TOWARD A PERCEPTUAL-COGNITIVE ACCOUNT OF DOUBLE-TIME FEEL IN JAZZ

by

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THESIS ABSTRACT

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The *New Grove Dictionary of Jazz* defines "double time" as "the apparent doubling of the tempo [...] achieved by halving the prevailing note value." A more precise term for this concept is "double-time feel." The question of how a musical performance creates double-time feel has received little scholarly attention. *Grove*'s explanation is incomplete because "halving the prevailing note value" is sometimes perceived by listeners as diminution within an unchanged tempo. My hypothesis is that swing rhythm, pervasive in many styles of jazz, not only facilitates the use of double-time feel but allows for subtle gradations in its use. I offer a model that classifies rhythms according to how strongly they support (or undermine) a double-time feel in a swing rhythm context, and I apply the model to performances by Louis Armstrong and Lee Morgan. My analysis demonstrates these artists' fine-grained control over double-time feel and suggests directions for future research.

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CHAPTER I

INTRODUCTION

How do we perceive tempo? When we listen to a piece of music, what makes us experience it as being in a particular tempo as opposed to some other tempo? And what makes us feel that the tempo has changed?

These questions are especially interesting when listeners disagree—when the music contains cues for tempo perception that are ambiguous or contradictory, and, as a result, some listeners perceive one tempo and others perceive a different tempo. This is the case when a jazz performance goes into a "double-time feel": some features of the music suggest that the tempo has doubled, while others suggest that the tempo has not changed.

In this thesis I will offer a hypothesis as to how jazz musicians create a double-time feel. The features of double-time feel that suggest an unchanged tempo are well understood, so I will focus on those features that suggest a doubling of tempo. My hypothesis is that swing rhythm, which is pervasive in several major styles of jazz, not only facilitates the use of double-time feel but allows for subtle gradations in its use. I will offer a model that classifies rhythms according to how strongly they support (or undermine) a double-time feel in a swing rhythm context. Using this analytical framework, I will analyze two performances by Louis Armstrong of "Lazy River" and one performance by Lee Morgan of "Ill Wind." By comparing the two Armstrong performances, I will show how different choices of rhythm can strengthen or weaken a double-time feel, and how, in the later performance, Armstrong tends to choose rhythms that intensify the effect of a tempo change. My analysis of the Morgan performance will show that double-time feel need not be fully "on" or "off" as in the Armstrong performances, but can be more subtle and fluid. In other words, the effect can range from a single performer creating just a hint of double-time feel for a measure or two, all the way to a lengthy passage in which all the performers work together to create a clear double-time feel. I will conclude with a summary and some possibilities for future work.

Double-Time Feel

"Double time" is defined by the *New Grove Dictionary of Jazz* as "the apparent doubling of the tempo [...] achieved by halving the prevailing note-value" (Kernfeld, 2002). In an explanation of the same term written for a popular audience, the book *What to Listen for in Jazz* clarifies that double time "involves a doubling of tempo in the rhythm section, a doubling of the general speed of the melody line, or both" (Kernfeld, 1997). The *Grove*'s use of the word "apparent" implies that the tempo has not in fact doubled. To emphasize this point, some authors prefer the more precise term "double-time feel," reserving the term "double time" for a true doubling of tempo (Levine, 1995). For the sake of clarity, I will favor the term "double-time feel" in this thesis, except where the context makes it clear that the simpler term "double time" refers to an *illusory* doubling of tempo.

In order for an illusory doubling of tempo to be possible, there must be a standard other than the surface rhythm by which to judge tempo. In the jazz genre this standard can be found in the theme-and-variations form of most jazz performances. A typical jazz performance begins with a statement of the melody and continues with a number of choruses, that is, improvisations over the harmonies ("the changes") that underlie the original melody. One way to define tempo in jazz, then, is to ask "How fast are the [chord] changes?", or more precisely, "How long does it take to get through a chorus?" If the answer to this question does not change, then, according to this definition, the tempo has not changed—even if surface rhythms create a double-time feel, i.e., even if surface rhythms create the illusion of a tempo doubling. I consider harmonic rhythm to be a stronger tempo indicator than surface rhythm for two reasons: first, because it operates at a deeper, larger-scale level of the music, and second, because it can be related back to the original score that is the basis for the improvisation, when such a score exists.

This thesis will focus exclusively on double-time *feel* as opposed to true double time. In other words, this thesis will focus on music which, by the standard of harmonic rhythm, never actually doubles in tempo, but which sounds *as if* it has doubled in tempo due to surface rhythms.

Unfortunately, there is no generally accepted term for the opposite of double-time feel, i.e., for the perception of the original, slower tempo that a performance establishes before going into a double-time feel. Most of the terms for this that I have encountered are potentially confusing. "Straight time" suggests the avoidance of swing rhythm. "Common time" suggests that double-time feel does not sound like 4/4. "Regular time" suggests that double-time feel has an irregular pulse. Given these poor alternatives, my preferred term is "normal time" or "normal-time feel."

In the course of my analyses, I will often ask to what extent a given musical passage or rhythm creates a normal-time feel or a double-time feel. In order to be able to ask that question using fewer words, I would like to introduce the term "time feel" (from the shared part of the terms "normal-time feel" and "double-time feel"), so that the question becomes, “What is the time feel of this passage (or rhythm)?” The answer could be “strong normal time,” “a hint of double time,” “ambiguous/unclear,” etc. (Some jazz musicians use the term “time feel” with a different meaning, so there is some possibility for confusion; I hope that the preceding explanation clearly defines how I will use the term “time feel” in this thesis.)

A few musical examples will clarify what double-time feel is. I will defer detailed discussion of these initial examples to Chapter IV. Instead I will assume that the reader has the recordings at hand and that he or she will rely primarily on the recordings, as opposed to my transcriptions, to follow the initial examples. (A brief point about notation in the transcriptions: eighth notes represent “swing” eighths unless marked as a duplet, which identifies them as “straight” eighths. A similar convention applies to sixteenth notes. I discuss the swing/straight distinction in greater detail in Chapter II.)

Consider the passage in Figure 1.1, from the 1956 Louis Armstrong recording of “Lazy River” on the album *Satchmo: A Musical Autobiography* (Carmichael & Arodin, 1931b). The beginning of this passage has a strong normal-time feel; in other words, the (written) quarter note is felt as the beat. At m. 37, about one minute and forty-five seconds into the recording, the rhythm section doubles the rate at which they are providing pulses behind Armstrong, who adjusts his own manner of singing in response. This produces the aural effect of a doubling in tempo, i.e., double time, and I have indicated this in the transcription by notating aural beats 1, 2, 3, and 4 below the staff. At about the two-minute mark (m. 43 in the transcription), the band temporarily stops playing, leaving Armstrong unaccompanied. The jazz term for this effect is a “break” and I will discuss it in more detail later. During the break, Armstrong sings in such a way as to preserve the feeling of double time despite the absence of the rhythm section. When the break ends several seconds later (mm. 44-45), the feeling of the original slow tempo returns, which I have indicated in the score with parenthesized numerals 3 and 4 that match the notated beat. At this point the rhythm section returns to their original quarter-note pulse behind Armstrong.

Figure 1.1: 1956 Louis Armstrong performance of “Lazy River,” mm. 31-45.

Figure 1.2 shows a passage from Armstrong's 1931 recording of the same song (Carmichael & Arodin, 1931a). This passage also begins in a normal-time feel, with the steady quarter-note pulse of the rhythm section felt as the beat. In mm. 7-8, the rhythm section drops out and Armstrong alone creates a double-time feel. In other words, in this passage's break, Armstrong does not merely preserve an existing double-time feel (as in Figure 1.1) but creates a double-time feel on his own. His use of swing sixteenth notes, particularly when syncopated as in m. 7, contributes heavily to the effect. The assistance of the rhythm section, then, is not always necessary for the creation of a double-time feel, a point to which I will return.

Figure 1.2: 1931 Louis Armstrong performance of "Lazy River," mm. 5-9.

A more subtle instance of double-time feel, transcribed from a Lee Morgan recording of "Ill Wind" on the 1965 album *Cornbread* (Arlen & Kohler, 1934), is shown in Figure 1.3. In the very first measure of this passage, pianist Herbie Hancock suggests a double-time feel through the use of a rhythm involving syncopated swing sixteenths. Bassist Larry Ridley supports Hancock's double-time feel by using straight eighth notes, but rather than strongly defining a double-time beat by playing a stream of straight eighth notes like the rhythm section in the first Armstrong example (Figure 1.1), Ridley uses a dotted-quarter-plus-eighth rhythm. In the same measure, Lee Morgan's trumpet plays a whole note, perfectly neutral as far as time feel is concerned, and drummer Billy Higgins plays a swing eighth-note pattern(!), albeit quietly, a pattern which on its own would strongly suggest normal time.

The hint of double-time feel created by Hancock (piano) in the first measure of the passage continues in the next measure, m. 36, in which Morgan (trumpet) imitates the rhythm that Hancock played a measure earlier. Meanwhile, Hancock plays an almost neutral rhythm with just one instance of a straight eighth-note, the bass plays a purely neutral rhythm based on quarter notes, and the drums continue their normal-time swing. Measures 37-38 contain transitional material that I will discuss in more detail in Chapter IV. Suffice it to say that by m. 39, which contains eighth-note triplet figures across three instruments, any hint of double-time feel is gone.

The Morgan excerpt demonstrates that double-time feel can be subtle and fleeting, and that it can be created by a single musician while the others play rhythms that are neutral or even contradictory (i.e., suggestive of a normal-time feel). The excerpt also shows that other musicians may choose to respond to such a hint of double time by adjusting their own rhythms to support or intensify the gesture.

Figure 1.3: Lee Morgan performance of “Ill Wind,” mm. 35-41.

These examples raise the question of how a double-time feel is created. In each example I have observed a change from rhythms based on eighth notes to rhythms based on sixteenth notes. This is consistent with the definition of "double time" in the *Grove*, which states that a double-time feel "is achieved by halving the prevailing note-value." However, this alone is not sufficient, in my view, to produce a double-time feel. For example, consider Johann Pachelbel's famous *Canon in D* (ca. 1680). Like most jazz performances, this piece consists of a number of variations on a repeated chord progression. It begins with a steady quarter-note rhythm in the cello part, and at first each of the other parts also proceeds in quarter notes. Then, as Pachelbel's variations on his theme become more elaborate, the prevailing note value is halved several times in succession, becoming eighth notes, then sixteenth notes, then thirty-second notes (see Figure 1.4). All the while, the listener's sense of the basic pulse of the music remains undisturbed. The apparent tempo does not change.

Why do the Armstrong and Morgan performances create a double-time feel while Pachelbel's *Canon* does not? In the rhythm section's part of the 1956 Armstrong passage in Figure 1.1, for example, one can see and hear the "halving [of] the prevailing note-value" specified by the *Grove*. Yet this alone is not sufficient to explain the double-time feel, because Pachelbel's *Canon* halves the prevailing note value several times with no effect on the listener's sense of tempo. Of the second Armstrong example, Figure 1.2, one might still say that the prevailing note value is halved, but this halving is less obvious because the rhythm section stops playing and Armstrong alone creates a double-time feel. The third example (Figure 1.3), from the Lee Morgan performance, is so subtle and fleeting that there is not a clear "prevailing note value" at all. Surely there must be additional factors at work in creating the effect of double time.

Figure 1.4: Successive halvings of the prevailing note value in Pachelbel's *Canon in D*, mm. 5-7 (a), 9-11 (b), and 17-19 (c). The score excerpts shown here are based on a score of the full *Canon* in an article by Beckmann (1919).

Scope of Thesis

The scope of this thesis is necessarily limited.

Although the title of the thesis refers simply to "jazz," my hypothesis is intended to apply only to those styles of jazz in which swing rhythm is pervasive and in which there is a strong aural distinction between “swing” and “straight” subdivision of the beat. Such styles include Traditional Jazz, New Orleans Jazz, Swing (as a style of jazz), and Straight-Ahead Jazz. From this repertoire I have selected three case studies. A broad survey of the repertoire would require a book-length work at the least.

Double-time feel as a phenomenon is not limited to jazz, but examples from other genres (such as gospel, rock, or classical music) are outside the scope of this thesis, as are the historical roots of double time as a performance convention.

While I hope that my hypothesis applies to listeners in general, the case studies in this thesis are based primarily on introspection, i.e., on my own personal experience with the Armstrong and Morgan performances as a listener. That said, I am intrigued by the possibility of testing my ideas experimentally in future work.

There are undoubtedly factors other than swing rhythm influencing the perception of double-time feel. To name just one example, Collier and Collier (1994) observed that several recorded jazz performances in which the tempo nominally “doubled” actually more than doubled in tempo, and that a subsequent “halving” of the tempo arrived at a tempo slightly faster than the original. My analyses in this thesis set aside such effects and focus exclusively on swing rhythm.

With the above limitations of scope in mind, the remainder of the thesis is organized as follows. Chapter II will review the relevant literature on tempo perception, swing rhythm, and metrical dissonance. Chapter III will describe my hypothesis on the importance of swing rhythm to double-time feel in jazz and present a model of how certain rhythms support (or undermine) a double-time feel. Chapter IV will present case studies of the three performances from which Figures 1.1, 1.2, and 1.3 were drawn, and will analyze the use of double-time feel in these performances using the model from Chapter III. Chapter V will conclude the thesis with a discussion of the case studies and possibilities for future work.

CHAPTER II

REVIEW OF LITERATURE

Tempo Perception and Beat Inference

There has been a variety of research on perception of beat and tempo over the past several decades, but very little has been targeted specifically at the phenomenon of double time. To my knowledge, the only studies that directly examine doubling and halving of tempo are two by Collier and Collier (1994; 2007), both of which study performers, not listeners. The first of these studies (Collier, 1994) was a broad survey of the use of tempo in jazz. The authors timed a variety of commercial jazz recordings with a stopwatch. They noted that 18 of the recordings in their corpus included a change in tempo—nominally either a doubling, a halving, or both—but did not specify whether the tempo changes were real or illusory according to the standard of harmonic rhythm. Every nominal doubling of tempo, they found, was in fact more than twice the previous tempo, and every nominal return from double time to "normal" time in fact arrived at a tempo slightly faster than the original. (I have not used a stopwatch to time the recordings to be discussed in this thesis; I treat the apparent tempo changes in these recordings as if they are exact doublings and halvings.) In a subsequent study by the same authors (Collier & Collier, 2007), participants were asked to drum or tap a beat, double their speed, and then return to their original speed. Musicians performed this task with reasonable accuracy, although with a slight tendency to "compress" the tempi (i.e., to make the fast tempo too slow and the slow tempo too fast). Nonmusicians' attempts at doubling the tempo tended to be much too fast, but they were still able to return to a tempo near the original, suggesting short-term memory for absolute tempo. While these studies of performers are interesting, it is listeners that are my primary concern in this thesis.

Studies relevant to double time as perceived by listeners generally fall into one of two categories, depending on the task required of participants. One category of studies asks participants to compare the tempo of one stimulus to another and rate it as faster, slower, or the same tempo. The second category of studies asks participants to tap the beat while listening to a musical stimulus. There is a small amount of overlap between these two categories.

Studies in the first category have found several musical factors that influence judgments of tempo. Boltz (2011) found that melodies with higher pitch or brighter timbre tend to be rated as faster by listeners, and increases in pitch or loudness are associated with the perception of increasing tempo. Kuhn and Booth (1988) found that melodies with more “activity” (ornamentation) were rated as faster by elementary school students. Two studies have examined the effect of staccato vs. legato articulation on tempo judgments, with conflicting results. Geringer, Madsen, MacLeod, and Droe (2006) found that listeners tend to judge staccato stimuli as increasing in tempo more than legato stimuli, but Repp and Marcus (2010) found no effect of articulation on tempo judgments, and did not cite Geringer et al. Thus there is some evidence that various musical factors can contribute to illusory changes in tempo, but their connection to double time in jazz, if any, is not yet clear. It is worth noting that in all of these tempo perception studies, the true tempi of the stimuli were either steady or changing only gradually; sudden, dramatic changes in tempo such as those characteristic of double time were not examined.

Studies in the second category examine beat-tapping. The simplest such studies involve stimuli that consist of an isochronous series of tones at the same pitch. Using such stimuli, Duke (1989) found that college music majors appear to prefer a beat rate between 60 and 120 bpm, and if necessary they will group or subdivide stimulus tones in order to keep the beat rate within this range. A follow-up study by Duke, Geringer, and Madsen (1991) replicated this result, but found that younger listeners and non-musicians tended to tap at the same rate as the stimulus, even at the extremes of tempo (40 bpm and 240 bpm). Repp (2008) tested the effect of interleaving the “beat tones” with “subdivision tones” that were lower in pitch and quieter. The more subdivision tones in the stimulus, he found, the slower were participants’ continuations of tapping after the stimulus had stopped. In a follow-up study, Repp (2010) asked participants to generate their own subdivisions of a slow external beat, either mentally or by tapping the subdivisions. He found that subdivision improved the accuracy of participants’ synchronization with the external beat. These studies using isochronous tones provide some clues about beat perception, but it is difficult to know how to generalize their results to more complex musical situations.

The ecological validity of beat studies may be greater when stimuli somewhat more realistic than isochronous tones are considered. In a speculative paper on the metric interpretation of unaccompanied melodies, Longuet-Higgins and Lee (1984) argued that all rhythms are in principle metrically ambiguous, but they do not seem that way to listeners, who infer beats in such a way as to minimize syncopation. Phrasing, they argued, can serve as an additional clue for beat inference. Dawe, Plait, and Racine (1994) used simple harmonized melodies to examine the effect of harmonic, melodic, and temporal accents on meter inference. They found that harmonic accents were the most influential, particularly among musicians, followed by melodic accents and finally temporal accents. Snyder & Krumhansl (2001) investigated the effect of large-scale alterations to ragtime music on pulse-finding. Removal of pitch information from ragtime music, they found, has no significant effect on listener's pulse-finding ability. Removal of the left-hand piano part of ragtime music, however, greatly reduces listeners' ability to find a pulse. This last condition could be considered analogous to a break in which the jazz rhythm section stops playing for one or two measures, leaving the soloist unaccompanied. Although the stimuli used in these studies were more realistic than isochronous tones, the use of real-world musical performances promises even greater ecological validity.

Several studies have asked listeners to tap the beat while listening to recordings of musical performances. A large set of such data was collected by van Noorden and Moelants (1999). They proposed using resonance curves to model the resulting distribution of tapping rates, which peaked near 120 bpm. McKinney and Moelants (2006) investigated whether a similar tapping rate distribution would apply to individual songs. They found that individual songs often had peaks far from 120 bpm and often had multiple peaks at tempi that were in simple integer ratios to each other, corresponding to different levels of meter. In searching for variables that would explain a listener preference for one tapping rate over another in a multi-peak distribution, they found no correlation with age or musical training. Drake, Jones, and Baruch (2000) found that both age and musical training were correlated with a tendency to tap at a higher hierarchical level while listening to Ravel's *Bolero*. These studies using realistic stimuli reveal there is often more than one valid choice of beat for listeners.

The relationship of beat, tempo, and "tactus," i.e., the rate at which it is comfortable for a listener to tap along with the music, has been the subject of several recent papers. Justin London (2002) discussed possible reasons for choosing among several possible beats and argued that "beat perception may require (at least potentially) the perception of a concomitant level of subdivision." In a subsequent experiment (London 2011), he found some evidence that asking participants to tap while listening to music biased their judgments of tempo, and argued that our judgments of tempo and speed are not entirely captured by our preferred tapping rate. Martens (2011) makes a similar argument about preferred tapping rate or tactus and hypothesizes three listener strategies to accounts for differences in tactus for different listeners of the same music.

Perhaps the single result in the music perception literature most significant for the study of double time is that listeners can feel the beat at more than one level in the same music. This is directly related to the fact that, in a double-time passage, it sounds at the surface level as if the tempo has doubled, but at the deeper level of harmonic rhythm, it sounds as if the tempo has remained the same.

Swing Rhythm

In many styles of jazz there is a notational convention that written eighth notes represent a beat divided not equally in half, as with standard ("straight") eighth notes, but rather unequally, with the first "half" of the beat being longer than the first. These are called “swing” eighth notes, and pieces in which they are the basic rhythm are said to be “in swing time.”

Empirical studies of swing have tended to focus on details of performance. For example, Fernando Benadon (2006) has documented how the ratio between the two “halves” of the swing-time beat, which he calls the “beat-upbeat ratio” (BUR), can vary substantially across different jazz performances and even within the same performance. A survey of studies along similar lines is provided by Butterfield (2011).

For the purpose of my argument in this thesis, the important point is that, whatever their exact ratio, swing eighth notes divide the beat unevenly. My argument also relies on the saliency of this unevenness—in other words, I assume a BUR sufficiently large that listeners perceive swing eighths as qualitatively different from straight eighths. When this is not true (for example, in performances at such a fast tempo that the BUR becomes very low), my argument does not apply.

Vijay Iyer (2002) states that “swing enhances the perception of the main pulse.” Although I feel that my own experience as a listener supports this claim, and in fact my argument in this thesis relies on it, I am not aware of any empirical studies testing it.

Metrical Dissonance

Harald Krebs’ (1999) concept of “metrical dissonance” describes how rhythms can clash with one another in a way analogous to how pitches can be perceived as dissonant with each other.

Figure 2.1 is an example of a type of metrical dissonance that Krebs calls “grouping dissonance.” The figure is based on a similar figure in Krebs (1999), but is inverted top-to-bottom for reasons that will become clear when I present similar figures in Chapter III. The dot notation in both my figure and Krebs' original is based on the work of Lerdahl and Jackendoff (1983). Each row of dots represents a series of pulses, in this case isochronous pulses. The pulses are accent patterns that may have been extracted from a more complex rhythm. Dots that are vertically aligned represent simultaneous pulses. Consider the top two rows in the figure, which, following Krebs, I will call "layers." The leftmost and rightmost dots in these two layers are vertically aligned. Starting from the leftmost dots and counting until just before the layers realign gives five dots for the top row has five dots and three for the bottom row. Thus the top two layers represent a three-against-five polyrhythm. The third layer, which Krebs calls the "micropulse layer," represents a sort of least common denominator such that both of the top two layers can be seen as grouping the pulses of the third layer in different ways. Any polyrhythm can be seen in this way, which is the reason for Krebs' term "grouping dissonance."

Krebs calls pulse layers "metrically consonant" when one nests perfectly inside the other. For example, although the top two layers in Figure 2.1 are metrically dissonant with each other, each is metrically consonant with the third layer.

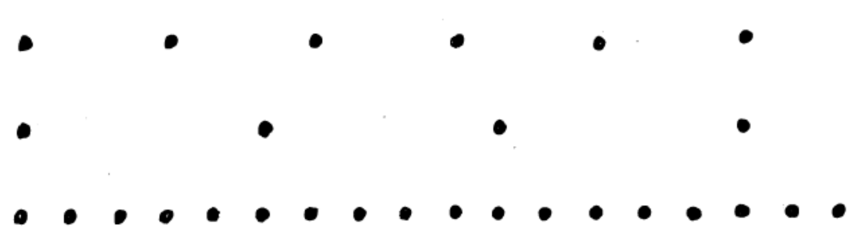


Figure 2.1: An example of grouping dissonance.

Butterfield (2011) briefly applies the concept of grouping dissonance to swing, observing that swing eighths with a BUR near 2:1 would likely be heard as metrically consonant with eighth-note triplets, and swing eighths with a low (i.e., near-even) BUR would likely be heard as metrically dissonant with eighth-note triplets.

Love (2013) also applies Krebs' metrical dissonance to jazz, but focuses on a different type of dissonance that Krebs calls "displacement dissonance." In terms of the dot diagram, displacement dissonance would be represented by two layers with identically spaced dots, one of the layers being shifted horizontally so that none of its dots align with those of the other layer.

Summary

Little of the research on tempo perception is directly related to double-time feel, but it does offer a direction for future research in the two paradigms that most experiments follow: tapping, and direct comparison of stimuli. Recent work by London (2011) and Martens (2011) has confirmed the value of both approaches and suggested that one cannot be abandoned in favor of the other.

Existing research on swing has focused on details of performance rather than how swing is perceived. Specifically, although scholars such as Iyer (2002) have claimed a connection between swing rhythm and beat inference, this connection has yet to be validated by experiment.

Harald Krebs' (1999) work on metrical dissonance has inspired a variety of scholars to build on his ideas. Only very recently (Butterfield, 2012; Love, 2013) has his work begun to be applied to jazz.

CHAPTER III

HYPOTHESIS

Music theorists have long been aware that different levels of beat are often simultaneously available to the listener. Harald Krebs (1999) uses the term "metrical layers" to describe this phenomenon. In the normal case, metrical layers nest neatly inside one another; they are metrically consonant with each other. This occurs, for example, in Pachelbel's *Canon* as the prevailing note-values are repeatedly halved. Figure 3.1 shows this nesting relationship between layers. There is no need for a separate micropulse layer because the layers are metrically consonant: both eighth notes and quarter notes can be expressed as groupings of sixteenth notes.

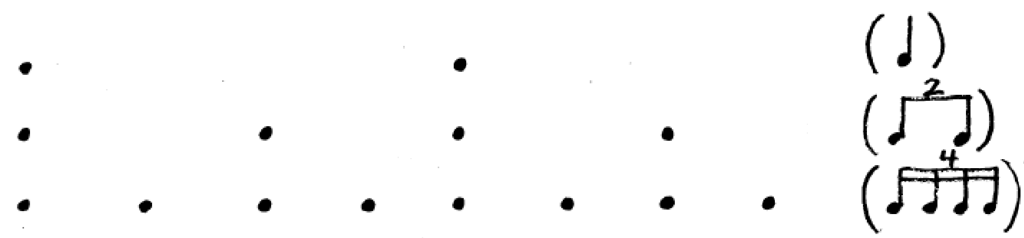


Figure 3.1: "Straight" (even) subdivisions of the beat nest within each other.

The opposite situation is what Krebs calls metrical dissonance. I will argue that in jazz styles where swing rhythm is pervasive, halving the prevailing note-value can produce metrical dissonance, and that this dissonance is one of the main factors contributing to listeners' perception of double time.

To consider the idea of swing eighth notes in terms of Krebs' metrical layers, I will call the quarter-note level of rhythm the "beat layer" and the level at which quarter notes have been subdivided into swing eighths the "sub-beat layer." The beat layer and sub-beat layer can be regarded as two different ways of grouping a third layer of micropulses that form a common denominator between the two layers. The micropulses may be present in the music, or they may only be implied by the relationships among the rhythms that are heard. For example, in the case where swing eighths match the classic approximation of a triplet containing a quarter note followed by an eighth note (BUR 2.0, Benadon's terms), the micropulses would be triplet eighth notes. This third layer, the pulses of which form a common denominator among all higher layers, I will call the "micropulse layer."

When two metrical layers group pulses from a third layer in contradictory ways, Krebs describes the resulting metrical dissonance as grouping dissonance. This type of dissonance is exactly what occurs when a jazz performance using swing eighth notes goes into double time. If the beat is a quarter note, then doubling the apparent tempo requires dividing quarter notes exactly in half, i.e., into *straight* eighths, which group micropulses in a different way than swing-eighths do. Similarly, sixteenth notes, whether straight or swung, group micropulses in a way that is inconsistent with swing eighths, because the third sixteenth note in a group of four divides a quarter note exactly in half. In short, a doubling of tempo in a swing-time piece, whether real or illusory, inevitably creates grouping dissonance.

Figure 3.2 diagrams this grouping dissonance. There is a need for a micropulse layer here because, unlike straight subdivision, swing subdivision does not nest. The micropulse layer is not shown in the diagram, however, because that would imply a specific BUR. For purposes of my argument, the specific BUR does not matter as long as it is within a range such that normal-time swing is metrically dissonant with double-time swing.

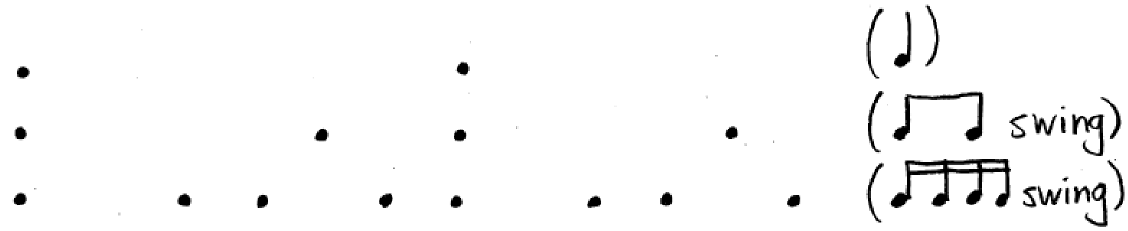


Figure 3.2: "Swing" subdivision at the eighth-note level is metrically dissonant with swing at the sixteenth-note level. Swing doesn't nest.

It must be emphasized that swing is not a single rhythm, but rather a particular kind of note-value subdivision which can be implied by a large number of different rhythms. In terms of the diagram in Figure 3.2, one might omit a few of the dots from one of the swing layers (the second or third layer), or one might add a few dots, and the resulting rhythm of that layer might still imply swing subdivision. Not all rhythms that imply swing subdivision do so with the same strength, a point to which I will return later in this chapter. Other factors may also affect how strongly a particular rhythm suggests swing subdivision to the listener, such as which instrument is playing the rhythm, dynamics (i.e., how loudly the rhythm is played), and accents. For example, a rhythm might have a greater influence on the listener when played by the drums than when played by another instrument, all else being equal. If played *quietly* by the drums, the same rhythm might have little effect. If played loudly with syncopated accents, it might have a greater effect.

Listener perception of swing subdivision, then, is the primary variable to which my hypothesis attributes double-time feel. Additional variables that may influence listener perception include the degree to which the specific rhythms used imply swing subdivision, the particular instrument that plays the rhythm, the loudness with which the rhythm is played, and which notes, if any, are accented. These variables may differ across instrumental parts that are heard simultaneously, and in some cases the instruments may "compete" with each other, some suggesting normal-time feel, others double-time feel.

As Krebs points out, it is not necessary for two groupings of micropulses to be heard simultaneously in order for grouping dissonance to occur. It is enough for the two groupings to be heard in succession, because our memory of the first grouping creates a dissonance with the second grouping. Krebs calls this "indirect dissonance," as opposed to "direct dissonance." Double time usually involves indirect dissonance; direct dissonance often (but not always) undermines or even prevents the tempo-change illusion, as I will discuss in Chapter IV.

The presence of straight eighth notes, then, is sufficient to create metrical grouping dissonance in a swing-time piece. But this alone would probably not be enough to create a double-time feel, because it does not suggest swing at the sixteenth-note level. It might be heard instead as a temporary switch from swing time to "straight time." Creating the impression of doubling the tempo requires the use of note values smaller than an eighth note, so sixteenth notes are also a necessary ingredient for double time. Moreover, there must be something that encourages the listener to hear the music in terms of sixteenth notes rather than eighth notes.

There are two main elements that I can identify by which listeners can be drawn to the sixteenth note level of rhythm. The first element is the use of syncopation. Uninterrupted runs of sixteenth notes emphasize strong beats and tend to be heard as ornamental (as in Pachelbel's *Canon*). Syncopated sixteenth-note patterns, on the other hand, emphasize the second and fourth sixteenth notes in a group of four, metrical positions that are not included in higher metrical layers and so draw attention to the sixteenth-note layer. I am reminded of David Temperley's observation in a different context that "syncopated rhythms often seem to reinforce the metre" (Temperley 1999). The second element is the use of swing sixteenths. Because swing eighths are the norm in so much jazz, I hypothesize that listeners tend to hear the layer in which swing occurs as the eighth note layer. For this reason, swing sixteenths would provide a strong incentive for listeners to reorient their feeling of the beat.

Figure 3.3 shows a spectrum of rhythms classified by the effect I hypothesize that they have on tempo perception, or time feel, in a swing rhythm context. Rhythms toward the top of the chart reinforce or re-establish the original tempo (i.e., a normal-time feel), and rhythms toward the bottom of the chart suggest that the tempo has doubled (i.e., create or reinforce a double-time feel).

At the center of the chart, marked "neutral," is the quarter note. Quarter notes are neutral because they are metrically consonant with both eighth-note swing (i.e., normal-time swing) and sixteenth-note swing (i.e., double-time swing). Moving upward in the chart, we find swing eighth notes marked as reinforcing normal time (not surprisingly). Further up, triplet eighth notes are classified as strengthening a normal-time feel. This classification assumes that triplet eighth notes are metrically consonant with swing eighths, which is the case in the Armstrong and Morgan performances and in many others, but could be false in the case of a BUR that deviates too much from the 2:1 ratio implied by the triplet.

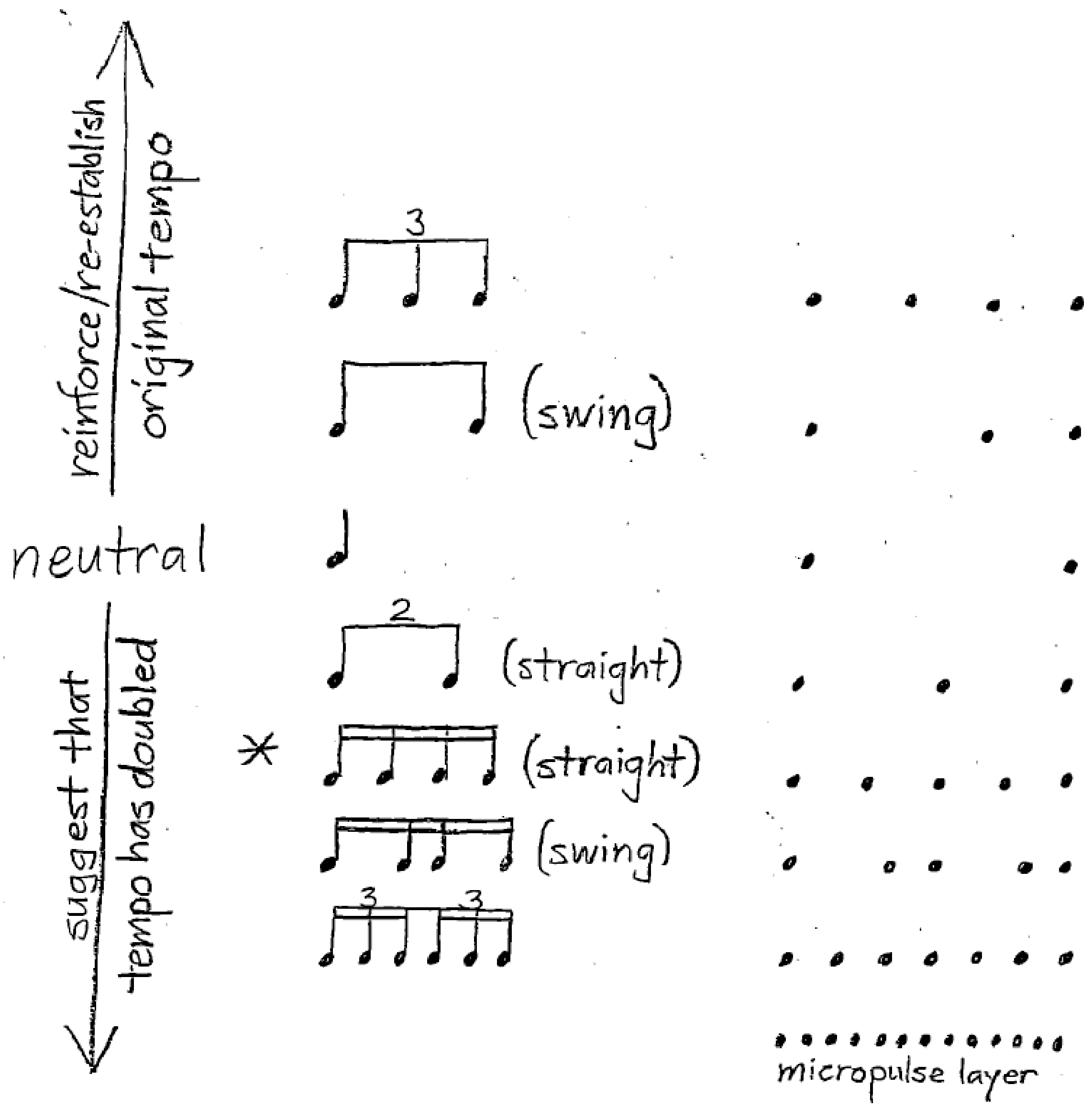


Figure 3.3: Hypothesized effect of various rhythms on tempo perception in a swing rhythm context. Straight sixteenth notes are marked with an asterisk because they do not fit the nesting pattern established by the other rhythms in the figure.

Going back to the neutral middle and moving down the chart from "neutral," the first rhythm we encounter is straight eighth notes. This rhythm deserves special comment because it is dissonant with normal-time swing and consonant with double-time swing, yet does not itself contain any double-time swing. By destabilizing normal-time swing, it prepares the way for the establishment of a double-time feel, but stops short of suggesting double-time feel on its own. And because the progression toward a double-time feel is not guaranteed—the music could continue in "straight time" at the original tempo, for instance, or simply return to normal-time swing—the straight-eighth rhythm may create a feeling of anticipation or uncertainty in the listener.

Continuing down the chart, I will temporarily skip over the straight sixteenth notes since they are a special case.

The swing sixteenth notes and triplet sixteenth notes work to establish a double-time feel in the same way that swing eighth notes and triplet eighth notes work to establish a double-time feel, with the same caveat about BUR. In the case of a BUR too far from 2:1, the triplets could be removed from the ends of the spectrum and the heart of the diagram would still apply.

In both directions from "neutral"—again, ignoring the straight sixteenths for the moment—the rhythms show a clear pattern of nesting, as the Lerdahl and Jackendoff (1983) style dot diagram on the right shows. This nesting is exactly what we would expect of rhythms that are metrically consonant with each other, just like in Figure 3.1. Of course, because eighth-note swing is dissonant with sixteenth-note swing, the rhythms above "neutral" on the spectrum are dissonant with the rhythms below "neutral," hence the need for the micropulse layer shown at bottom right. But as I mentioned in the discussion of Figure 3.2, the micropulse layer must vary depending on the value of the BUR, so the micropulse layer shown here is merely an example.

Returning to the straight sixteenth notes in Figure 3.3, these are marked with an asterisk because they, like many other rhythms not shown on the chart, do not fit the nesting pattern just described. They are dissonant with both normal-time swing and double-time swing. Such rhythms have the same "destabilizing" effect as the straight eighths, but without the possibility of leading through further subdivision into double-time swing. Thus, somewhat paradoxically, straight sixteenths and other rhythms that do not appear on the chart are likely to have the same effect as a simple quarter note, that is, they are likely not to suggest any tempo change at all.

One aspect of rhythm not shown in Figure 3.3 is syncopation. In this model, syncopated rhythms intensify whatever suggestion the same rhythm would have had if not syncopated. In other words, swing eighths reinforce a normal-time feel, and syncopated swing eighths do the same thing more strongly. The same is true of swing sixteenths vs. syncopated swing sixteenths. There is a relationship between this effect and the nesting of rhythms in the chart. The nesting means that, as you move further away from "neutral," your rhythm accumulates new note attack (onset) positions at each step. Syncopation emphasizes these new positions, thus emphasizing the change from one level to another in the chart.

Does the syncopation effect persist even into the triplets at the extremes of the spectrum? Triplets with the *last* note accented would have an effect similar to syncopated eighths or sixteenths, but the last note of each triplet is not the new note at that level of the chart. Rather, the *second* note of each triplet is the new note. Emphasizing the second note of each triplet, either by accent or by syncopation, is a relatively rare effect, although it does happen occasionally in the Armstrong and Morgan performances. My impression as a listener is that, used sparingly, such a rhythm does reinforce swing subdivision. I would expect excessive use to create displacement dissonance and thus undermine the original meter.

What makes this model particularly distinctive, in comparison to genres or styles of music that do not have a pervasive swing rhythm, is that the rhythms in question can potentially be produced by any instrument, and are not linked to a specific timbre. In other genres, a "beat indicator" rhythm might be something like the "*bass (drum)—snare—bass—snare*" pattern in rock, or the "*mmp—tss—mmp—tss*" alternation of bass and cymbal in electronic dance music. Since these patterns are tied to specific timbres, the possibility of double-time feel depends entirely on what the instrument that produces those timbres is doing. But in the styles of jazz that fit my model, any instrument can play the rhythms in Figure 3.3. This means that there are degrees of time feel not just in a particular instrument's part, but across all instruments, depending on which ones are neutral, which ones are suggesting double time, and which are suggesting normal time.

One final point is that the spectrum model can be applied to more than just the surface rhythms of the music. It can apply to accent patterns extracted from a more complex rhythm. Here I use the term "accent" in a broad sense, following Joel Lester (1986), whose concept of accent includes not just sudden changes in dynamics, but also changes in duration, pitch, contour, harmony, texture, etc., that result in emphasis of a particular note.

To summarize my hypothesis, in styles where swing rhythm is pervasive, swing acts as a strong "beat indicator," and thus, rhythms that are metrically dissonant with swing at the original tempo will tend to destabilize the listener's sense of the beat, and rhythms that are metrically consonant with swing at double the original tempo will tend to suggest to the listener that the tempo has doubled. According to the model, syncopated swing rhythms will suggest either normal time or double time (depending on their speed) more strongly than non-syncopated rhythms. Rhythms which are either consonant with both normal-time and double-time swing (i.e., quarter notes), or which are dissonant with both, tend to have a neutral effect on time feel. Additional factors such as instrument (timbre), loudness, and accent may affect how strongly a particular rhythm influences the listener.

The instruments of the rhythm section (drums, bass, etc.) often help to create double-time feel, but it is possible for other instruments to suggest double time in the context of a "neutral" or even absent accompaniment, as shown in Figures 1.2 and 1.3.

CHAPTER IV

CASE STUDIES

About the Transcriptions

The transcriptions of all three performances analyzed in this chapter (Carmichael & Arodin, 1931a, 1931b; Arlen & Koehler, 1934) are my own.

A question that arose while I was transcribing the Armstrong and Morgan performances was how to represent swing eighth notes. The classic approximation to swing eighth notes, often printed at the top of a score to assist beginners, is a triplet containing a quarter note followed by an eighth note. (In Benadon's terms, this represents a BUR of 2.0.) For these performances, to my ear, this approximation was passable, and so I considered using it explicitly in my transcriptions, via a time signature of 12/8. The trouble is that the musicians sometimes do divide the beat equally in half, and the resulting rhythms are visually awkward if notated in 12/8. In the end I decided to follow jazz convention for notating swing eighths. Where straight eighths are used, I notate them with a duplet (i.e., a small numeral 2 appears next to the eighth notes).

The question of swing eighths raised a broader question about notation. When is a complex rhythm heard as a way of performing a simpler rhythm, and in such cases, which of the two rhythms should be transcribed? For example, jazz performers often deliberately play slightly "behind" or "ahead of" the beat in order to achieve a feeling of relaxation or of energy, respectively. If precisely notated, such effects would be difficult to read, yet they are still an important aspect of the performance. With these performances, I have tried to show "early" or "late" rhythms explicitly in the notation, within reason. However, since I relied on my own perception of the rhythm, rather than using computer analysis of note onsets, there are surely cases where I unconsciously "corrected" a rhythm into a simpler one. My hope is that, in such cases, other listeners make similar adjustments, and if the notation is not a fully precise representation of the performance, it is an accurate representation of the listening experience.

Louis Armstrong, "Lazy River"

"Lazy River" was written by Hoagy Carmichael and Sidney Arodin in 1931, and Louis Armstrong made a hit recording of the song that same year (Carmichael & Arodin, 1931a). Twenty-five years later, Armstrong re-recorded the song as part of a career retrospective album titled *Satchmo: A Musical Autobiography* (Carmichael & Arodin, 1931b). The album includes a spoken introduction to the song in which Armstrong specifically refers to his 1931 recording, and the two performances have many elements in common, presumably by design.

Parallel transcriptions of both performances are included in an appendix to this thesis in order to facilitate comparison. The single-line staves labeled "Rhythm section" represent a composite of the instruments whose function in these performances is to provide a pulse, such as drums, bass, piano, guitar, and/or tuba. For the sake of alignment with the 1931 performance, my transcription of the 1956 performance omits a four-measure introduction during which Armstrong does not play.

Table 4.1 provides an overview of both performances. The Time Feel column shows where the performances shift into and out of double-time feel, and these shifts create a pattern noted in the *New Grove Dictionary of Jazz*, which states that double-time feel occurs "generally in a recognizable four-, eight-, or 16-bar section of a piece, or in a break.” Indeed, these two performances have a double-time feel in the eight-measure A section of the third chorus (mm. 37-44), which includes a break, as well as in the breaks in mm. 7-8 and 25-26.

		Measure	Length	*1931 performance*		*1956 performance*	
Chorus	**Section**	**Numbers**	**(measures)**	**Time Index**	**Time Feel**	**Time Index**	**Time Feel**
-	introduction	*	4	-	-	0:00	normal
1	A	1-6	6	0:00	normal	0:10	
		7-8	2	0:13	double	0:26	double
	A'	9-18	10	0:18	normal	0:32	normal
2	A	19-24	6	0:42		0:58	
		25-26	2	0:56	unclear	1:14	double
	A'	27-36	10	1:01	normal	1:19	normal
3	A	37-42	6	1:25	double?	1:46	double
		43-44	2	1:39	double	2:02	
	A'	45-54	10	1:44	normal	2:08	normal
-	interlude	55-58	4	2:08		2:35	
4	A	59-64	6	2:18		2:46	
		65-66	2	2:32		3:01	
	A'	67-76	10	2:37		3:07	

Table 4.1: Overview of 1931 and 1956 Louis Armstrong performances of “Lazy River.”

My discussion of the Armstrong performances will initially focus on the 1956 recording, which has the clearest examples of double time. This clarity is a result, I believe, of deliberate interpretive changes made by Armstrong, which I will show by comparing the two performances.

1956 performance. In the part of the passage shown in Figure 1.1 that has a double-time feel, mm. 37-44, we hear straight eighth notes in the rhythm section, one sign of double time. Armstrong starts out also playing mostly straight eighths, then in m. 38 introduces some sixteenth-note syncopations that increase the double-time effect. When Armstrong sings several consecutive sixteenth notes in m. 39, we hear that they are swing sixteenths, a strong sign of double time. Further confirmation comes in m. 40 we hear an agogic and registral accent on the second sixteenth note of the measure, followed later in the measure by a sixteenth-note syncopation. At this point Armstrong begins to move toward rhythms that, though they involve sixteenth notes, tend to emphasize the metrical positions of straight eighth notes. For the most part, this pattern continues through the break in mm. 43-44, although the third quarter note beat of m. 43 has a sixteenth-note syncopation. In the second half of m. 44 we hear a change back to triplet-based rhythms as Armstrong anticipates the end of the break.

The concept of a break is worth examining in more detail as it applies to this song and the Armstrong performances. The *New Grove Dictionary of Jazz* defines a break as "a brief solo passage occurring during an interruption in the accompaniment, usually lasting one or two bars and maintaining the underlying rhythm and harmony of the piece" (Kernfeld 2002). Breaks, the *Grove* adds, "appear most frequently at the end of phrases, particularly the last phrase in a structural unit" (Kernfeld 2002). As it turns out, breaks in these performances of "Lazy River" occur in every chorus at the same spot.

The 18-measure chorus of "Lazy River" is a simple two-part form that divides into two "halves" of eight measures each with a two-bar extension at the end of the second half. The aural cue for this two-part division is the return of the opening melody in m. 9, and it is the two measures immediately before the return of the opening melody, mm. 7-8, that are always treated as a break in these performances. This pattern is reflected in Table 4.1 in that the first A section of each chorus is broken into two rows, one for the first six measures and one for the break. An analogous use of breaks is common in the 32-measure AABA song form more typical of jazz repertoire, where the last two measures of the B section or "bridge" are often treated as a break, leading into the return of the opening material in the A section that follows.

The break in mm. 43-44 of the 1956 performance follows several measures in which double time has already been clearly established, but a break can often establish double time on its own. The absence of accompaniment encourages the listener to rely on the soloist's rhythms for a sense of pulse, providing more flexibility to the performer than if the accompaniment had continued uninterrupted.

For example, consider Armstrong's trumpet introduction to the 1956 performance, shown in Figure 4.1. In the first six measures, both the rhythm section and Armstrong's melody create a strong sense of "normal" time (as opposed to double time). The rhythm section provides a steady quarter-note beat, and Armstrong's melody is composed almost entirely of swing eighth notes, with a few eighth-note triplets. Then in m. 7, as the break begins, Armstrong immediately begins to establish double-time feel. As in mm. 37-44, he arranges his rhythmic clues to double-time in an arch form, with the strongest clues in the middle, but here the arch is compressed since the break is only two measures long. Armstrong starts using sixteenth notes immediately, but initially emphasizes straight-eighth metrical positions, then introduces sixteenth-note syncopation, and peaks on sixteenth-note triplets (which suggest swing at the sixteenth-note level) before returning to straight-eighth accents and ending the break on a metrically neutral quarter note.

Figure 4.1: 1956 Louis Armstrong performance of "Lazy River," mm. 1-9.

Armstrong's sung break in mm. 25-26 of the 1956 performance (see Figure 4.2) does not provide as strong a feeling of double time as mm. 7-8. For some listeners, it may provide no sense of double time at all. Why not? I can identify two factors here: the lack of strong double-time clues in the rhythms Armstrong uses in the break, and a lack of strong contrast with the immediately preceding rhythmic material.

The two strongest clues to double time in my list were syncopated sixteenths and swing sixteenths. I hear the sixteenths in this passage (mm. 25-26) as straight, so that eliminates one factor. There is one instance of syncopated sixteenths on the word "troubles," but it does not stand out nearly as much as the same rhythm does in m. 40. I think the lack of a change in pitch on the syncopation in m. 25 is one factor. Another is the influence of the text: the syncopated rhythm fits how we would naturally say the word "trouble" and therefore sounds unremarkable, not to mention that the stressed syllable falls on the non-syncopated note. There is another instance of syncopation on the third beat of m. 26 which is emphasized by the pitch change from G to B-flat, but by that point the break is almost over and it is too late to establish double time.

Figure 4.2: 1956 Louis Armstrong performance of "Lazy River," mm. 19-26.

The rhythms of the break in mm. 25-26 also lack a strong contrast with the immediately preceding material. The first words in the break, "throw away your troubles," have the same rhythm that we heard for "up the lazy river" (m. 19) and "ling'rin' in the shade" (m. 23), when an accompaniment of steady quarter notes was present. Opening the break with the same rhythm may remind listeners of those earlier instances and the rhythmic environment in which they occurred. But why didn't these earlier instances create double time? Does a steady quarter-note pulse from the rhythm section necessarily prevent the establishment of double time? Not necessarily, I think, but it does make it more difficult. To some extent it depends on the listener; those who naturally listen with a local rather than global focus may be more attuned to brief and subtle suggestions of double time.

The final break in the 1956 performance, shown in Figure 4.3, is less interesting from the perspective of double time than the surrounding measures. In the break itself (mm. 65-66), Armstrong plays glissando figures and makes no attempt to suggest double time. In the surrounding measures (mm. 63-64, 67-68), there are straight-eighth and sixteenth figures, and these do contrast strongly with the rhythmic material around them, yet to my ear they do not suggest double time in the slightest. The reason, I think, is that in this last chorus the drummer is playing not just quarter notes but a classic swing-time pattern. The conventions of the genre give the rhythm section more weight than the other instruments in defining the time feel. A quarter-note pattern in the rhythm section would be rhythmically neutral, that is, metrically consonant both with double time and "normal" time, giving Armstrong room to define the time feel himself. But a backing rhythm with swing eighth notes creates at least mild direct dissonance with any attempt at double-time feel. In this case, because the drums are so prominent, the rhythm section "wins." No matter what Armstrong does here, the normal-time feel persists.

Figure 4.3: 1956 Louis Armstrong performance of "Lazy River," mm. 63-68.

1931 performance. On the whole, Armstrong's 1931 performance creates weaker rhythmic contrasts than the 1956 performance.

In mm. 1-8 of the 1931 performance (see Figure 4.4), there is not as strong a dividing line between triplet-based figures in mm. 1-6 vs. sixteenth-based figures in mm. 7-8 as in 1956. For example, the rhythms in m. 3 are based on straight eighths and sixteenths.

Figure 4.4: 1931 Louis Armstrong performance of "Lazy River," mm. 1-9.

Measures 19-24 (see Figure 4.5) do not contain nearly as much sixteenth-note material as in the 1956 performance, which could have allowed for a strong sense of double-time in the break in mm. 25-26. Instead, Armstrong's rhythms in this break leave me as a listener suspended without a clear regular pulse until the rhythm section comes back m. 27.

Figure 4.5: 1931 Louis Armstrong performance of "Lazy River," mm. 19-26.

The rhythm section in the 1931 performance continues playing quarter notes in mm. 37-42 (see Figure 4.6), making it difficult for Armstrong to suggest double time even with abundant sixteenth notes. On the other hand, the fact that the sixteenth notes are so dense and continuous may decrease the sense of double time due to the lack of syncopations. In any case, this provides opportunity for contrast in the break in mm. 43-

44. Although the two performances are very similar in this break, I think the 1931 performance is slightly more successful at creating a double-time feel due to a stronger rhythmic (and melodic) peak on the E-natural that ends m. 43.

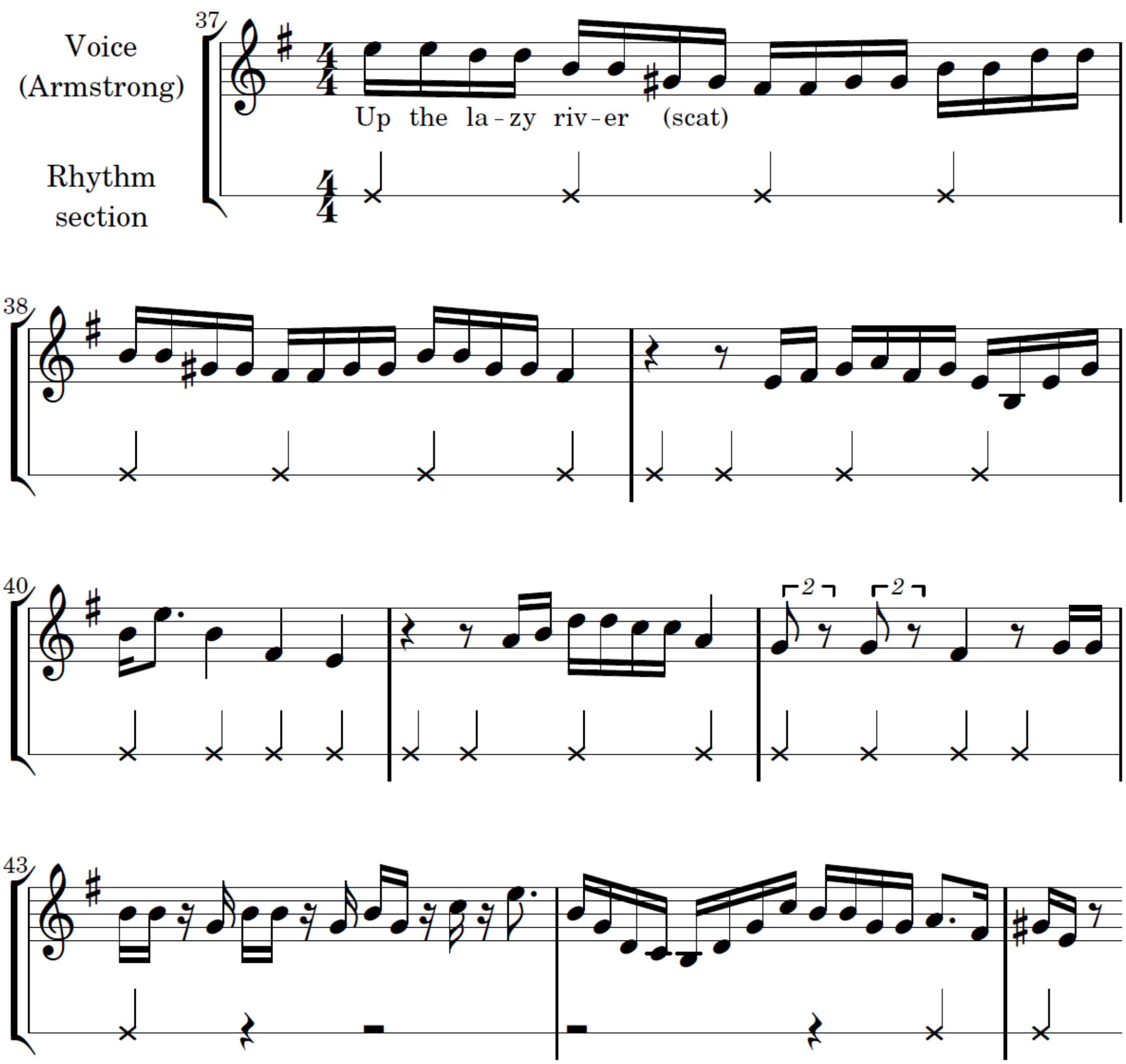


Figure 4.6: 1931 Louis Armstrong performance of "Lazy River," mm. 37-45.

The final chorus beginning in mm. 59 is another spot where the 1956 performance has a change in backing rhythm and the 1931 performance has the same quarter notes. The break in mm. 65-66 is identical between the two performances, at least as notated. In the rest of the chorus, it seems that the 1956 performance is the more rhythmically adventurous one, strangely enough, with the exception of the quintuplet in m. 71 of the 1931 performance.

Summary. My analysis has shown that the 1956 Armstrong performance often has stronger contrasts between normal-time feel and double-time feel than the 1931 performance, due to changes such as having the rhythm section play straight eighths in the A section of the third chorus (mm. 37-42), having the rhythm section play a swing pattern in the fourth chorus (mm. 59-64 and 67-74), making a greater use of sixteenth-note syncopation in the breaks, and using normal-time swing rhythms more consistently in the measures surrounding the breaks.

One could choose to view this as the mature artist improving on the 1931 performance, or one could choose to view it as overcorrection that removes some of the "organic" energy of the more youthful performance; a third alternative is the view that each of the two performances has its own merits. Because Armstrong uses double-time feel in specific parts of the song's form (see Table 4.1), the effect of the stronger contrast between normal-time feel and double-time feel in the 1956 performance is to delineate the form more clearly. It seems plausible that this was Armstrong's intention. In the 1931 performance, on the other hand, the weaker contrasts in time feel help Armstrong give the performance as a whole a more unified mood. Despite the slightly faster tempo (as shown by the time indices in Table 4.1), the ever-present, leisurely quarter-note beat of the rhythm section gives the earlier performance a "lazier" feel, befitting the song's title.

Figure 4.7: 1931 Louis Armstrong performance of “Lazy River,” mm. 59-76.

Lee Morgan, "Ill Wind"

Lee Morgan's 1965 recording of "Ill Wind" offers a contrast to the Armstrong performances in three main ways. First, the tempo feeling is more flexible. Whereas the Armstrong tends to have either a strong normal-time feel or a strong double-time feel, with few moments of ambiguity, there are large stretches of the Morgan performance in which the time feel is ambiguous or at least weaker than in the Armstrong. It is as if Armstrong is using a two-way switch to flip between normal-time feel and double-time, whereas Morgan is slowly turning a dial. Second, the Morgan performance includes clear instances of the musicians' choice of rhythms influencing each other, an effect which is absent in the Armstrong. Third, in contrast to the Armstrong recordings, where faster rhythms almost always suggest double time to some extent, fast rhythms in the Morgan often do not suggest double time. This highlights the importance of swing and syncopation in those rhythms that do suggest double time.

Table 4.2 provides an overview of the Morgan performance, grouped into an introduction and three choruses. The original song on which the performance is based, written by Harold Arlen and Ted Koehler in 1934, has a 32-measure AABA-form chorus typical of American popular song of the period. The eight-measure introduction, Morgan's addition, consists of a repeated two-measure vamp. The same vamp is later used to extend parts of the first and third choruses, which grow to 40 measures and 37 measures as a result. Only the second chorus preserves the original 32-measure chorus length.

Chorus	Section	Measure Numbers	Length (measures)	Time Index	Solo Instrument	Time Feel
-	intro	1-8	8	0:00	none	strong normal
1	A	9-14	6	0:28	trumpet	normal
		15-18	4	0:51		strong normal
	A	19-26	8	1:05		normal
	B	27-34	8	1:35	tenor sax.	
	A	35-40	6	2:04	trumpet	hints of double
		41-48	8	2:27		strong normal
2	A	49-56	8	2:57	piano	neutral
	A	57-64	8	3:28		hints of double
	B	65-72	8	4:01		strong double
	A	73-80	8	4:33		varies
3	A	81-88	8	5:08	trumpet	strong double
	A	89-96	8	5:42		
	B	97-104	8	6:17	tenor sax.	double
	A	105-110	6	6:56	trumpet	normal
		111-116	6	7:22		strong normal
		117	-	7:45		out of time

Table 4.2: Overview of Lee Morgan's performance of "Ill Wind." Descriptions of time feel are approximate, as there are often subtle changes in time feel within sections and across instruments.

I have chosen to organize my discussion of the Morgan performance chronologically, because such an order provides a clear progression from one end of the time-feel spectrum to the other. The introduction establishes swing rhythm at the original tempo, and the normal-time feel continues through most of the first chorus. The third A section of the first chorus briefly hints at double time, as if to preview what is to come, but quickly returns to a solid normal-time feel. In the first A section of the second chorus, pianist Herbie Hancock's rapid scales and arpeggios displace the normal-time swing, yet do not suggest double time, leaving the time feel in a neutral or ambiguous state. Then, during the second A section of the second chorus, Hancock plays a rhythm that strongly suggests double-time swing, bassist Larry Ridley responds, and Hancock plays the same rhythm again. Just as this second hint of double-time feel seems to dissipate, the B section of the second chorus begins and drummer Billy Higgins plays swing sixteenths for the first time, establishing a strong double-time feel.

Introduction: Establishment of normal time. Morgan's performance begins with an eight-measure introduction, the first half of which is shown in Figure 4.8. It consists of a two-measure vamp repeated with slight variations (for example, the saxophones come in at m. 5, and the bass line changes slightly between repetitions). What is most significant about this section of the performance is that it strongly establishes the original tempo. As in the Armstrong performances, swing rhythms are an essential ingredient in reinforcing the beat. But in contrast to the Armstrong performances, where the rhythm section almost never plays swing rhythms (the one exception being the last chorus of the 1956 performance, as in Figure 4.3), in the introduction to the Morgan performance, all the instruments use swing rhythms. This effect is unique within the Morgan performance, because only in this section do all of the instruments "agree" on a normal-time feel, as opposed to some playing "neutral" rhythms or suggesting a faster tempo.

Figure 4.8: Lee Morgan performance of "Ill Wind," mm. 1-4.

The introduction provides a reference point against which later rhythmic effects take place. It is not that we hear the vamp simultaneously with the new rhythms, but that our memory of it, or at least our memory of swing at that tempo or beat rate, contrasts with the new rhythms. It is an example of what Krebs calls "indirect dissonance."

Syncopation also figures heavily in the vamp section. More than half the notes in the melody played by the piano and the saxophones have an off-beat onset. In other words, they fall on the "and" of a beat. This has the effect of emphasizing what I call the "sub-beat layer," that is, the eighth-note layer, the layer at which swing subdivision is in effect. The syncopation emphasizes the swing.

At this point in the performance we do not yet see interplay or influence between the musicians because the parts are clearly planned out. This is not to say that every single note is prescribed; as I mentioned, there is a small amount of variety in the bass line, for example. Nevertheless, whatever improvisation is present is tightly restrained.

The vamp from the introduction returns in later sections of the performance, which has the effect of strongly re-establishing a normal-time feel. This effect occurs despite the fact that the trumpet, which was silent during the introduction, plays rhythms in the vamps that do not at all match those of the other instruments. The situation is similar to that of the final chorus in the 1956 Louis Armstrong performance of "Lazy River" (see Figure 4.3): with all the other instruments playing normal-time swing rhythms, the soloist can play almost anything without disturbing the time feel. In addition, the trumpet lines in the vamp almost always build to a strong arrival on the downbeat of a measure, and it is those points of rhythmic alignment with the other instruments that Morgan seems to emphasize most. There is a distinct lack of syncopation or otherwise accented offbeats. The trumpet produces only mild rhythmic dissonance in the vamps.

First chorus, third A section: First hints of double-time feel. The third A section of the first chorus is where we first hear rhythms that suggest double-time feel (see Figure 4.9). This is section of the piece from which the example in Chapter I was taken. The first hint of double time is in the very first measure of the figure, m. 35. In that measure alone, there are four instances of sixteenth-note syncopation in the piano part, and the sixteenths notes are swing sixteenths, per my notational conventions. That one measure of syncopated swing sixteenths in the piano part suggests double time as strongly as any measure in the Armstrong performances.

Figure 4.9: Lee Morgan performance of "Ill Wind," mm. 35-41, with annotations describing changes in time feel within each instrument's part

What are the other instruments doing at the same time? The trumpet is playing a single held note, a whole note, which is as neutral with respect to time feel as it is possible to be without dropping out entirely. The bass is playing a dotted-quarter-plus-eighth rhythm using straight eighth notes, just slightly away from neutral in my chart (Figure 3.3). The drums are playing a classic swing pattern with swing eighth notes, which may seem surprising. After all, in discussing the final chorus of Armstrong's 1956 performance of "Lazy River," I claimed that, because there was a strong normal-time feel in the rhythm section, nothing the soloist (Armstrong) could do would create a double-time feel. The difference here, I think, is that the normal-time feel in the drums is not a *strong* normal-time feel—not when dynamics are taken into account. The drummer, Billy Higgins, is using the brushes gently on the snare drum, and the off-beat eighth notes in the drum part are extremely quiet, so quiet that they are easy to ignore. In other words, Higgins might as well be playing quarter notes (unless the listener is focusing attention specifically on the drums). In that case, the drums and the trumpet are neutral, and the bass "leans" toward double time very subtly. This leaves the piano free to go all-out with its double-time feel.

In the second measure of the excerpt, m. 36, the trumpet picks up the rhythm that the piano just played. The first half of the measure has an identical rhythm to the piano a measure earlier. Meanwhile, the piano is now nearly neutral, with just one off-beat attack on the straight-eighth "and" of beat three, the bass is completely neutral, with a half notes and two quarter notes, and the drums continue their quiet "might as well be quarter notes" rhythm. Measure 37 marks the transition from this very brief suggestion of double time toward normal time. On the first beat of the measure, the trumpet plays a swing sixteenth followed by a dotted eighth, a syncopated rhythm, and then on beat two the piano plays four sixteenth notes with the last sixteenth note tied to the next beat, another syncopated rhythm. On the next two beats in the piano part, while all the other parts are neutral, the piano makes use a note value that may not at first seem to be included in my chart: sixteenth note sextuplets. That note value does appear at the bottom of my chart, but there it is grouped into triplets. One could also position this rhythm just off the top of my chart, provided the notes were grouped into twos and therefore sounded like a subdivision of eighth-note triplets. In a swing rhythm context, however, subdivision beyond the triplet level is unusual and can potentially undermine the swing feel. The pattern of accents within a sixteenth-note sextuplet might suggest straight eighth notes, for example, or triplet eighth notes offset by one sixteenth note. In this particular case, Hancock's accents within the sixteenth-note sextuplet do all fall on triplet eighth notes. This makes the pattern metrically consonant with eighth-note swing even as its "excessive" subdivision prevents it from solidifying a swing feel.

In the following measures, the transition to a normal-time feel continues. The piano and bass both use swing-eighth-based rhythms in the first half of m. 37. The trumpet does use one straight eighth note in the same measure, but in context it merely draws attention to the trumpet part without disturbing the overall time feel. Beat four of m. 38 gives us an eighth-note triplet in the trumpet part, and the first three beats of m. 39 all have eighth-note triplet rhythms, first in the trumpet, then in the piano and bass, firmly establishing normal time.

Second chorus, first A section: Fast notes without double-time feel. In the first A section of the second chorus (see Figure 4.10), the piano plays many rapid scale and arpeggio figures without suggesting any change in tempo. Most of these rhythms, such as the septuplets in m. 49, the trill-like figure in m. 50 and the thirty-second notes in m. 54, do not fit into the spectrum of Figure 3.3. Like the straight sixteenth notes in Figure 3.3, they are dissonant with both normal-time swing and double-time swing, and therefore have a neutral effect on time feel. There are some swing sixteenths in m. 51, but they are not syncopated, and they are played with a very relaxed, "behind the beat" feel, so they do not strongly suggest a double-time feel. Measure 52 alternates rhythms consonant with normal-time swing (beats one and three) and with double-time swing (beats two and four), with no particular rhythm lasting long enough to establish a time feel.

The most surprising measure in terms of its lack of effect is m. 53, which is almost completely filled with swing sixteenth notes that are not delayed like those in m. 51. What prevents these sixteenth notes from establishing a strong double-time feel, I think, is the same factor that worked against Armstrong's solo in mm. 37-38 of the 1931 "Lazy River" performance (see Figure 4.6). The fact that each pair of consecutive sixteenth notes is the same pitch works to de-emphasize the second sixteenth note of each pair—the same sixteenth notes that would have been emphasized by syncopation. The effect is almost the same as a run of straight eighth notes, which have only a weak effect on time feel.

Second chorus, second A section: Double-time feel as contagious. The second A section of the second chorus is where we as listeners finally get a sustained feeling of double time (see Figure 4.11). It is initiated by the pianist (Herbie Hancock) with the rhythm that he plays in m. 59 and repeats in m. 60. Even before he repeats the rhythm, the bassist is already responding by playing a rhythm that also uses swing sixteenth notes and syncopation.

Figure 4.10: Lee Morgan performance of “Ill Wind,” mm. 49-54.

Figure 4.11: Lee Morgan performance of "Ill Wind," mm. 59-64, with annotations describing changes in time feel within each instrument's part.

As I hear the figure Hancock plays in m. 59, the combination of rhythm and contour emphasizes the first and last note of each group of four. In other words, the metric positions that receive an accent are the downbeat, the fourth swing sixteenth note of beat one, the third swing sixteenth note (or, equivalently, the second straight eighth note) of beat two, and the second swing sixteenth note of beat three. The syncopation and the repetition of the same four-note “cell” displaced by a straight eighth note make this rhythm highly salient. It is no wonder that bassist Larry Ridley responds—his rhythm on beat four of the measure is the same as Hancock’s on beat three—and that Hancock repeats the rhythm in the following measure (m. 60).

In m. 61, Hancock at first plays an eighth-note triplet, suggesting that he is returning to a normal-time feel. Perhaps this is why Ridley sticks to a neutral bass line rhythm or pure quarter notes, leaving Hancock free to mix time feels as he pleases. Throughout this passage, Billy Higgins’ drum pattern is the same very quiet eighth-note swing that we saw, for example, in Figure 1.3. So there is direct dissonance, but it is so quiet that the listener would not notice it without specifically listening for it.

In the last measure of the excerpt, m. 64, the drums finally begin to follow Hancock’s lead and play a few swing sixteenth-note rhythms, which leads smoothly into the B section.

Second chorus, B section: Solid double-time feel. In the B section of the second chorus, most of which is shown in Figure 4.12, the drums finally begin to participate in double-time feel. Drummer Billy Higgins not only begins to use rhythms based on swing sixteenths, but also syncopates (e.g., m. 65), emphasizes off-beat metrical positions, and plays triplet sixteenth notes (m. 67). The bass and drums also play swing-sixteenth-based rhythms in this section, and with all the instruments “on the same page” in this way, the double-time feel is stronger or more solid than at any earlier point in the performance.

Figure 4.12: Lee Morgan performance of “Ill Wind,” mm. 65-68.

Summary. The preceding excerpts from Lee Morgan’s performance of “Ill Wind” (Figures 1.3 and 4.8-4.11) show clearly how time feel can vary from strong normal time to weak normal time to ambiguous to weak double to strong double. They also show how quickly such shifts can occur and how even a single instrument within a small ensemble can suggest a double-time feel to the listener.

Although my analysis did not cover every section of the performance in detail, Table 4.1 shows how my model allows us to trace the use of double time across a performance. Morgan establishes a strong normal-time feel in the introduction, maintains normal time in most of the first chorus, briefly hints at double time in the third A section (apparently prompted by Hancock), and then quickly returns to a strong normal-time feel using the vamp from the introduction. In the second chorus, Hancock takes us from an A section with whirling rhythms but relatively static time feel, to a second A section where he and Ridley give us a taste of double time (almost as in the third A section of the first chorus), and finally, in the B section, pianist, bassist, and drummer are all supporting a solid double-time feel. The rhythmic excitement reaches a peak in the third chorus's first two A sections, where Morgan returns to his soloist role, and then the time feel gradually works its way back through the spectrum to a solid normal-time feel and the return of the vamp. Following how the time feel traces this sort of arc across the piece would not be possible without a model that allows for degrees of time feel.

CHAPTER V

CONCLUSION

Summary

The available literature on double-time feel does not adequately explain how a musical performance can create the impression of an increase in tempo. Drawing on Krebs' (1999) concept of metrical dissonance, specifically grouping dissonance, I have argued that swing as a rhythmic norm creates implicit dissonance when swing rhythm occurs at twice its original speed, and that this dissonance makes a "halving [of] the prevailing note value" (*Grove*) more likely to create a double-time feel than it would otherwise be. I have hypothesized that the strength with which a rhythm supports or undermines a double-time feel can be predicted by the extent to which the rhythm is metrically consonant or dissonant with double-time swing, and I have also observed that syncopated rhythms are likely to have a stronger effect.

Using this model of double-time feel, I have analyzed two performances by Louis Armstrong of "Lazy River" and one performance by Lee Morgan of "Ill Wind." The "Lazy River" analyses show that Armstrong creates a stronger contrast between normal-time feel and double-time feel in the 1956 performance than in the 1931 performance, due to specific interpretive changes such as having the rhythm section play straight eighths in the A section of the third chorus (mm. 37-42), having the rhythm section play a swing pattern in the fourth chorus (mm. 59-64 and 67-74), making a greater use of sixteenth-note syncopation in the breaks, and using normal-time swing rhythms more consistently in the measures surrounding the breaks. There are four clues to the listener that double time is in effect—straight eighths, sixteenths, syncopation at the sixteenth-note level, and swing at the sixteenth-note level—and I have examined how these clues function in two performances by Louis Armstrong of "Lazy River." I have discussed how double time can be used to articulate form through the use of double-time breaks to emphasize sectional divisions, and I have shown how Armstrong's 1956 performance creates stronger rhythmic contrasts than the 1931 performance, possibly as a result of conscious intent to emphasize those contrasts.

My analysis of Lee Morgan's "Ill Wind" shows the strengths of a model that allows for degrees of double time. The Morgan performance includes many examples of subtle and quick changes in time feel, including some cases where Hancock plays a piano figure suggesting double time and influences one or more of the other musicians to do the same. The "Ill Wind" analysis also shows how the model lets us trace an arch form created by the changes in time feel across the length of the performance.

Future Work

There are many opportunities for further research on the use of double time in jazz. From a music-theoretical perspective, there are a great deal more performances that could be analyzed. (I have received many suggestions that I had to set aside in order to sufficiently narrow my thesis material.) One possible direction would be to focus on performances from the early decades of jazz, following Collier & Collier (1994). Another would be to look at later performances by artists such as Miles Davis, or perhaps even contemporary jazz artists such as Fred Hersch. A third direction would be to focus on styles of jazz that may challenge the model, such as the Bebop recordings of Charlie Parker in which swing tends to have a low BUR.

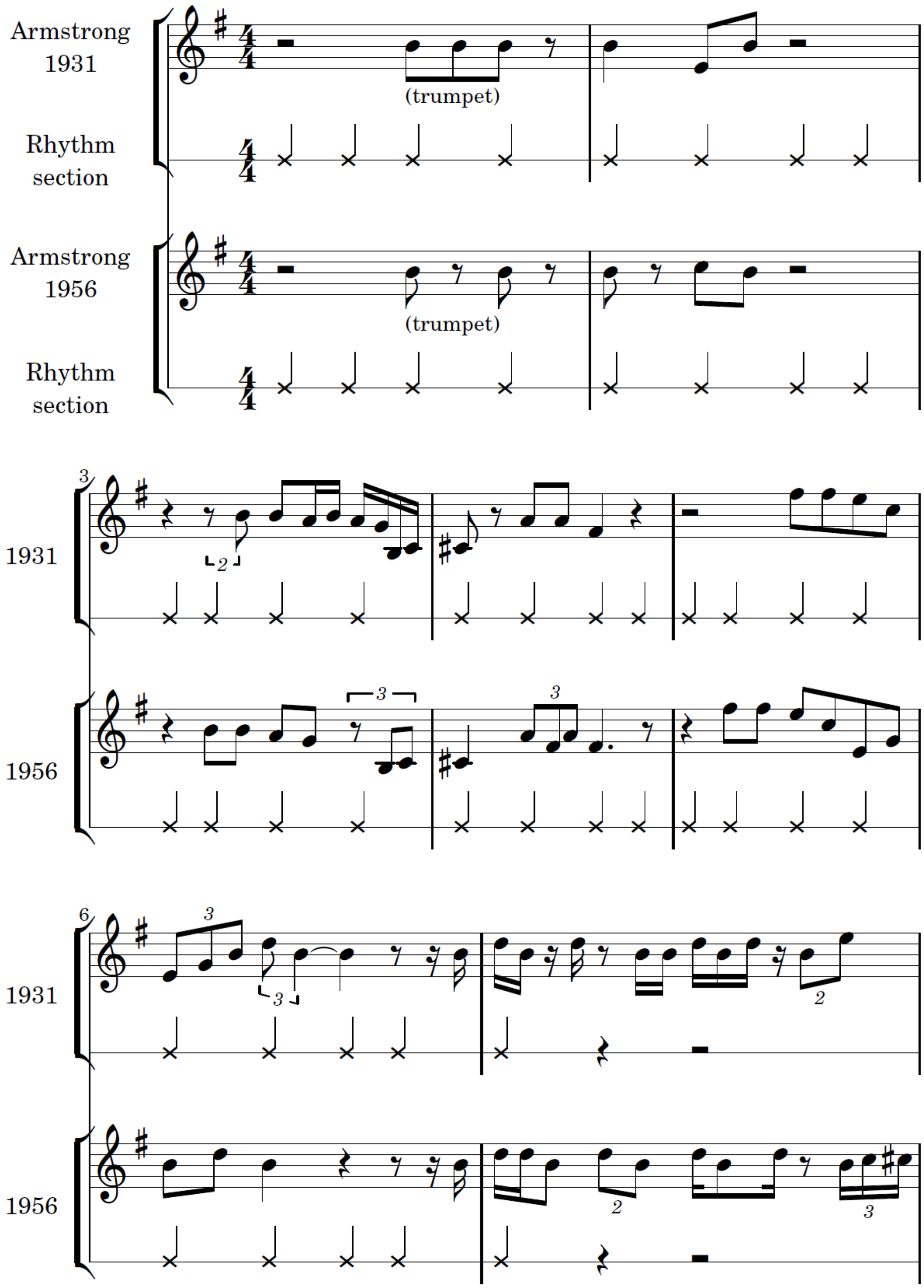
From a perception-cognition perspective, there is very little empirical research on double time available. It seems to me that the first idea to test would be that swing rhythm reinforces perception of the beat. Only then would it make sense to test my model in detail. The existing literature on tempo perception follows two main experimental paradigms, tapping and direct comparison of stimuli, and recent authors have shown that both of these paradigms have value. I wonder if there may also be room for a new type of experiment, specifically focused on double-time feel, where subjects control a dial that they turn to show how strong a normal-time or double-time feel they are experiencing. Such an experimental design may be vulnerable to accusations of bias, but to me, even questions such as whether subjects would control such a dial in a consistent, repeatable way are interesting.

My hope is that this thesis can serve as a basis both for further theoretical work and for testable empirical models of double-time feel.

APPENDIX

PARALLEL TRANSCRIPTIONS OF LOUIS ARMSTRONG'S

1931 AND 1956 PERFORMANCES OF "LAZY RIVER"




1931
1956
Oh,
up la - zy river where th'
Oh,
up the la-zy river where the
old mill run.
Meet the la - zy riv - er with
old mill-run,
up the la - zy riv-er


22
1931
the noon day sun.
Linger in the shade
1956
with the noon day sun,
ling'rin' in the shade of a
24
1931
of a kind old tree.
Throw a way your trou - ble, dream a dream
1956
kind old tree,
throw a-way your troubles, dream a
26
1931
of me, dream a dream of me.
Up the la - zy riv-
1956
dream of me, dream a dream of me.
Up the la-zy riv-er where the

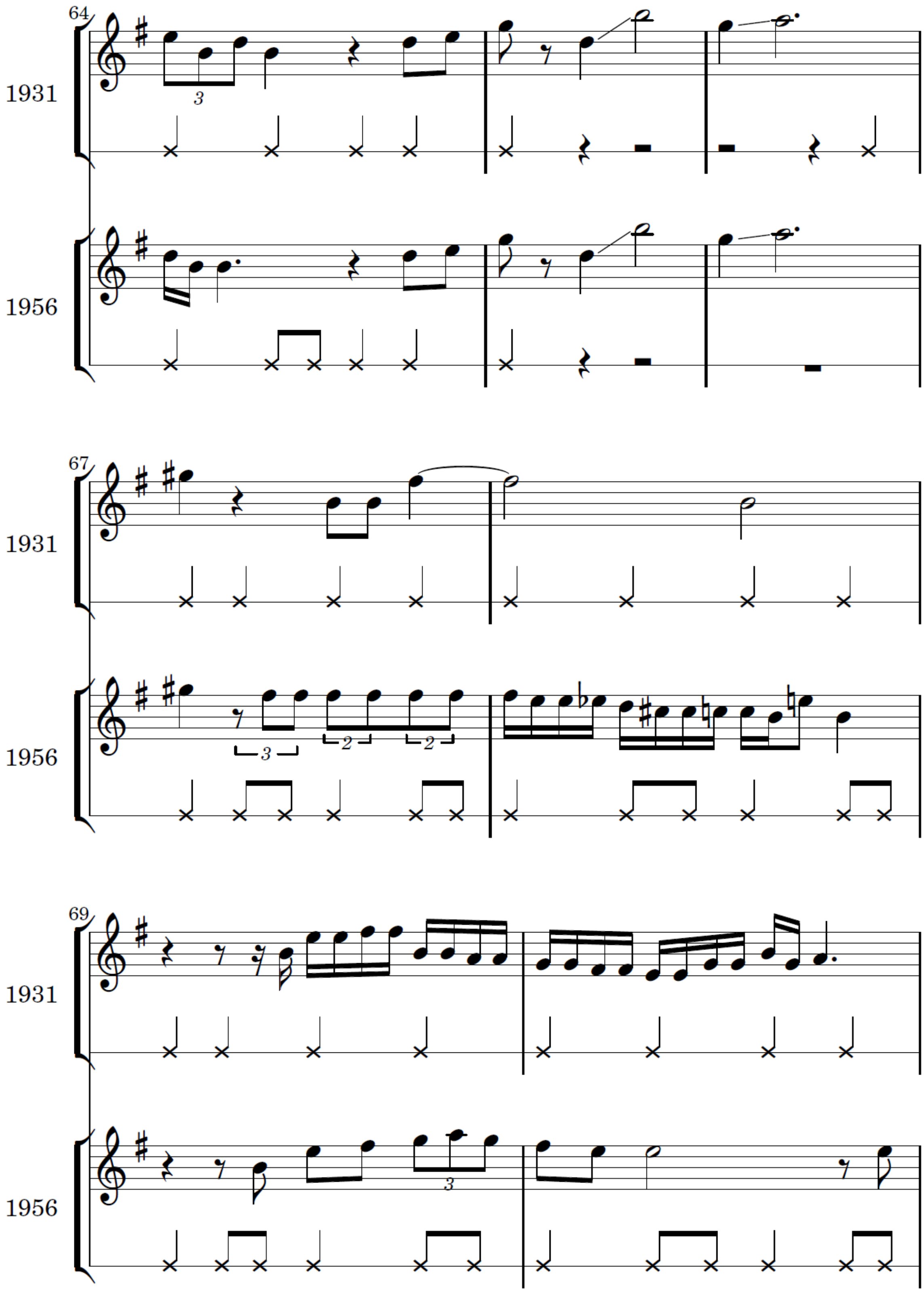

28
1931
er where the robin's song
wakes to bright new morning
1956
rob-in's song
Two bright lights
30
1931
as we loaf a-long.
Blue skies up a-bove.
1956
as we stroll a - long.
Blue skies up a - bove,
32
1931
Ev-'ry-one in love.
Up the la - zy riv-er,
1956
mmm, the one I love,
up the la - zy riv - er,


34
1931
how hap - py we will be,
ma - ma, ma - ma.
1956
how hap py we will be,
ma - ma, yes.
36
1931
Oh,
up the la-zy riv-er (scat)
1956
Yes,
up the la - zy riv - er (scat)
38
1931
1956


40
1931
1956
42
1931
1956
44
1931
1956
Yes,
yes.


46
1931
1956
Yes, yes, yes, yes.
49
1931
Up the la - zy riv-er, mmm, riv-er,
1956
Up the la - zy riv-er, oh, you riv-er,
51
1931
oh, you riv-er, oh, you dog, oh, you riv-er.
1956
mmm, you riv-er, oh, you dog, riv-er.


53
1931
1956
4
4
59
(trumpet)
1931
1956
(trumpet)
62
1931
1956


64
1931
1956
67
1931
1956
69
1931
1956


71
1931
1956
73
1931
1956
75
1931
1956

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