean when you [I] landed on that A natural [on a strong beat]... that could have been an easy place... a pivot point where you could have gone somewhere else." Watkins may chose chord tones on the strong beats several beats before they are played; however, the notes between the chord tones appear to be chosen unconsciously in the moment as a means of connecting the key notes. "There is also a more unconscious realm for me that [is] harder to talk about what decisions are made at that level."

Concerning the timing of decisions, Watkins explains that individual note choices are made in the moment, but that architectural decisions may be made earlier. "There is a certain element of improvising where it's really just trying to get to the next note and not fall apart, I mean... it's just hanging on." It appears that he values the risk involved with choosing notes right before they are played. "For me a lot is not premeditated. A lot is sort of dictated... at the last minute on the spot... That's what makes it more fun and scarier."

Describing the sketch planning process, Watkins explains how various architectural decisions are made several measures in advance. He cites as an example how he knew before the solo began that he would start with simple rhythmic figures. Speaking about a later chorus containing mostly eighth notes, he states that he made the decision sometime during that chorus to switch to "bluesy" material in the following chorus.

Watkins explains how his thinking switched between sound and visualization depending on the nature of the material played. In addition to auditory imagery, the guitar allows the improviser to visualize note choices as they appear on the fingerboard. Asked to describe his thinking process, Watkins labels some figures as "easy to hear," and that he was simply hearing a sound (m. 19). In another example that he describes as "more difficult to hear," he explains how he visualizes the fingering on the fingerboard: "That's the kind of thing that's harder... [to] hear as sounds and I'd be looking at it in terms of patterns on the neck or geometry on the neck" (m. 28).

Sketch Planning in Stages

Watkins' interview further illuminates how different decisions are formulated at different times. Speaking about his second improvised chorus, Watkins discusses how he decided to use a harmonic device prior to playing it (mm. 27-28). Interestingly, the notes in the specified passage were considered at least three different times, each time with greater specificity until the final choices were made in the moment from a very small set of options. Initially, Watkins chose to play something that would "push the listener." Closer to the beginning of the passage in question, Watkins made the decision to use the altered scale. He describes how all possible choices within the altered scale became apparent to him through visualization. "I try to look at it like say I have a bunch of lights on my fingerboard that light up for... all the eligible notes at a given point in time, and then it is up to me to sort of choose which ones." Watkins compares the process to playing chess on a computer: "It's like... a chess program... and it shows you all your eligible moves." Asked whether Watkins then played all the notes that "lit up," he continued, "it doesn't mean I'm gonna play all of them." This implies that the actual note choices are made after all eligible notes "light up" on the fingerboard.

Watkins chose the notes in this particular passage in at least three stages. Each stage limited the number of choices compared to the stage before. In the first stage, the decision was made to play something that will add harmonic tension by "stretching" the listener's ear. According to Watkins, this decision did not include choosing the actual device. This defines the goal for the upcoming passage and is similar to a visual artist sketching out essential features of an object in a sketch drawing. In the second stage, Watkins decided to use the altered scale as a means for attaining his goal. This decision resulted in the appearance of a mental image of all the notes in the altered scale. In the last stage, Watkins chose which notes to play from the visualized eligible notes. Other

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interviewees have mentioned how notes of a particular passage are chosen in a process that limits the number of note choices at successive time points.

Practicing to Develop Flexible Ideas

Watkins' interview included information about practice behavior that seems to relate to his thinking process during performance. While describing a rhythmic device used in the last solo chorus (mm. 61-64), Watkins explains how practicing the device in various ways allowed him to use it in the current context. The device in question is the rhythmic displacement of melodic figures, which gives the listener the impression that the improviser is playing in a different time signature. For example, the effect can be achieved by repeating a figure consisting of three quarter notes to an accompaniment in common time. Watkins explains: "You can spend some time in your practice just seeing how... a pattern in seven relates to 4/4 time." He continues, "I only can do that because I've practiced it." Yet, he denies that he practiced the actual note configuration used in the current solo. Watkins developed a very abstract and flexible way of using the device through practice, an example of an idea from his idea bank that is stored in an abstract and flexible form. This way of practicing appears similar to the thinking process he used to shape and insert the idea during performance.

Stan Kessler Transcription and Summary

Stan Kessler's solo on Sonnymoon for Two

Trumpet
(concert key)

Transcribed by M. Norgaard

II

PLAN: "I think it is really important to play a really simple statement at the beginning of the solo to kind of get grounded and get started" [47]

HP: "the third and the seventh... those are your hot notes" [55]

HP: "when you are playing by yourself and you're trying to outline the changes, you know, and that's what you're doing" [55]

HP: "I'm really hearing jazz blues... three six turnaround going to the two... and you'll hear that in the solo" [115]

IB: "...is a lick... from some big band chart... I want to say it's a Count Basie chart" [87]
"the Kansas City tradition... a lot of it is based on riffs" [91]

HP: "you hear the D7 you know the six chord so I go for the third there" [115]

III

IB: "that's another excerpt from some tune" [127]

TIMING: "I like to start somewhere that is familiar and inside... and
then if you want to get more complex... I like to do that further on
down the road... I mean that's just when I hear it." [145]

IB & HP: fraimng the notes of the C dim
chord but altering the pattern in the end
[149]

HP: "at that point I'm hearing some
different... some more altered chords" [137]
Internal chord determines line yet it
happens simultaneously [141]

IB & PRACTICE: "... a pattern that I practiced in all three
diminished scales... over and over for years and years and
again I'm not in the habit of... plugging things in... I want to
play what I hear... on another day I might have continued with
that pattern... and today I didn't" [153]

IV
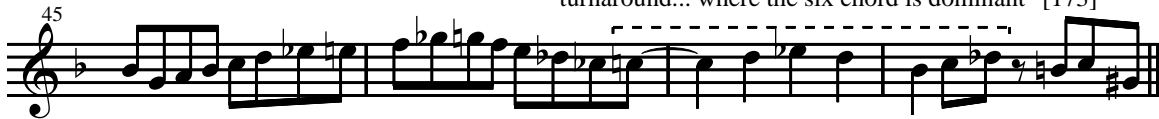
IB: "That's like an old Charlie Parker lick... where it ends on
the 9th" [157]

140

HP: "it's playing a leading tone up to the chord" [165]

HP: "that's just outlining going to the flat nine. It's a turnaround... where the six chord is dominant" [173]

V
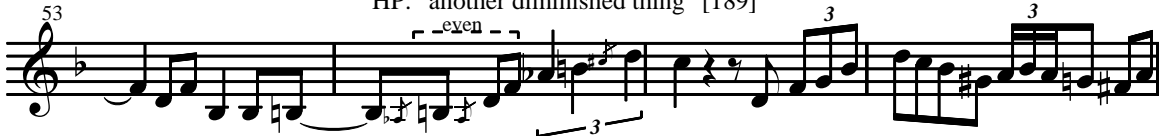
TECH: end of idea corresponds to need to take a breath [231-239]

HP & PRACTICE: "It's another diminished pattern... that I worked on" [181]

HP: "another diminished thing" [189]

HP & PRACTICE: "sharp nine flat nine... that leads to the fifth of the one chord. And that is another one of those things that you practice and it just finds its way into your conscious level" [245]

IB LESS EXPLICIT: "some shapes become kind of a stock and trade of the language" [261]
"you can have the same shape and... but vary the notes and you still have the same shape" [265]

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VI

HP: "here are fourths" [273]
"I'm hearing a different chord there... the sus chord" [281]
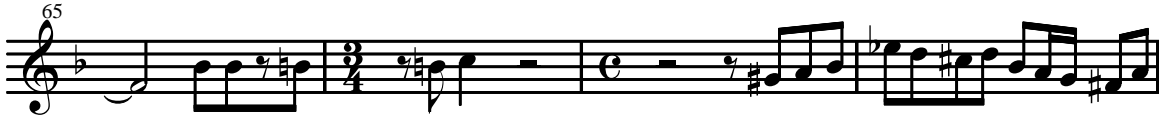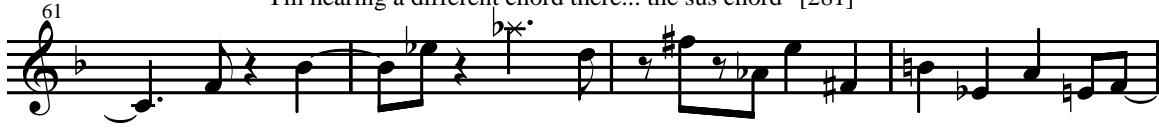
MON: "I went kind of out there with the quartal harmony for a few bars and then it felt like 'OK, let's bring it back to earth... bring it back home with something more beboppy' ... so that you can hear the form" [285]

MON & RHYTHM: "playing across bar lines... is something I like to hear and something I like to do" [301]

VII

IB: "That is a blues lick" [293]

PLAN: "a lot of that last chorus was very blues oriented and that was deliberate. The chorus before had more outside kind of sounding stuff more modern and it is a way of bringing the ear or the listener back to ground zero which is blues" [321]

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143

FIRMLY ROOTED IN KANSAS CITY

Stan Kessler is a trumpet player from Kansas City with roots in the famous Kansas City tradition of Count Basie and Charlie Parker. Kessler's experiences are reflected in the content of his solo and in the way it was generated using the intuitive process of "playing what you hear."

Kessler states that he mainly plays what he hears and that most note choices are made in the moment; however, he contends that some note choices depend on an architectural plan and that he evaluates his playing by imagining he is listening to his own solo. Like Watkins, Kessler mainly explains his own note choices in terms of harmonic priority and inserting learned melodic figures from his idea bank.

Sketch Planning

Though Kessler states his note choices are made in the moment, he speaks of a sketch plan in two instances (mm. 13-24 and 73-84). "I think it is really important to play a really simple statement at the beginning of the solo to kind of get grounded and get started." Kessler explains that, after playing several choruses and using some advanced harmonic effects, he makes a "deliberate" decision to return to very tonal material in the last solo chorus.

Monitoring

"As I'm playing I'm also thinking... I'm the listener also... I want to play what I'd like to hear if I was listening," Kessler explains. Concerning a long eighth-note line in mm. 67-74, he states, "I went kind of out there with the quartal harmony for a few bars and then it felt like 'OK, let's bring it back to earth with something more beboppy' so that you can hear the form." This indicates that he was monitoring his output while executing the line, which led to his decision to "bring it back to earth."

Kessler describes his basic thinking process as "you hear the sound and it comes out." Asked when note choices were made during a particular passage, Kessler states "the moment that it was happening." He continues, "there was no thinking involved." Under ideal conditions, according to Kessler, the instrument is just a tool to communicate the sounds that appear internally.

The ongoing monitoring process alerts the improviser when something goes wrong. Kessler asserts that only when something goes wrong will the performer think about instrument technique during an improvisation. Kessler gives the examples of a "sticky valve" or "tired chops" to illustrate how technical considerations may interfere with his idealized process of "playing what you hear."

Harmonic Priority

Like other interviewees, Kessler describes how he often shoots for certain important chord tones such as the third and seventh of the chord. He describes these notes as "hot notes" that communicate the chord progression to the listener.

Kessler describes how the chords he is "hearing" correspond with his note choices. Asked what guides the note choices in a particular passage (mm. 19-20), he explains: "I'm really hearing jazz blues [chord progression]... three six turnaround going

to the two [chord]... and you'll hear that in the solo." At a later point in the solo, he describes how an improvised passage using mainly the interval of a fourth reflects the suspended chords he is hearing at that moment (mm. 61-66). However, he denies that the chords heard internally precede the choosing of notes and asserts that he hears the chords and makes the note choices simultaneously.

Kessler's description of his thinking using harmonic priority appears inconsistent with his contention that "there was no thinking is involved." He explains how his note choices are guided by the hot notes in the chord progression. It also seems plausible that he hears the chords guiding his note choices prior to the choosing of notes which is inconsistent with his assertion that he hears the chords and makes note choices simultaneously.

Using the Idea Bank

Material in an artist's idea bank can range from specific melodic figures to mere templates like melodic contours. Kessler identifies several melodic figures as being derived from various tunes or musicians (mm. 17, 35, 38, 57, and 74). "[This] is a lick... from some big band chart... I want to say it's a Count Basie chart," states Kessler in one example (m. 17). In another example he says, "that's like an old Charlie Parker lick... where it ends on the ninth" (mm. 37-39).

Like other improvisers in the current study, Kessler describes how ideas from his idea bank may be inexplicit. In one example, Kessler denies that the melodic contour of a six-measure phrase was planned, explaining that "some shapes become kind of a stock and trade of the language" (mm. 55-61). This illustrates how learned material comprises templates that guide note choices without dictating particular notes. Kessler explains

further, "you can have the same shape and... but vary the notes and you still have the same shape."

Kessler also explains how trumpet players learn to phrase according to the physical demands of the instrument. Asked whether a particular phrase ending was based on melodic considerations or the physical demands of the trumpet, Kessler answered "it's both." He continues by explaining how advanced players automatically coordinate phrases with breathing. Occasionally the player may run into trouble. "You are hearing something in your head and you're starting to run out of air, and you run out of air before you finish your idea. That's a problem."

Learning How to Improvise

Kessler describes learning to improvise in three stages. During the first stage, the performer simply improvises by ear. According to Kessler, the performer in this stage has no theoretical knowledge and therefore is unaware of the tonal and rhythmic functions of the improvised material. At the second stage, the performer studies music theory and learns material to be used in improvisation according to theoretical function. At this stage, the performer transposes learned melodic figures into all 12 keys and practices this material in many tempos. The performer may "plug things in" during this intermediate level but it will not sound "natural," explains Kessler. During the final stage, the performer will be able to draw on the material practiced in the second stage, but in an intuitive process similar to the initial stage. The performer may be able to use the analytical labels learned during the second stage to identify material used in improvisation, but the analysis is not part of improvisatory thinking. The performer in the final stage merely experiences improvisation as playing "what is heard in the moment."

Although Kessler refers to the three learning stages in general terms, they may also describe Kessler's own development. Kessler clearly views himself as being in the last stage, defined by the unconscious choosing of notes in the moment. He states that this process of simply "playing what you hear" is so prevalent that it may supersede the physical limitations of the instrument. "It is amazing how much air you can produce when you're caught up in the moment of actually playing. Way more than you can do when you are practicing at home. I mean... the body can do phenomenal things when you don't know the meaning of the word 'no,' you know, because it's just your playing and that's it."

Jeff Hellmer Transcription and Summary

Jeff Hellmer's solo on Tenor Madness

Transcribed by M. Norgaard

HP: "that came from a standard harmonic path of going through the chords" [83]

IB: "I've played those sets of pitches before as structural points in a phrase. I've maybe never played it with exactly that rhythm or exactly those extra little notes that are in the bottom that are kind of little pickup notes underneath." [83]

IB: "an afterthought that is very typical in my conception of jazz phrasing" [97]

IB & TIMING: "in that space after that I though about 'ok I'm gonna play something that... leads into the Bb' and that is what I thought of right there and that I have played before." [101]

III

PLAN: chromatic line was decided before starting the phrase; pick-up and ending was decided in the moment. [91]

HP: "the only thought I had there was just continue playing eighth notes and hit the chords" [111]

HP & TIMING: contour and key notes were known but notes in between were decided in the moment [111]

TIMING: "this provides me with the space to think about that" [points to measure 33-35] [143]

IB: "another afterthought" [133]

29

IB: "I want to stay in the common language" [155]

PLAN & HP: "I want to play something that relates to the form, I want to get to the fifth at the end so it sounds like there is a sense of prolongation into the next chorus" [155]

TIMING: heard next unit [175-177]

33

PLAN: "this is my second chorus it is gonna go a little higher later on but... right now I'm gonna just like stay in the common language" [177]

IV

IB: "real common language" [173]

INC: "the next thought is develop it [previous unit] somehow so I just added a few notes" [177]

37

3

152

PLAN:
1) decided to use upper extensions [181-187]
2) decided actual notes in the moment [191]

TIMING: "The idea of... G could be the top of my architecture... that happens in the middle of the line like while this is running up this arpeggio" [191]

INC: top arpeggio note is 6th, same as last two units [191]

PLAN: "the main thought is covering this shape is like to go up in the upper register... we are in the second chorus and like it needs to start moving into another gear" [201]

IB: "I thought about that series of shapes before but I didn't think about it consciously in the moment" [213]

TIMING: decides to end on C [225]

PLAN: "how can I gracefully get down from this register?" [227]
HP: "secondarily to that [descending] I'm gonna play notes that reflect the chords of the blues" [227]

153

MON & INC:
1) "then it is like "OK can I work with that? yeah, I want to sequence that" [239]
2) decided to use in sequence
3) added harmonic interest to later iteration of sequence

53

delayed

IB: common language concluding phrase [259]

IB: "that is basically an F6 chord... that is one unit and then starting... that links up that C... to the next unit" [265]

IB: "It's like having a bunch of legos around and how the legos can fit together" [273] outlines unit structure [279]
"I can pivot off of... the C's and the F's in all kinds of different ways" [279]

HP: thinking sharp 5 alteration for a second then back to common language [277-279]

57

3

IB EXPLICIT: "If I could recreate this whole two bars and play it all exactly the same way every time, then I would say "yeah, that is a unit that I have learned and I'm plugging that into my improvisation right here." But it is not that way, you know... but I know I can plug, I can (play)... this is a unit and this is a unit and this is a unit, and this is how they are put together." [279]

PLAN: "So now I'm thought of thinking in terms of longer phrases" [301]

PLAN: decision to play chords is made before the start of the chorus to leave space and emphasize the left hand [305-309]

PLAN:
1) decided to play changes
2) decided to use altered chord

IB: "that is the same line as before... the F, Eb, D, Db, C, right... I didn't think about that in the moment but it is a common line" [311]

IB: "I've played that a thousand times" [317]

VI

61

154

TIMING: "the change in the resolution that is just something that happened like on the way down [in the previous measure]" [317]

TIMING & INC: "that was just born off of the half step and then... that... brought to mind a melodic shape... and then that... is a shape that is interesting so what can I do with that" [319]

65

HP & IB: "there is the most overt statement of a C7 so far. That's got the fully altered thing going on... that just sort of happened intuitively" [331]
"that's a real standard phrase that I've played a lot" [335]

PLAN: "At this point, boy, I thought: OK, I'm gonna play something that is a little more... bebopish" [357]

69

HP & IB: "it is part of the template of improvisation... most of the time it's gonna be an F7... altered in that spot" [363]

IB: "C is the link" [371]

HP & TIMING: "the decision to reflect it in my improvisation comes right around there" [363]

VII

IB: "that is a standard Charlie Parker phrase" [349]

73

IB & HP: "I just improvised my own phrase ending to it" [359]

155

ERROR & MON: "you're monitoring a bunch of different things in the music... (the) line, changes... form, and if one of them becomes a problem that screen gets bigger... you zoom in to it... and then take care of it" [447]

TIMING: a couple of notes before decided to play chord to "clear that [error] out" [435]

HP: "finally I got to the Bb7 and then I'm thinking B diminished" [431]

INC: "that's all like kind of generated off of that one chord [m. 91]" [449]

IX

PLAN: "it is a device to... get the solo to go to... this should have been the high point of the solo" [463]

INC: "basically that unit has a little answer and then the unit is played again and it has a different answer" [455]

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PLAN: "I'm trying to play a really strong
concluding phrase" [465]
ending on the root because this could
have been end of solo [469]

MON: "I probably should have ended the solo right here.
You know, in retrospect... I just didn't get... my ending the
way I wanted it" [465]

TIMING: "probably bar twelve, I decided
to keep going for another chorus" [469]

105

3

ahead

X

PLAN: "I don't want to do anything that is too uplifting cause ... I'm headed around for the ending again [485]

HP: "it is just some simple phrases that are like just kind of bubbling around the chord changes" [485]

109

3

PLAN: "again the idea, same concept as the last chorus, play a strong phrase that concludes it in nine and ten, you know, and so I play a little bluesy motive to start with that and then like get to the root again" [487]

PLAN: "in the two chord in the ninth bar, I decided "OK, I'm just gonna play that standard ending in eleven and twelve" [487]

JEFF HELLMER:

CHOOSING AHEAD OF TIME

Jeff Hellmer is a prominent pianist and educator from the Austin area who plays in the tonal jazz tradition. His solo was the first recorded for this project, and working with him provided invaluable information about how to structure the remaining six interviews. His solo uniquely illustrates how the sketch planning process is activated on multiple levels concurrently.

Hellmer uses sketch planning to create what he describes as a pleasing "solo curve." He speaks about formulating decisions about the chorus and the phrase, all of which are first construed in a somewhat abstract form. At each level, decisions are made as one chorus ends and the next begins, or as one phrase ends, and the next begins.

This orderly process of planning is interrupted in a section where Hellmer's piano fingering "breaks down." In that instance, he describes only dealing with material in the moment with no consideration of overall structure.

Choosing the Subject of the Next Chorus

Concerning the overall architecture of the solo, Hellmer describes how he chooses the "subject" of the next chorus from available options. These subjects include use of chromaticism, density of notes, and use of various registers and textures. As an example, Hellmer explains how he wanted to go into a different register in the second solo chorus (mm. 37-48). "This is like an overall thought of the thing: We are in the second chorus and... it needs to start moving into another gear." In a later chorus, he changes the texture by switching from chordal accompaniment to a walking bass line in the left hand.

Devices are employed at specific points to produce an overall shape to the solo, which Hellmer refers to as the "solo curve." "I have kind of a general curve in mind... so that over time... there should be a build in interest somehow." The solo curve is designed to sustain the interest of the audience. "The whole idea of the solo curve is designed with the audience in mind. I mean [the] idea that... the solo should build over time is a way to carry the listener along."

Though Hellmer appears to start the solo with a pre-conceived solo curve, the actual "subject" of each chorus is not planned in advance but is chosen at the very end of the preceding chorus. Hellmer explains how the solo curve implies increased intensity: "Probably by the third chorus I'm gonna have something happening and add more intensity." However, the actual device used to build intensity appears to be chosen near the end of the second chorus. "It is more like a decision point around the end of each chorus," explains Hellmer, "so that [the] next flow might be... a different register... or it might be you play something really out of the standard jazz vocabulary, or it might be you play something that is highly chromatic or it might be you get rhythmic."

Choosing the Subject of the Next Phrase

Sketch planning also occurs on at the level of the phrase. In one example, Hellmer describes his thought process concerning the contour of an upcoming phrase: "The main thought is covering this shape... in the upper register" (mm. 45-48). In another example, one concerning pitch content, he explains how he knew the key notes of an upcoming phrase prior to playing the phrase. "I knew that was gonna happen before I started into it" (mm. 25-27). The role of key notes or target notes has been described by other interviewees as well.

The decisions concerning the upcoming phrase appear to be made in the space between phrases or at the very ends of preceding phrases. In some instances, Hellmer specifically identifies the rest between phrases as the time when decisions about the upcoming phrases are made (m. 28), though, most often, Hellmer explains that he makes phrase-level decisions during the performance of each preceding phrase. He identifies one example of a melodic figure at the end of a phrase as the time when he planned the next phrase (m. 31). "This provides me with the space to think about that." Hellmer labels the figure "an afterthought" that he tagged on to the preceding phrase, in part, to allow "thinking time" to plan the upcoming phrase. This indicates that he is able to plan upcoming choices while playing. According to Hellmer, this is only possible during the playing of material that requires no conscious thought. "That is just an afterthought that is very typical in my conception of jazz phrasing... there wasn't anything conscious about it."

Decisions concerning an upcoming phrase may be based on an evaluation of the effectiveness of the current phrase (ongoing monitoring). Hellmer explains: "Basically, in terms of the flow of ideas on a local level... there is an idea, I'll play it and then there is sort of a decision point that goes on in my head 'is this worth developing?'" He explains that some ideas are worth developing and others are abandoned.

Choosing the Next Unit

Hellmer describes smaller "units" as musical figures in his memory store (idea bank) that he is able to recall and perform in multiple contexts. In one example, he divides a four-bar phrase consisting primarily of eighth notes into four units, each of which is 6 to 11 notes long (mm. 57-60). He explains how the phrase was generated by

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"plugging in" these learned units: "It's like having a bunch of Legos around and how the Legos can fit together."

Hellmer explains that the choice of the next units happens "about the note before" the end of the current unit. The decision-making transpires so quickly that he finds it difficult to explain: "It is some intuitive process. I don't know what to say other than that... and part of it is magic."

The Plan is Interrupted

The orderly process of choosing the subject of upcoming choruses and phrases ahead of time has to be abandoned when passages are not executed as planned. Describing a particular passage in the beginning of the sixth solo chorus (m. 85-88), Hellmer states that the sketch plan was "scalar notes with some passing tones." But then something unexpected happened: "I kind of got into this third thing and either my fingering broke down... maybe that's what happened. I didn't feel I was like gonna be able to sustain that line."

Hellmer explains how he dealt with the unexpected fingering error by returning to material that he had played earlier in the solo (incorporating material played previously). At the very moment when Hellmer's fingering "broke down," he unexpectedly ended an eighth-note line by playing a two note shape. He then repeated the shape in various rhythmic iterations in the measures that followed. "I got this two note shape so I'm gonna take that and... play something that has some rhythmic interest."

Hellmer explains that during this recovery process any consideration of overall structure is abandoned as attention is directed toward the unexpected. "My focus shifted. There is not much consideration here of [the] flow of the solo or... long term considerations. It's more like a survivor mode." He describes how various areas of the

improvisation—the improvised line, the implied chord changes, and the overall form—are all monitored continuously. When unexpected events occur in a particular area, the improviser "zooms in" to regain control.

John Mills Transcription and Summary

John Mills' solo on the Blues

Transcribed by M. Norgaard

IB: "I feed myself that starting figure" [23]
"the nature of riffy blues heads has a certain component" [27]

INC: "whatever... I improvise in that first couple of bars, that's my germ... and so I try to hang with that and... treat that like a theme" [27]

TIMING: make decision to express four chord by transposing figure [51]

HP: "Am I gonna try to express the four chord in the same range where I set up my... the one chord or... in this case I went down" [39]
"I'm seeing that chord mentally coming" [47]

IB: "I must be unconsciously following... some kind of a tension release pattern of blues heads where somehow the riff doesn't quite get carried away [into bar 9-12]" [63]
"that's sort of a **model** I have for a blues head" [71]

MON: "had I generated something that's solid yet?... there is a little too much variation for it to really serve as a good riff head. Let me see if I can do another cycle" [35]
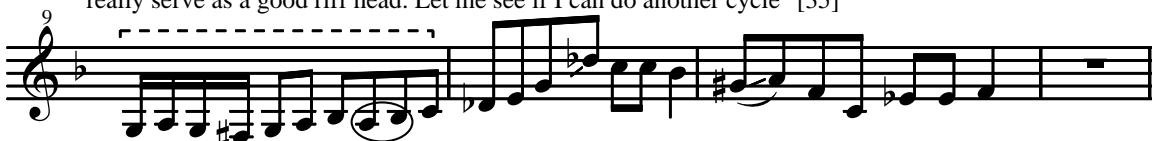
TIMING & HP: "when I'm... a few eighth notes... away, that's where... I have made my commitment to what is gonna be my pitch for the five chord" [127]

HP: "basically a run-up the two minor chord from the root... I'm playing some kind of a flat nine version of the dominant" [83]
"when the chords are changing you try to weave as close as scalar kind of connection as possible... once you're inside the new chord then you have the most freedom to skip around" [115]
"I am sort of assessing while I'm playing within... Gm and I know that C7 is coming so I'm always looking to see where is that next little branch of the tree I can jump to when the chord changes" [123]

IB: "there is a harmonic formula there that's going on more than the specific lick" [83]
"I'm using a rising scale and then... when the five chord hits... that diminished triad that we map on to the dominant chord" [83]
"it is a general shape... that's been done a billion different ways... but that idea that... say a... scale orientation of the two chord and an arpeggiated version of the five chord... that's a sort of **model**" [107]

THINKING FORMAT: "I think of it in scale degrees" [95]
"..because if any key I play that I would have probably gone to that spot [G in m. 9]" [99]

PRACTICE: "the product of the drilling is to kind of make scale degrees, fingering, sound, the mental, the physical, the aural, to kind of become one" [103]

PLAN: "I'm sort of solidifying the nature of this riff theme [by playing it twice]" [31]
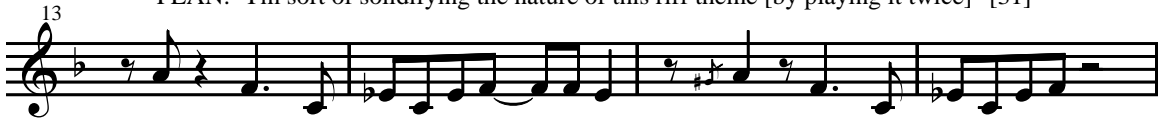
INC & HP: "I stayed in the same range and just made the adjustment" [27]

PLAN: "that phrase length is a more typical "OK, now we're soloing" [163]

IB: "I had a **model** of what's gonna happen in that fourth bar... sort of a harmonic set with no pre-set plan or certain figure" [171]

III

HP: "it's sort of chromatic embellishment of just really the I7 chord until the fourth bar where I've done a tritone sub" [147]

HP: "moving from the one to the major seven to the flat seven there it just sort of sets up what's to come which is my arpeggiated tritone triad" [155]

HP: "I tend to be pretty conscious in that fourth bar of the blues, the eighth bar of the blues... of doing something that really kind of delivers all that information so... I'm really thinking the... D7b9 there..." [175]
IB: "I'm trying to establish expectations... so that kind of a formula... is so logical..." [175]

IB: "I kind of rose up to a point arpeggiating through that diminished seventh chord [m. 32]... I'm kind of [playing] a scalar response to that [m. 33]" [179]

HP: "it is... coming out of... a tritone... framework... and then I'm... seeing that available lower neighbor... to... ease my landing into the chord change" [199]

IV

RHYTHM: element of cross-rhythm [259]

IB: "pre-conceived notion I'm gonna express the tritone sub in that fourth bar" [267]
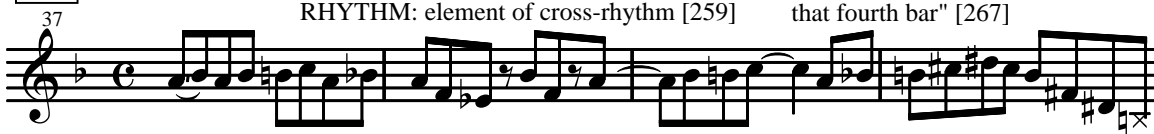
PLAN & MON: "Right so I kind of played all the way up to the eighth bar. Yeah, so... I guess that is probably a factor of not so much a chosen thing like I'm gonna play a longer phrase this time but it is kind of the nature of getting some momentum going" [223]
"I hadn't necessarily thought that "I'm gonna play a longer phrase," but emotionally... you're trying to keep building it" [255]

IB: "the elements that could take it further is a little more relentless density of notes or length of phrase... There is sort of a **model** about what differentiates the second chorus from the first chorus" [239]

MON: "as I am... in the middle of that phrase I'm thinking "well, I still got some place I can still take it, I can still take it, I can still take it" [235]

HP: "instead of ever really landing on one, I'm hanging on to my five chord tension... to go ahead and wait all the way to the down beat of the next chorus" [287]

HP: "I was wanting to kind of bring it back in in terms of clarity" [279]

IB: "these are all the products of things that I am constantly trying to work out... not the licks but the models" [303]

MON: "I found myself in kind of a triadic kind of a combination... couple of triad combinations and... seeing an opportunity to hang with it longer" [299]

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RHYTHM: "getting into something that is like really rhythmic in nature" [307]

INC: cross-rhythm from m. 38 [307]

HP: tritone sub to four chord [307]

IB & HP: "I think that is again a model I'm tending to use that six chord feeding back to the two chord to be at a place where I'm bringing it back inside lines, you know, for harmonic clarity" [311]

MON: "the emphasis... a growl... gesture... I thought it had the potential to be a last chorus" [319]

INC: "I didn't stick with that blues gesture for whatever reason" [323]

VII INC & RHYTHM: "this is a similar kind of a rhythmic idea of a certain kind of a displacement" [343]

HP & IB & TIMING: "I'm definitely was doing a formula there in the last... turnaround. I was using the I bIII bVI bII thing, again not with a pre-set melodic shape to it... but deliberately chose that harmonic element" [351]

"I may not have even decided that [the I bIII bVI bII progression] until I truly landed on the very first chord and then I'm thinking those scale degrees, those chord outlines, but I'm not... playing a... preset figure... I'm just trying to create a line that's using... that harmonic underpinning" [359]

PLAN: "that's kind of a device that often signal the... final chorus to me in blues... something that's kind of... more "back home" blues language" [363]
IB: "I think that is kind of a model too... that the last chorus, you're kind of wrapping things up" [391]

IB: "I treated that fourth bar much more conventionally... a lot less tension" [375]

JOHN MILLS:

USING TEMPLATES ON ALL LEVELS

Saxophonist John Mills is also a prominent performer and educator in the Austin area. Though his solo clearly reflects the underlying chord progression, some of his harmonic language has roots in the post-bop jazz tradition of Miles Davis and John Coltrane. This is reflected in Mills' use of general templates to create improvised material.

Mills uses templates from his idea bank as a way to incorporate the jazz language into his improvisation. Templates guide the architectural structure of the entire solo and the implied chord structure of each chorus. On the phrase level, Mills uses templates to construct melodic lines, and he denies that any of his improvisation includes well-practiced ideas that are incorporated note for note. Mills states that he developed these templates by studying jazz solos.

Mills also uses harmonic priority in constructing melody lines. Throughout his solo, he appears to combine these two generative strategies by utilizing templates and filling in individual notes according to the harmonic context.

Architectural Template

Mills uses a template from his idea bank to guide architectural choices shaping the overall solo. The template includes information about the general intensity level of each chorus in the solo. Concerning the transition from the first to the second chorus, Mills states, "OK, here is the next plane. I probably had in mind I was gonna do maybe five choruses or something. I sort of had a shape so I kind of knew where I was in the

solo." This solo shape template is realized by varying the intensity levels in each chorus using devices like implied harmony, note density, phrase length, and register. In the first chorus, Mills implies a standard chord progression and uses shorter phrases. In the second chorus, he defies expectations by prolonging the initial phrase. By the third chorus, Mills is using more complex rhythmic and harmonic material. The fourth chorus includes the highest pitched note and a harmonic prolongation. By the last chorus, Mills returns to shorter phrases in the middle register.

Mills also uses templates that include information about the implied chord structure of the chorus. Jazz improvisers can imply an underlying chord structure in a monophonic improvised line by placing chord tones on strong beats and incorporating arpeggios in the melody. Describing why he implied specific chords with tension in certain places, Mills explains, "I tend to be pretty conscious in that fourth and eighth bar of the blues... of doing something that really kind of delivers all that [chordal] information." He labels these alterations as being so ingrained in the jazz-blues tradition that they are expected. Describing the last chorus, he states how he defies expectations by not altering the chords in those measures.

The chorus templates also include information about phrase length. In the first and second chorus, Mills improvised a blues melody. He used shorter, repeated "riffs" in the first eight measures and concluded each chorus with a longer phrase. "That's sort of a model I have for a blues head... that [in] those [last] four bars [I] can let go [of the riff]." In the third chorus, Mills switched to a different chorus template that included a four bar phrase in the beginning of the chorus. This template suggests the soloist has transitioned from a blues melody to the solo. "That phrase length is a more typical 'OK, now we're soloing...'"

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Phrase Level Templates

Mills explains how many of his melodic lines are guided by contour models and harmonic principles embedded in the less explicit templates from his idea bank. In one example, he describes a phrase as follows: "I'm using a rising scale and then... when the five chord hits [I play] that diminished triad that we map on to the dominant chord" (m. 9-11). Mills denies that the figure in question was created by inserting well-practiced, memorized material. Instead, he asserts that the figure was created in the moment guided by harmonic principles. "There is a harmonic formula there that's going on more than the specific lick." In another example, Mills describes choosing a chordal template from his idea bank, and then choosing in the moment the actual notes from the resulting limited set of options (m. 83-84). "I'm not playing a preset figure like [sings]. I'm not... I'm just trying to create a line that's using... that harmonic underpinning." Other interviewees have also described how the incorporation of memorized material often refers to the use of templates and principles and not specific passages inserted "note for note."

The Monkey Comparison

Mills uses an interesting comparison to explain how he creates a melody with harmonic priority, likening his choosing notes to monkeys jumping from branch to branch on different trees, each tree representing a chord. While the underlying harmonic structure implies a particular chord, the soloist makes choices in the moment by jumping from chord tone to chord tone or by inserting passing tones. "My analogy is like being a monkey swinging through tree branches and while I'm swinging on one tree branch I'm seeing the next tree coming." When the harmony changes to another chord, the soloist will have to decide upon the landing spot in the new chord a couple of notes before he

"jumps," eyeing a branch in an adjacent tree and then choosing a particular set of movements to get there. Mills further explains that selecting the upcoming target note too early can interrupt the improvised line. "[I try to] not... make that choice too soon so where I'm interrupting the phrase... because I've learned there is always a very comfortable landing spot."

Thinking and Pedagogy

Asked about how choices are represented in his thinking, Mills explains that he thinks in scale degrees, which reflect the relationships among pitches, independent of key. "I think of it in scale degrees... because if any key... I would have probably gone to that spot so I'm thinking scale degrees rather than pitch names." This also indicates that he is not thinking in saxophone fingerings, as they too would be tied to a particular key. Mills describes how he developed the ability to think in terms of scale function, independent of key. "That's just the product of the drilling... to kind of make scale degrees [and] fingering, the sound, the mental, the physical, the aural to kind of become one." By practicing in all twelve keys, Mills is able to think in relative terms as the link to the correct fingering in any key has become over-learned.

Concerning pedagogy, Mills explains the need to extract general principles during instruction. "I always like students to find phrases that they like and find the common denominator….the lick is one example... one manifestation of an underlying principle." Mills elaborates by explaining that knowledge of the general principles behind the construction of a phrase can later be used to create variations on the same phrase. This process enables the student to learn abstract principles or templates that can be used during improvisation.

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Chapter Five

Discussion

The qualitative investigations in the literature that explore the thought processes of jazz artists rely primarily on artists' comments about improvisation in general and not about the thinking engaged in specific music performances (e.g. Berliner, 1994). In the few studies in which artists have been interviewed specifically about their own improvisations, the improvisations discussed were performances that had been recorded many years before the interviews took place (e.g. Monson, 1996).

In the current study, I describe jazz artists' perceptions of their own thinking, which I obtained immediately after recording their improvised performances. Seven artist-level jazz musicians improvised solos on a blues chord progression. Immediately following, I created approximate transcriptions of the music using a computer, and these transcriptions together with the original audio served as the bases for the interviews. I later transcribed and coded the artists' comments following standard qualitative research procedures. Major themes emerged from the artists' descriptions of their thinking. The interviews revealed idiosyncratic patterns of thought that guided the improvisational choices and were related to the goals and priorities expressed by the improvisers.

I linked relevant comments from the interviews to the passages in the music to which they pertained, and I created exact transcriptions of each improvised solo with verbal quotations reflecting the improvisers' descriptions of their thought processes. These transcriptions provide a unique narrative of the artists' thinking as they are linked directly to their recorded solos.

ONGOING PROCESSES

I identified six main themes through the coding of the interviews. Two of the themes concern ongoing processes that appear to be present throughout the act of improvisation among all seven artists. These pertained to the forward-looking act of planning and the backward-looking act of monitoring what had been played in the past.

The two ongoing processes identified in the current study are a sketch planning process and an evaluative monitoring process. The sketch planning process involves sketching out some, but not all, of the features of upcoming events. These features include architectural considerations, note density, melodic contour, chord substitutions, and style. All the transcriptions include examples in which specific musical material is linked to the sketch planning process.

Planning processes essential to improvisation are part of several hypothetical models that I discussed earlier (Kenny & Gellrich, 2002; Pressing, 1988). Kenny and Gellrich suggest that planning takes place on multiple temporal levels, referring to these planning processes as short-, medium-, and long-term anticipation. This is consistent with the findings of the current study, which reveal that sketch plans may pertain to the entire solo, the upcoming chorus, the upcoming passage, or the next melodic figure.

Throughout the improvisations, the artists monitored the music they were making and evaluated what they had done along several dimensions. Five of the seven annotated transcriptions include artists' descriptions of such monitoring. Anger, for example, described "being happy" with a particular passage; Mills remembered prolonging a phrase while thinking, "I still got some place I can take it."

The artists reported evaluating longer passages as well, which suggests that music stored in memory is recalled and considered during the course of the improvisation. As in the Anger example, this did not appear to interfere with the continuous creation of new

material. The fact that evaluation occurs during creation and longer passages can be remembered and evaluated suggests a temporal independence between the monitoring process and the real-time choice making. This may be possible because the generative strategies that control real-time choices can operate implicitly.

The evaluation of material just performed influences upcoming choices. Improvisers often explain how specific improvised figures trigger subsequent output. Specifically, the monitoring process may evaluate generated output according to whether the output corresponds to a plan. If the sketch plan of an upcoming passage dictates a particular melodic contour, the monitoring process may evaluate whether the actual performed output follows this contour. Anger explained how he planned to use double stops in a passage but realized while playing that the tempo was too fast: "As I was playing... attempting to play the double stops, I was realizing this isn't gonna work like I hoped it would." Subsequently, Anger switched to a single note line.

At times, improvisers appeared unhappy with their own output. In these cases, improvisers spoke of fixing the error by radically altering the plan for the following material. The skillful improviser is able to mold material following an error to such an extent that the final result is nevertheless satisfying to a listener.

Both the sketch planning and the monitoring processes may guide all note choices and be active concurrently. The large number of comments in the current study coded with the PLAN and MON labels suggests that both processes are ongoing and influence all of the strategies used to make actual note choices.

THE IDEA BANK

Neither the sketch planning nor the monitoring process determines specific note choices to the improviser. I identified four generative strategies that the artists used to

make actual note choices: The use of memorized music, which I call an idea bank; selecting notes with particular attention to the harmonic structure of the music, which I call harmonic priority; selecting notes with particular attention to the shape of the melodic line, which I refer to as melodic priority; and the recall of music played earlier in the solo, which is then incorporated into the ongoing music.

When using the idea bank strategy, improvisers insert material retrieved from long-term memory. A total of 56 comments in the interviews were coded with the idea bank label (originally labeled "nuggets of stuff," see Appendix B), and this strategy appears in the descriptions given by all seven artists This result is in line with existing literature that often mentions the use of memorized material in improvisation (Berliner, 1994; Finkelman, 1997; Gushee, 1991; Pressing, 1988).

At times, improvisers in the current study described using note-for-note iterations of memorized music. More often, they described ideas recalled from memory that were not expressed in terms of specific notes, but were general outlines, like melodic contours or interval patterns. In a few instances, ideas from the idea bank included very explicit melodic material, but in most instances, what was recalled were templates or outlines for selecting notes. Whenever the artists described inserting an idea and were able to delineate starting and ending points of the idea, I interpreted this as information from the idea bank.

There is a tradition in analyses of jazz solo transcriptions of identifying repeated melodic material. These analyses are typically conducted without the possibility of consulting with the performer. Examples of closely related elements or phrases have been labeled formulas (Gushee, 1991) or motives (Owens, 1995). Gushee defines formulas as "more or less literal motive or phrase repetitions" (1991, p. 239). Finkelman (1997) notes several problems with these definitions and their use in analysis of solo transcriptions:

How does one define the boundaries of a formula in the context of a freely flowing melodic line? How long or distinctive must a pattern be in order to be classified as a formula? How similar must fragments be in order to be perceived as related to each other? And what criteria of similarity does one apply? Once they *are* pronounced similar, how is it determined which fragment is the 'formula itself' and which a variation of the formula? [emphasis in original] (p. 159)

In the current study, the analysis based on the input from the participants addresses the main concerns raised by Finkelman above. The length of the idea had to be defined by the participant in order for the passage to be coded as coming from an idea bank. Yet, an idea could be any length, from a few notes to an entire solo. Participants labeled ideas as coming from their idea banks based on their own experience. I did not attempt to verify the similarity between individual ideas and their sources, but I relied on the information supplied by the improvisers.

Finkelman (1997) addresses the questions above by defining formulas as procedures needed to construct material, which is similar to the thinking described by participants in the current study. Finkelman states that "formulas allow players to construct phrases over certain chords, chord sequences, or cadences" (p. 162). In one example, he lists a formula as "a descending dominant ninth arpeggio with a chromatic descent between the fifth and final third degrees of the chord" (p. 170). This description is similar to John Mills' description of an idea taken from his own idea bank as "a harmonic formula... using a rising scale and then when the five chord hits that diminished triad." Finkelman's definition is also in line with the general observation from the current study that ideas from the idea bank are often inexplicit. Using Finkelman's vocabulary, improvisers mostly access "procedures" or "formulas" for creating licks more often than they retrieve specific licks that have been memorized.

The Implicit Aspect of the Idea Bank Strategy

Participants' comments suggest that parts of the decision making process happen implicitly. For example, Darol Anger explained that "the hand is gonna crawl around... and the brain is gonna like try to... pick out something that the hand is doing," implying that he chose excerpts from material that was automatically generated, without conscious involvement. Stan Kessler asserted that "there was no thinking involved" during much of his improvisation. Jeff Hellmer's performance specifically illustrates how it is possible to improvise without conscious deliberation. During part of his improvisation, Hellmer improvised two lines concurrently, a solo line in the right hand and an accompanying walking bass line in the left. He explained that all his attention was focused on the right hand, yet his left created a bass line that was also improvised.

It has been suggested that note choices can by generated by an unconscious stimulus-independent process that relies on over-learned melodic figures and rules (Limb & Braun, 2008). This implicit process may be an extension of the implicit process proposed by Dietrich (2004), who outlines how rule driven choices can be made without conscious engagement in over-learned tasks. Dietrich explains how an experienced driver may be engaged in conversation with a passenger while making implicit decisions regarding the necessary pressure on the gas pedal; the automatic regulation of pressure on the gas pedal is directed by a specific rule set, which processes input from the sensory motor system concerning distance to the next car, speed limit, road conditions, and more, and translates this information to motor movements in the driver's foot.

Ideas stored in the idea bank may represent rules that can generate note choices during improvisation without conscious thought. As previously mentioned, improvisers rely on a collection of melodic figures referred to as formulas (Clarke, 1988; Finkelman, 1997; Lord, 1960; Owens, 1995; Spring, 1990). These formulas are likely stored as

generalized motor programs (GMP) (Petersen, van Mier, Fiez, & Raichle, 1998; Shea & Wulf, 2005), linked to auditory representations (Brodsky, Henik, Rubinstein, & Zorman, 2003; Fuster, 2001; Halpern & Zatorre, 1999). As practiced figures are over-learned, less attention is required to control motor movements, as the corresponding GMPs become highly automatized and require less conscious attention (Kelly & Garavan, 2005; Petersen, van Mier, Fiez, & Raichle, 1998).

CHORDS AND CONTOUR DETERMINE NOTES: THE HARMONIC PRIORITY STRATEGY

When improvisers make note decisions based on harmonic priority, they use the chord outlines as guides for note choices. I assigned the HP label to comments in the interviews more than I assigned any other strategy code. A total of 101 comments in the interviews pertain to harmonic priority (originally labeled "math construction" & "melodic choices linked to progression," see Appendix B), though Anger never mentioned this mode of thinking in his interview. This may indicate that he was less concerned with implying the underlying chordal progression in his solo than were the other participants.

Ron Westray explained harmonic priority as follows: "Sometimes you're just... connecting the dots with what the chord calls for," constructing improvised material according to rules dictated by the chord progression. These rules include placing chord tones on strong beats and connecting chord tones using scalar or arpeggiated motion (see Figure 17). Westray stated that he was aware of structurally significant notes but that he chose the connecting pitches in the moment.

Johnson-Laird (2002) describes how jazz musicians can improvise by using rules based on the underlying chords and contour considerations. He presents a model for choosing individual pitches that is based on the constraints of chord function and contour.

According to Johnson-Laird's model, the improviser chooses a scale that includes chord tones and passing tones according to the harmonic context. Individual notes in the scale are chosen based on contour considerations that include patterns of steps and leaps. This explanation is in line with observations made by participants in the current study. John Mills explained how he improvised using the harmonic priority strategy by connecting chord tones "like a monkey swinging through tree branches" choosing the next branch or chord tone just before the jump.

Concerning the interaction between melodic contour and chord function, Johnson-Laird (2002) suggests that scalar motion alternates between chord tones and passing tones but leap motion mainly features chord tones. This is evident in many of the passages created in the current study. In Hellmer's solo (see Figure 26), the first measure includes mainly leaps and only chord tones (note the arpeggio uses the upper extensions 5, 7, 9, & 11 of the Gm11 chord). The second measure includes passing tones in scalar motion and leaps to chord tones (except for the leap to the note F, which is a non-chord tone). In each measure, the improvised output specifically implies the individual chords of the blues progression.

Figure 26:   Illustration of harmonic priority. Excerpt from Hellmer's solo, mm. 81-84.

The Implicit Aspect of the Harmonic Priority Strategy

Johnson-Laird (1991) argues that the process of choosing notes according to the underlying harmonic structure is possible without the need to store intermediate results in working memory. To support this assertion, he constructed a computer program capable of generating an improvised bass line, in which each note is determined by rules related only to the two preceding notes. Johnson-Laird specifically designed the program to model an improvisational thinking process that requires no conscious involvement. It seems that artist-level improvisers have internalized rules for generating lines using a harmonic priority strategy that are similar to the rules in the Johnson-Laird model. It is possible that note choices made using the harmonic priority strategy can be made implicitly just like the driver in Dietrich's description can regulate the pressure on the gas pedal in an implicit process (Dietrich, 2004).

LINEAR FOCUS: THE MELODIC PRIORITY STRATEGY

When improvisers focused primarily on the shape of the melodic line, giving less attention to the structure of chords, I described this as a melodic priority strategy. Output created using melodic priority typically does not clearly reflect the underlying chord structure.

Considerably fewer comments in the interviews indicate that the artists were generating ideas with a melodic priority strategy. Rufus Reid described constructing lines that "go up and down" and are melodic "because of the strength of those notes." Ron Westray described how he was "just singing." Both comments reflect a focus on the linear qualities of the improvisation.

Sloboda (1985) lists repetition and patterning as ways to infuse cohesion in a melodic line independent of the chord structure. Patterning refers to repetition of certain

rhythmic or melodic features, though "the repetition is not exact" and includes pitch transposition and inversion (Sloboda, 1985, p. 55). Interestingly, Reid's initial phrase, which I coded as melodic priority, includes a triadic pattern that "can just keep going." Reid explained that he could have completed the pattern in various ways and sang examples of alternate endings.

Although Reid's solo reflects the underlying blues structure, he contended that "I'm not playing the chord changes; I'm playing the sound, which I think is different." Yet, in the case of Reid, it appears that the chordal implications in his solo are byproducts of his stated goal of creating strong melodic lines. This represents a horizontal focus of attention rather than a focus on the vertical structure of the chords.

THE INC PRINCIPLE AND THE "ASSOCIATIVE CHAIN"

The last generative strategy is one in which the artists incorporate material that they had played earlier in their improvisations, either developing ideas immediately or recalling ideas from earlier points in the solo. Six of the seven interviews include comments labeled with this strategy.

Clarke's (1988) model for improvisation includes a generative strategy he refers to as "the associative chain," which Clarke describes as a process in which each new musical "event [is] derived from the previous sequence by the forward transfer of information" (p. 8). Such a chain of related events is present in the solos of Hellmer, Reid, and Anger as seen in Figures 21, 22 and 24. This generative strategy seems particularly prominent in the solo by Anger who built his solo around a theme he identified in the early part of his improvisation. When he identified the theme in measure 38, he explained that "I start to figure out what the solo is gonna be about."

Each of the four generative strategies suggests specific ways of thinking that can be used to generate improvised material, and much of the music in the seven solos was created using a combination of these strategies. In order of the frequency with which each of the generative strategies was mentioned, the harmonic priority strategy was cited most often, followed by idea bank, incorporating previously played material, and melodic priority. The idea bank strategy was the only strategy mentioned by all participants. Using ideas recalled from memory is a strategy identified in much of the literature on improvisation, so it is perhaps not surprising that this approach appears so prominently throughout the improvisations in the current study.

The participants improvised over the blues without a harmonic accompaniment, which may help explain that six of the seven improvisers mentioned the harmonic priority principle. This is supported by participants' comments concerning improvisation without harmonic accompaniment. Kessler stated, "Especially when you're playing by yourself it's important to play chord tones or include chord tones in your lines." Westray agreed: "Playing a capella blues... [is] something I like to do. I love it, 'cause I like to hear my ability to actually play the shape of the blues, like where I can hear the blues [harmony in the] line."

Comments by Anger and Reid suggest that they were less focused on implying the underlying chord progression than were the other participants, an effect that may be related to these improvisers' backgrounds.

SIMILARITIES BETWEEN JAZZ IMPROVISATION AND LANGUAGE PRODUCTION

One of the major themes identified in the current study, the sketch planning process, has intriguing parallels to language production. The final products in music and language are fundamentally different, of course. Language expresses specific meanings

and music communicates abstract emotional information. Yet, production in both domains includes concurrent planning.

Language production includes an ongoing planning process in which conceptual information is translated into specific utterances (Dipper, Black, & Bryan, 2005; Slobin, 1996). Planning of upcoming output occurs while we speak (Harley, 2008).

Improvisers in the current study described sketch planning that applies to upcoming passages, phrases, and choruses, deciding first on an outline that is later translated into specific note choices. In one example, Jeff Hellmer wanted to "move into another gear." The abstract concept of "another gear" represents a sketch plan that dictates the upcoming phrase will have increased intensity. The way this concept is translated will depend on the improviser's background. Hellmer's sketch plan was translated into a set of notes that went into the top register of the piano. This process represents a translation of a concept, increased intensity, into a specific set of notes derived from Hellmer's "language" or idea bank.

This translation process is analogous to a two stage model of language production (Dipper, Black, & Bryan, 2005; Harley, 2008; Levelt, Roelofs, & Meyer, 1999; Slobin, 1996). The initial semantic stage consists of a speaker translating complex sensory information into language. To do so, the speaker has to choose a point of view and decide which elements from the concept or experience should be the focus of the utterance (Dipper, Black, & Bryan, 2005). Slobin describes this as follows: "Any utterance is a selective schematization of a concept" (Slobin, 1996, pp. 75-76). Slobin further asserts that this translation is dependent on the speaker's native language and represents a specific kind of cognitive process. He refers to this as "thinking for speaking, a special form of thought that is mobilized for communication" (p. 76).

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A similar conversion happens as the improviser translates a sketch plan into specific note choices. As in language, the initial idea or plan includes abstract information. The label used by Hellmer in the current study, "another gear," is an example of an abstract concept. Other examples include comments such as "[I wanted to express] a higher level of excitement [in the second chorus]" made by Mills or Westray's plan for the second chorus in which he would "string more linear stuff together." The way that these plans are translated into specific playable note choices depend on the improviser's background. According to the "thinking for speaking" analogy, even the thought process guiding the note choices is affected by the improviser's background.

The second stage in speech production is referred to as phonological encoding (Harley, 2008; Levelt, Roelofs, & Meyer, 1999). In this stage, the result of the previous conceptualization process is translated into audible utterances. This involves retrieving specific phonological information needed to produce the utterances. This stage relies heavily on learned motor information stored in long-term memory that is encoded through years of practice.

The phonological encoding stage in speech production is analogous to a second stage in improvisational music performance. After an initial plan or concept is translated into possible note choices, the final choices are made by an implicit, automatic process and executed by the motor system. In improvisation, as in language, this stage depends on available information stored in the form of actual motor information and implicit strategies for making individual note choices. Both the implicit choices and the mapping of those choices to physical movements are dependent on previous experience. As suggested above, the implicit choices in improvisation may rely on generative strategies similar to the idea bank and harmonic priority strategies. In language the speaker relies on stored groupings of phonemes and words (Harley, 2008), which are mapped onto

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stored physical movements. Westray explains how he is able to translate a covert sound into movements on his instrument. "I heard the sound and I just knew where that sharp five was [on the trombone]." Despite obvious differences, in both domains the output from a conceptualization process is translated into actions.

It is possible that a mental representation of the impending output exists in both language and improvisation. In language, the existence of a cognitive representation of the output of the initial conceptualization stage has been debated (Harley, 2008; Levelt, Roelofs, & Meyer, 1999). In music, auditory imagery is known to activate the auditory cortex without the presence of sound (Halpern, Peretz, & Zatorre, 2003; Kraemer, Macrae, Green, & Kelley, 2005; Zatorre, Halpern, Perry, Meyer, & Evans, 1996), and has been linked to musical expertise (Aleman, Nieuwenstein, Bocker, & de Haan, 2000; Brodsky, Henik, Rubinstein, & Zorman, 2003). The internal sound image is at times described as containing exact information, yet it precedes any physical movement.

The interviews indicate that most improvisation choices were not preceded by an internal auditory image. Westray explained: "I remember the older guys used to tell me 'well, you play trombone, you always got to hear the note... before you play it.' That is not necessarily always the case... Sometimes you'll do that and other times you'll just be using logic to construct the line... pure logic, whether you hear it or not."

There is evidence in both language and music that planning and production occur concurrently. As Harley (2008) explains, "We plan and speak simultaneously; and we make it up as we go along, rather than planning one chunk at a time and only producing it when planning is complete" (p. 410). Hellmer explained that he was able to plan upcoming note choices while he was playing a given phrase. Likewise, Westray stated that he may "hear" an upcoming phrase while playing the end of a preceding phrase.

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IMPLICATIONS FOR EDUCATION

Though jazz is often defined by the element of improvisation, the thought processes guiding improvisation have received little attention in the research literature. An extensive body of pedagogical material exists to teach jazz improvisation to novices in high school and college. Yet, no research has formally evaluated whether available materials develop the types of improvisational thinking that are characteristic of artist-level improvisers.

I did not specifically study how the participants developed their ability to improvise, though several artists did refer to their learning experiences in their interviews, including their approaches to practicing and teaching. In the following section, I recommend strategies for teaching improvisation based on the results of the current study. The recommendations are based on the fundamental premise that all learners benefit when they learn to think like experts, even at the beginning stages of instruction (Bruner, 1977; Duke, 2005).

To experience success in music performance, the difficulty of each task in an instructional sequence has to be adjusted to accommodate students' experience levels (Duke, 2005). Even beginning instrumentalists can experience success if tasks are structured in ways that lead to student accomplishment.

Skill acquisition has been linked not only to practice but to changes in cognitive strategies. Skill acquisition in complex tasks "involves acquisition of higher-level strategies and goal structures in addition to the perceptual, cognitive, and motoric components" (Proctor & Vu, 2006, p. 282).

Developing the Idea Bank

One of the four generative strategies identified in the current study is the reliance on a bank of ideas stored in forms of varying explicitness. In most instances in which artists' identified ideas they had recalled from memory, those ideas were characterized as broad outlines of what was to be played, rather than as exact passages that had been practiced and memorized. In order for learners to draw from their own idea banks in the course of improvisation, they must be able to store flexible ideas that can be retrieved easily and translated in ways that fit different contexts.

Many jazz methods include collections of melodic ideas (e.g. Baker, 1988), and advocate having students transcribe improvised solos by jazz masters (Lawn & Hellmer, 1996; Reeves, 2001). According to Mills, learning an original idea is only part of the process of integrating the underlying concept into the idea bank: "I always like students to... find phrases that they like and find the common denominator in the things that catch their ear and then... create some new models that fit those same parameters, but are your own." After students identify phrases that appeal to them, the students should create new, similar phrases that "fit the same parameters," thus developing a collection of related ideas. In order to create similar phrases, students must identify the underlying concepts that unify related ideas.

Describing his own thinking process, Mills described how he uses idea templates from the idea bank as opposed to explicit, learned ideas. This description is consistent with many other participants' descriptions of the idea bank strategy.

It seems advantageous, then, that students learn multiple versions of different ideas that share common features. If the student wants to encode ideas in her idea bank that feature a particular concept, the following steps are recommended:

1.   Find many different versions of jazz licks that include the concept to be learned. Examples of concepts include playing quarter note triplets on a tune in 4/4 time or the use of the flat nine alteration on resolving dominant chords.

2.   Create personal iterations of licks that feature the same concept.

3.   Practice inserting various versions of the practiced licks into improvised material.

4.   Improvise licks using the concept without duplicating any of the learned models.

5.   If the concept is related to pitch, transpose the lick and variations to other keys.

The steps above seem advantageous for students at any level and are inspired by the practice strategies recommended by Mills. The goal of the steps above is to develop a flexible idea template, mirroring the thinking of artist-level improvisers during performance.

Teaching Strategies for Improvisation Using the Harmonic Priority Principle

Figures 18 and 26 show two examples of the artists' solos created with a harmonic priority strategy. Expert performance is in part defined by the ability to perform complex tasks with near automaticity (Dietrich, 2004; Proctor & Vu, 2006). One recent fMRI study of jazz improvisers suggests that deliberative decision making may actually be less engaged during jazz improvisation (Limb & Braun, 2008).

It is clearly beneficial to practice the components of complex skills, but these components must be integrated into whole-task training (Proctor & Vu, 2006). One component of improvising with harmonic priority is the identification of chord tones. Another component is the linking of chord tones in relatively conjunct lines, as described in Figure 17. Both these components could be practiced separately, and then integrated into whole-task practice.

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Learning to improvise using a harmonic priority strategy may be organized as follows:

1.   Analyze the chords of the tune to be practiced.

2.   Improvise a line using chord tones with long durations. For example, on a progression in 4/4 time, improvise a line in half notes using only chord tones.

3.   Practice connecting the chord tones with conjunct or arpeggiated motion, making certain that chord tones fall on the strong beats as illustrated in figure 17.

Experiencing the Sketch Planning Process

For the novice improviser who lacks a stored repertoire of ideas and strategies for creating improvisations, sketch planning may be entirely out of reach. But the process of sketch planning can be experienced at all levels of sophistication. Novices can be taught to think about features of what they are about to play, and then, using the resources available to them, realize those features in their improvisations.

It has been noted that traditional jazz instruction emphasizes music theory at the expense of structural and interactive concerns (Kenny & Gellrich, 2002; Pressing, 1988; Sarath, 2002). I suggest that jazz instruction could include two different modes (Norgaard, in press). In "theory mode" the idea bank and harmonic priority generative strategies are explored. The mode requires conscious engagement focused on theoretical concepts during practice. In "play mode" the focus is changed to explore planning and evaluative processes. The final goal of improvisational instruction should be to create situations in which students at all levels can experience flow, the state of mind described as the "optimal human experience" (Csikszentmihalyi, 1990).

SUGGESTIONS FOR FURTHER RESEARCH

In the current study I identified thinking processes used by artist-level improvisers based on their own verbal accounts. The main limitations of the current study involve the nature of retrospective verbal descriptions of thinking. Participants were interviewed immediately following their performances, and during the interview, they listened to and looked at approximate notation of their improvisations. Of course, the artists' descriptions of their thinking may be limited by their inability to access the actual nature of their thinking. Therefore further research is needed to explore the results of the current study.

Each of the ongoing processes could be explored more fully through systematic behavioral research. One recent study used a protocol in which improvisers of various skill levels were stopped in the midst of improvising and were asked to explain their planning (Fidlon, 2008).

Further research should also explore the implicit aspects of improvisation. Hellmer's ability to improvise a bass line in his left hand while focusing on the output of his right hand indicates that advanced improvisers can create a coherent output even when the conscious mind is engaged in other tasks. Future research should also explore the interactive elements of improvisation that were not considered in the current study.

The present exploratory study served as an initial examination of the thought processes guiding improvisation in artist-level improvisers. Two ongoing processes and four generative strategies were identified through the coding of the seven interviews. It is my hope that the current study will increase interest in the study of thinking processes

guiding improvisation and that further study may inform the teaching of improvisation on all levels.

Appendix A

Participant Biographies

DAROL ANGER

Darol Anger is a violinist, fiddler, composer, producer and educator. With the jazz-oriented Turtle Island String Quartet, Anger developed and popularized new techniques for playing contemporary music styles on stringed instruments. His Grammy-nomimated folk-jazz group Montreux was the original musical model for the New Adult Contemporary radio format. Working with some of the world's great improvising string musicians has contributed to the development of Anger's signature voice both as a player and composer. His published works include jazz originals and arrangements, a fiddle tune collection, and numerous recordings. Anger has produced dozens of recordings since 1977 featuring his compositions and performances. Active as a jazz educator, Anger holds the String Chair of the International Association of Jazz Educators and has led seminars at the Stanford, Oberlin, and Amherst Jazz Workshops. He regularly teaches at the Berklee School of Music and the Mark O'Connor Fiddle Camp and has presented workshops and clinics nationally and internationally. He is a Contributing Editor for Strings magazine, and is on the ASTA Editorial Board. The recipient of a 1995 California Arts Council Composer Fellowship, Anger was nominated in 1997 for the CalArts Alpert Award in the Arts. He is a MacDowell Fellow, and obtained a Composer Residency at the Virginia Center for the Arts. He has been a featured soloist on a number of motion picture soundtracks, and he wrote and performed the score for the Sundance Award-winning film "Best Offer." He was the winner of the Frets Magazine Readers' Poll for

Best Jazz Violinist for four years running. Anger's work has expanded not only the acoustic violin's boundaries, but has contributed to the development of violin synthesizer repertoire and technology. (Anger)

JEFF HELLMER

Jeff Hellmer, pianist, is an educator, composer, performer, and the Director of Jazz Studies at The University of Texas, Butler School of Music. His CD, "Peak Moments," recorded with UT jazz faculty members John Fremgen and A.D. Mannion, was declared an "exciting addition to the modern jazz piano catalog" by the All Music Guide. He maintains an extremely active performing and teaching profile, appearing frequently on the central Texas scene as well as throughout the United States at venues ranging from the Litchfield Jazz Festival to the Idyllwild Arts Academy. Twice named a finalist in the Great American Jazz Piano Competition, he has performed, taught and adjudicated jazz throughout the United States as well as in Russia and Taiwan. He has been a soloist with the Dallas Wind Symphony four times, and recorded with classical saxophonists Dan Goble and Harvey Pittel. Under his direction, the UT Jazz Orchestra recently performed at the North Sea and Montreux Jazz Festivals, won a 2005 Down Beat Student Recording Award, and appeared with jazz master Kenny Garrett. His jazz piano students have garnered impressive recognition for their creativity and individuality. He is co-author of the textbook *Jazz Theory and Practice*, published by Alfred, and his compositions for jazz ensemble are available through UNC Press and Concept Music. (Hellmer)

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STANTON KESSLER

Stanton Kessler is a trumpet/flugelhorn player, and teaches band, theory, trumpet, improvisation, and music business courses at the University of Missouri-Kansas City and the Missouri Western State College. Kessler leads a number of bands, including the Sons of Brasil, the Stan Kessler Quartet, Stan Kessler's TV, HoraceScope, and The Uncertainty Principle.

He attended Kansas University and Wichita State University, and his areas of expertise include jazz, rhythm and blues, funk, and all Latin genres. In 1980, he was voted "best trumpet player" and "leader of the best jazz band" in Kansas City by the Pitch readers' poll. (Kessler, 2008)

JOHN MILLS

Dr. John Mills, saxophonist, has performed, arranged, and composed for a vast number of CD's, film/TV soundtracks, and jingles. His interests and experience cover a wide spectrum of musical styles. John has been an integral part of Austin's jazz community since the 1970's, as a key member of such long-running groups as the Creative Opportunity Orchestra, Beto and the Fairlanes, the Tony Campise Band, and the Concept Orchestra. He has shared the stage with such diverse artists as Kenny Wheeler, Carla Bley, Stevie Ray Vaughan, Lyle Lovett, and Willie Nelson. Additionally, John is an active educator, clinician and adjudicator. While Director of Jazz Studies at Southwest Texas State University, his students won three Downbeat Magazine awards, and he designed a Bachelor of Music degree in Jazz Studies. Some of his former students have toured with the jazz orchestras of Ray Charles, Harry Connick Jr., and Maynard Ferguson. John Mills' new CD on 482 Records, Courage: "The Way Out Is Via The

Door," showcases John's compositions as well as his improvisations on saxophones, flute, bass clarinet, and textural keyboards. (Mills)

RUFUS REID

Rufus Reid is an award winning performer, composer and educator. In presenting him with the 2005 Mellon Jazz Living Legacy Award, the Mid-Atlantic Arts Foundation saluted him as "an American treasure with the vision to make a difference and turn possibilities into results." His compositions include works for string orchestra, jazz ensembles large and small, and double bass ensemble. Rufus travels throughout the world as guest artist presenting workshops and master classes while performing his compositions with both small and large ensembles. As an educator, Reid was Director of Jazz Studies and Performance at William Paterson University in Wayne, NJ, for 20 years. While there he spearheaded two residency outreach programs and served as music director of Jazz For Teens, sponsored by the New Jersey Performing Arts Center in Newark. He continues his ongoing work teaching at jazz workshops including The Richard Davis Foundation for Young Bassists. Reid has authored two books, *The Evolving Bassist* and *Evolving Upward*. The book, *The Evolving Bassist*, first published in 1974, continues to be recognized as the industry standard for a definitive bass method. In December 2003 The Evolving Bassist DVD was released. He has traveled, performed and recorded in collaboration with world renowned musicians and continues to perform with The Rufus Reid Quintet. In addition to awards from IAJE and Bass Player magazine in 1997 and 1998 respectively, Rufus received the Distinguished Achievement Award from The International Society of Bassists in 2001. (Reid)

MITCH WATKINS

Mitch Watkins, jazz guitarist, is an eclectic performer, producer and composer. When he is not traveling as lead guitarist for Lyle Lovett and Jerry Jeff Walker, he is busy in Austin in his own recording studio or working as a free-lance guitarist. His production credits are vast, and include a Grammy nomination for his work with singer/songwriter Abra Moore. He has three releases under his own name on the prestigious Enja label and one on the Austin-based Dos label. His discography is extensive, including appearances on Leonard Cohen's "Recent Songs", Barbara Dennerlein's "Straight Ahead", "Hot Stuff", "That's Me", "Take Off!", "Junkanoo", and "Outhipped", Joe Ely's "Hi-Res", "Lord of the Highway", and "Dig all Night", "Abra Moore's "Sing" and "Strangest Places", Paul Glasse's "Paul Glasse", "One More Night" and "The Road to Home", Bob Schneider's "Under the Onion Trees" and "The Galaxy Kings", Jerry Jeff Walker's "Jerry Jeff Jazz", and John Fremgen's "Meanwhile" and "If not Now". He has appeared on The Tonight Show, Late Night with David Letterman, and Austin City Limits. (Watkins)

RONALD WESTRAY

Ron Westray, trombonist, is a performer, teacher and recording artist. Ron serves as assistant professor in the Jazz Studies division at The University of Texas at Austin Butler School of Music teaching jazz trombone, improvisation, composition and arranging. Ron is perhaps best known for his work as lead trombonist in the Lincoln Center Jazz Orchestra conducted by Wynton Marsalis, as well as his collaborative effort with Wycliffe Gordon on the Atlantic Label titled Bone Structure. In addition to his schedule with the LCJO, Ron has recorded as a sideman on labels such as Columbia, Sony Classical, and RCA Novus. Mr. Westray has performed at jazz venues including

The Village Vanguard, The Jazz Standard, The Iridium, and The Blue Note, and has appeared in concert with innumerable performers including Ray Charles, Bob Dylan, Willie Nelson, and Stevie Wonder. (Westray)

Appendix B

Code Table

| | INTERVIEWEES | | | | | | | |
CODES	DA	SK	RR	RW	MW	JH	JM	Totals
Six-nine common language	0	0	0	0	0	4	0	4
Architecture	5	3	5	5	5	5	8	36
Architecture: Chorus	1	3	1	3	1	6	1	16
Architecture: Idea	0	0	0	0	0	0	0	0
Architecture: Learning process	0	0	1	0	0	0	0	1
Architecture: Phrase level	1	1	0	4	1	1	4	12
Audience	1	3	10	2	2	1	0	19
Balance between chromaticism and simple	0	0	0	0	1	0	0	1
Balance between eighths & space	0	0	0	0	0	1	0	1
Balance between expected and unexpected	0	0	2	0	0	0	0	2
Balance between heady and traditional	0	0	0	1	0	0	1	2
Balance between tension and release	0	1	0	0	0	0	3	4
Balance between typical and atypical chord progression	0	0	1	0	0	1	0	2
Balance: Arpeggio & scalar	0	0	0	0	0	0	1	1
Balance: Faster notes & bluesy	0	0	0	0	1	0	0	1
Challenging yourself	2	0	1	0	0	0	0	3
Cognitive load	0	0	0	1	0	0	0	1
Consciousness level	0	0	0	2	1	3	0	6
Contour – following the shape of the line	1	2	1	3	0	5	1	13
Deliberate action	0	0	3	0	0	0	0	3
Dichotomous generative strategies	2	0	1	4	0	2	0	9
Ear to hand coordination	0	0	0	1	0	0	0	1
Error correction	1	0	2	4	0	6	0	13
Error in analysis during interview	0	1	0	1	0	1	0	3
Evaluation	1	0	0	0	0	1	0	2
Everything is shifted	0	0	3	0	0	0	0	3
Experiment comment	0	2	2	2	0	2	1	9
Focusing choices	1	0	0	4	4	3	0	12

GS: Idea chain	0	0	0	0	0	4	0	4
GS: Incorporating the melody	2	0	0	0	0	0	0	2
GS: Line dictates note choices	2	0	8	0	0	0	1	11
GS: Math construction	0	10	0	11	13	14	9	57
GS: Nuggets of stuff	10	8	5	16	6	5	6	56
GS: Physical movement directs note choices	7	0	0	0	0	0	0	7
GS: Playing bluesy stuff	3	0	0	3	1	1	2	10
GS: Responding to stuff played previously	9	1	5	6	0	3	2	26
GS: Rhythm focus	1	1	2	1	1	1	3	10
GS: Sequence	4	0	1	0	0	2	0	7
GS: Shape permutations	1	0	0	0	0	0	0	1
GS: Singing	0	1	0	3	0	0	0	4
GS: Start & finish points	1	0	2	0	8	7	1	19
Habits	6	1	0	1	2	0	4	14
Hear before you play	0	0	0	3	1	1	0	5
Hearing chords	0	2	0	4	2	0	0	8
Initial instructions	0	0	0	2	0	1	0	3
Instrument technique	3	5	0	1	4	0	3	16
Instrument technique: Efficiency	0	1	0	0	0	0	0	1
Jump off the edge	2	0	0	0	0	0	0	2
Lick with various endings	0	0	1	0	0	0	0	1
Melodic choices imply progression displaced	0	0	0	0	1	0	0	1
Melodic choices linked to progression	0	7	6	21	4	4	2	44
Model	0	0	0	0	0	0	14	14
Monitoring	4	1	3	1	0	4	0	13
Negative feelings about playing things that were played before	2	1	2	1	2	0	0	8
Nuggets: Definition	0	0	0	5	0	0	0	5
Other players	0	2	1	1	1	0	0	5
Other players dictate generative strategies	0	0	1	0	0	0	0	1
Person: Adderley brothers	1	0	0	0	0	0	0	1
Person: Andrew Hill	0	0	1	0	0	0	0	1
Person: Archie Shepp	0	0	0	0	1	0	0	1
Person: Bennie Moten	0	1	0	0	0	0	0	1
Person: Charlie Parker	2	3	0	5	1	3	1	15
Person: Chris Potter	0	1	0	0	0	0	0	1
Person: Count Basie	0	2	0	0	0	0	0	2
Person: Dexter Gordon	0	0	1	0	0	0	0	1
Person: Eddie Harris	0	0	4	0	0	0	0	4
Person: Francois Rabbath	0	0	1	0	0	0	0	1
Person: Gene Ammons	0	0	1	0	0	0	0	1
Person: J. J. Johnson	0	0	2	1	0	0	0	3
Person: Jack McDuff	0	0	0	0	1	0	0	1

Person: Jimmy Heath	0	0	1	0	0	0	0	1
Person: Joe Henderson	0	0	1	0	0	0	0	1
Person: John Coltrane	0	1	1	1	0	0	1	4
Person: John Phillip	0	0	0	1	0	0	0	1
Person: Kenny Dorham	0	0	0	2	0	0	0	2
Person: Lester Young	0	0	0	4	0	0	0	4
Person: Louis Armstrong	0	1	0	0	0	0	0	1
Person: McCoy Tyner	1	0	1	0	0	0	0	2
Person: Miles Davis	0	1	1	0	0	0	0	2
Person: Muhal Richard Abrams	0	0	1	0	0	0	0	1
Person: Oscar Peterson	0	1	0	0	0	0	0	1
Person: Sam Jones	0	0	1	0	0	0	0	1
Person: Scott Joplin	0	0	1	0	0	0	0	1
Person: Slide Hampton	0	0	1	0	0	0	0	1
Person: Sonny Stitt	0	0	0	0	0	0	2	2
Person: Stan Getz	0	0	1	0	0	0	0	1
Person: Stuff Smith	1	0	0	0	0	0	0	1
Person: Thad Jones	0	0	2	0	0	0	0	2
Person: The Blue Devils	0	1	0	0	0	0	0	1
Person: Thelonious Monk	0	0	0	1	0	0	0	1
Person: Tommy Flanagan	0	1	1	0	0	0	0	2
Personal habits	0	0	0	0	0	3	0	3
Personality of note functions	2	0	0	3	0	0	0	5
Play melodic not fast	0	0	1	0	1	0	0	2
Play simple to establish entry point	0	1	2	0	1	1	0	5
Play simple to swing	1	1	1	3	0	0	0	6
Playing the sound	0	0	3	0	0	0	0	3
Practiced	2	4	0	0	1	4	1	12
Record keeping	0	0	0	1	0	0	0	1
Rhythm and melody generated with different principles	0	0	0	1	0	0	0	1
Riff based	0	0	0	0	0	0	2	2
Right hand dominance	0	0	0	0	0	2	0	2
Safety	0	0	0	2	0	0	0	2
Spontaneity is the charm of the music	0	0	1	0	0	0	0	1
Starting points and target notes	0	0	0	3	0	0	0	3
Teaching exercise	0	2	2	0	0	1	1	6
Teaching Performing link	0	0	0	0	0	1	0	1
Theatrical	2	0	0	0	0	0	0	2
Theme of solo	9	0	0	0	0	0	0	9
Thinking as a composer	0	0	2	0	0	0	0	2
Thinking format	1	2	1	2	2	2	2	12
Thinking Time	0	0	0	0	0	1	0	1
Timing of decisions	6	2	2	9	7	15	9	50
Timing: "just hanging on"	0	0	0	0	1	0	0	1
Timing: dichotomy in planning	0	0	0	0	2	0	0	2
Timing: notes anticipate								

upcoming chord	0	0	0	0	1	0	0	1
Tonal and atonal	3	0	0	0	0	0	0	3
Unit definition	0	0	0	0	0	5	0	5
Units	0	0	0	1	4	15	0	20
Visualize possible choices	0	0	0	0	3	0	0	3
Vocabulary dictated by history	0	0	0	2	1	0	0	3

Totals	104	82	108	159	89	142	86	770

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