

The purpose of this study was to investigate relationships among various aspects of vocal jazz improvisation achievement and several predictor variables. Subjects included 101 college students enrolled in vocal jazz courses. The aspects of vocal jazz improvisation achievement that were measured included 18 tonal, rhythmic, and expressive items. Subjects performed two vocal jazz improvisation tasks, a blues and a *ti-V-I* progression. The independent variables included jazz theory knowledge, imitative ability, jazz experience, instrumental lessons, voice lessons, gender, and general creativity.

The major findings of this study were as follows: (a) the best order of predictors of the blues task was jazz theory knowledge, jazz experience, and imitative ability; (b) the best order of predictors of the *ti-V-I* task was imitative ability, jazz theory knowledge, and jazz experience; (c) the best order of predictors of the composite improvisation tasks were jazz theory knowledge, imitative ability, and jazz experience; and (d) instrumental lessons, voice lessons, gender, and general creativity were not found to be significant predictors of vocal jazz improvisation achievement.

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Relationships among Vocal Jazz Improvisation Achievement, Jazz Theory Knowledge, Imitative Ability, Musical Experience, Creativity, and Gender

Improvisation is considered by many to be the essence of jazz (e.g., Aitken, 1980; Baker, 1988; Baraka, 1990). Coker (1978) explained: "The most important characteristic of jazz... is improvisation. Virtually every jazz selection will focus on improvisation, even when many other characteristics remain optional.... Jazz continues to develop... and

This article is based on the author's doctoral dissertation, "Relationships among Vocal Jazz Improvisation Achievement, Jazz Theory Knowledge, Imitative Ability, Previous Musical Experience, General Creativity, and Gender," accepted in 1992 by Indiana University, Bloomington. Patrice D. Madura can be contacted at 13952 Bora Bora Way, #223F, Marina del Rey, CA 90292. Copyright © 1996 by Music Educators National Conference.

change with great rapidity, but improvisation... remains reasonably constant throughout its history of development from folk music to art music" (p. 4).

Although improvisation is expected in instrumental jazz ensembles, many vocal jazz ensembles feature little or no skilled improvisation. Aitken and Aebersold (1983) cited the following problem areas of vocal jazz improvisation that particularly need attention by jazz educators: (a) the ability of singers to hear and comprehend the harmonic changes and to utilize the correct scales and chords, (b) the study and knowledge of well-known instrumental and vocal jazz soloists and their music, and (c) the use of scat syllables resulting in appropriate jazz style. Coker and Baker (1981) added the following: (a) an awareness of the potential of chromaticism, (b) a vocabulary of jazz patterns, and (c) the use of continuous eighth-note melodies resulting in appropriate rhythmic style.

Research into the nature of the vocal jazz improvisation process and the factors that influence achievement in improvisation is needed to help develop teaching techniques that can enable singers to become proficient in jazz improvisation. To date, we can only speculate on these issues, based on a good deal of anecdotal information and little empirical evidence.

Even though research in jazz improvisation achievement is growing, it has been concerned primarily with the instrumentalist. Research in instrumental jazz improvisation achievement has covered such topics as measurement and evaluation (e.g., Burnsed & Price, 1984; Pfenninger, 1990; Schilling, 1987), and predictors, including music achievement scores (e.g., Bash, 1984; McDaniel, 1974), music aptitude scores (e.g., Bash, 1984; Briscuso, 1972), gender (e.g., Bash, 1984; Hores, 1977; Olson, 1987), handedness (e.g., Olson, 1987), and music background (e.g., Hores, 1977; Madura, 1981; Shaw, 1979). It seems that only one investigation of vocal jazz improvisation achievement exists: Madura (1991) examined relationships between vocal jazz achievement and imitative ability, music theory knowledge, and previous musical experiences.

The independent variables in this study were selected based on results of jazz and nonjazz improvisation achievement research, as well as anecdotal information provided by professional jazz improvisers. These independent variables include jazz theory knowledge (Madura, 1991; McDaniel, 1974), imitative ability (Madura, 1991; Shaw, 1979), jazz experience (Madura, 1991; McDaniel, 1974; Shaw, 1979), instrumental lessons (Berendt, 1982; Madura, 1991), gender (Bash, 1984; Hores, 1977; Olson, 1987), and general creativity (Madura, 1991; Webster, 1979). The purpose of the present study was to explore these independent variables, with the additional variable previous voice lessons, as predictors of achievement in vocal jazz improvisation.

METHOD

The sample for the study comprised 101 subjects enrolled in seven

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universities or colleges located in the West ($n = 48$), East ($n = 16$), and Midwest ($n = 37$). Criteria for inclusion in the study consisted of the subjects' enrollment in a collegiate vocal jazz ensemble ($n = 91$) or solo jazz singing class ($n = 10$) in which substantial instruction in jazz improvisation was given. The sample included 96 undergraduate students and 5 graduate students; 85 were music majors and 16 were nonmusic majors. Subjects' ages ranged from 18 to 39, with a mean of 22. Sixty females and 41 males participated. The data collection took place over a period of 5 weeks in the fall of 1991.

Vocal jazz improvisation achievement was measured by a researcher-constructed instrument that was developed and refined as a result of pilot testing (Madura, 1991). It consisted of three main dimensions of jazz improvisation, suggested by Pfeminger (1990) to be relatively discrete.

The three dimensions were then divided into 18 items. The 18 items and their definitions were taken from the jazz adjudication measure in *Jazz Pedagogy* (1989) by David N. Baker. Evidence of Baker's pedagogical expertise was identified by Moorman (1984) and Kuzmich (1980).

The three dimensions and 18 items were the following: (a) tonal (correct notes, appropriate tonal language, variety, originality, motivic development, unity, and intonation); (b) rhythm (rhythmic feel, appropriate rhythmic figures, variety, originality, motivic development, and unity); and (c) expression (appropriate scat syllables, appropriate sound, variety of sound, variety of range, and variety of dynamics).

Subjects were instructed to improvise for 1 minute to a blues and for 1 minute to a ii-V7-I progression while they were accompanied by a recorded rhythm section (Aebetsold, 1967). The progressions were selected because they are the two most widely used chord progressions in jazz (Coker, 1978; Moorman, 1984). The Aebetsold recordings were selected because they are widely used by jazz educators for the development of improvisation skills (Paulson, 1983). The improvisations were tape-recorded.

Improvisation evaluations were made by three judges. Two judges were doctoral students who had recently completed master's degrees in jazz studies; the other was the researcher. After an extensive training session, the judges listened to all improvisations three times—once for the tonal items, once for the rhythm items, and once for the expression items. A 5-point rating scale was used for each item, ranging from 1 (very poor) to 5 (excellent).

Cronbach's alpha was computed to assess interrater reliability for each item, dimension, task, and composite improvisation (see Table 1). Intertjudge reliabilities for items ranged from a low of .63 for dynamic variety to a high of .89 for correct tones. Dimension reliabilities ranged from .84 for expression to .88 for tonal. The composite improvisation interjudge reliability was .88 for the blues task, and .89 for the ii-V7-I task. Intertjudge reliability for the composite improvisation measure was .90.

Generally, interjudge reliabilities were acceptable. However, reliability for appropriate sound quality was modest, which suggests that cau-

tion is needed in the interpretation of results regarding sound. The lack of strong interjudge agreement may be due to the fact that two of the judges were primarily instrumental jazz musicians who may have had limited exposure to the variety of tone qualities used by jazz singers. Other modest interjudge reliabilities were found in the areas of rhythmic feel, rhythmic unity, and dynamic variety in the blues.

Measures of the predictor variables are detailed below.

1. *Imitative ability.* Ten melodies were chosen from Baker's (1988) first set of ear-training exercises. The tape-recorded melodies were played on the piano by Baker. The duration of each melody was eight beats, followed by eight beats of silence during which the subjects imitated the melodies. The singers were instructed to imitate the melody in any octave that was comfortable, using any syllable. The imitation task was tape-recorded. The imitation test involved the evaluation of both pitch and rhythmic accuracy. Judges evaluated pitch accuracy on one hearing and rhythmic accuracy on a second hearing to produce a composite score for imitation. Rating scales were used to indicate a range of totally inaccurate (1) to totally accurate (5) for each of the ten melodies. Interrater reliability was computed using Cronbach's alpha and was found to be very high (.96) for imitative ability.

2. *Jazz theory knowledge.* A researcher-constructed measure was developed based on sample exam items used in jazz improvisation classes at a major Midwestern university. The test was designed to measure both written and aural knowledge of jazz chord and scale types. To establish content validity of the measure, the specific items tested were based on a survey sent to all of the directors whose students participated in this study. These directors indicated which information was taught to their students, and based on the responses, a balanced sample of difficult and moderately easy items was selected. The resulting jazz theory measure consisted of 25 multiple-choice items that required the subject to identify jazz chords (i.e., major, minor, dominant, diminished, and augmented, including extensions), scales (i.e., major, Dorian, Mixolydian, blues, diminished, Locrian, pentatonic, and whole tone), and their relationships. Based on the directors' responses, which indicated that most of the information was conveyed aurally, the measure was divided into 15 aural items and 10 written items. The aural examples were previously tape-recorded and included chords and scales played on the piano by the researcher. Due to the moderately small number of testing items on the jazz theory measure ($n = 25$), the Spearman-Brown split-halves reliability formula was computed for the jazz theory measure, and reliability was high (.88).

3. *Jazz experience.* A researcher-constructed questionnaire was used to assess the extent of subjects' previous jazz experience. The following data were collected by means of rating scales in which subjects indicated frequency or degree of the experiences: (a) jazz improvisation lessons, (b) jazz improvisation practice, (c) vocal jazz ensemble experience, (d) vocal jazz listening, (e) instrumental jazz listening, (f) jazz recordings owned, (g) jazz performances attended, (h) time interested in jazz, (i) jazz heard in the home as a child, (j) assessment of parents'

Table 1
Interrater Reliability for Improvisation Items, Dimensions, Tasks, and Composites (N = 101)

Variable	Interrater reliability
<i>Blues task</i>	
Correct tones	.84
Tonal language	.83
Tonal variety	.77
Tonal originality	.77
Tonal motivic development	.74
Tonal unity	.73
Intonation	.78
Rhythmic feel	.65
Rhythmic figures	.73
Rhythmic variety	.82
Rhythmic originality	.80
Rhythmic motivic development	.76
Rhythmic unity	.68
Scat syllables	.73
Sound	.66
Variety of sound	.71
Variety of range	.81
Variety of dynamics	.63
Combined tonal items	.85
Combined rhythmic items	.82
Combined expressive items	.80
Composite blues	.88
<i>ii-V7-I task</i>	
Correct tones	.89
Tonal language	.85
Tonal variety	.74
Tonal originality	.75
Tonal motivic development	.80
Tonal unity	.76
Intonation	.73
Rhythmic feel	.73
Rhythmic figures	.78
Rhythmic variety	.81
Rhythmic originality	.78
Rhythmic motivic development	.75
Rhythmic unity	.77
Scat syllables	.74
Sound	.67
Variety of sound	.76
Variety of range	.77
Variety of dynamics	.75
Combined tonal items	.87
Combined rhythmic items	.84
Combined expressive items	.83
Composite ii-V7-I	.89

Table 1 continues on next page.

Table 1, concluded
Interrater Reliability for Improvisation Items, Dimensions, Tasks, and Composites (N = 101)

Variable	Interrater reliability
<i>Composite dimensions</i>	
Tonal	.88
Rhythmic	.85
Expressive	.84
Total improvisation	.90

attitude toward jazz, and (k) use of aural feedback as a method of practice. A composite jazz experience variable was created from a summation of individual z-scores for each item. Gender and previous instrumental and voice lessons were also assessed.

4. *General creativity.* The Torrance Tests of Creative Thinking (TTCT)—Verbal Form A (1990) were used to measure general creativity. Trained scorers from the Scholastic Testing Service scored the tests. Torrance (1990) reports test-retest reliabilities of .60 through .80. An extensive section dealing with validity is included in the TTCT manual.

The TTCT was used to measure creative fluency, flexibility, and originality. Fluency is defined as the total number of relevant responses; flexibility is defined as the number of different responses given, or variety or shifts in content; and originality is defined as a rare or uncommon response to a specific task. In this study, fluency, flexibility, and originality were fairly highly intercorrelated, with results ranging from $r = .83$ between originality and flexibility to $r = .88$ between fluency and flexibility. Torrance (1990) suggests using the average standard score as the best overall indicator of creative strength. Therefore, a creativity variable was created from a composite of the z-scores for the fluency, flexibility, and originality tests.

The musical background questionnaires were sent to the directors to distribute to the students prior to the researcher's arrival. When the researcher arrived at each school site, the entire group of subjects from that school was administered the TTCT and the jazz theory test, which required approximately 1.5 hours. Each individual then met privately with the researcher for approximately 10 minutes to sing the imitation and improvisation tasks, both of which were tape-recorded for subsequent evaluation. Each subject's identification number was recorded prior to the singing tasks.

RESULTS

After descriptive statistics were determined for all variables in the study, Pearson correlations were computed to determine the relation-

Table 2
Pearson Correlations among Independent Variables (N = 101)

	Imitative	Theory	Jazzexp	Gender	TTCT score	Instrument
Theory	.33					
Jazzexp	.18	.31				
Gender	-.14	-.03	.15			
TTCT score	.22	.18	.03	-.11		
Instrument	.27	.44	.14	-.01	.14	
Voice	-.03	.03	.02	-.42	.11	.02

Note. Imitate = imitative ability; Theory = jazz theory knowledge; Jazzexp = jazz experience; TTCT = Torrance Tests of Creative Thinking (creativity score); Instrument = instrumental lessons; Voice = voice lessons. All correlation coefficients above .20 are significant beyond the .05 level; all correlation coefficients above .26 are significant beyond the .01 level; all correlation coefficients above .32 are significant beyond the .001 level.

ships among the dependent and independent variables, as well as between the blues and ii-V7-I tasks. Additionally, multiple stepwise regression analyses were used to examine the predictor variables for separate and combined improvisation tasks.

Table 2 shows Pearson correlations among all of the independent variables. The independent variables were found to be relatively discrete, although a moderate correlation was identified between jazz theory knowledge and instrumental lessons ($r = .44$). Gender was negatively correlated with voice lessons ($r = -.42, p < .001$). The negative correlation in this case indicates a positive relationship between the female gender and greater number of years of voice lessons.

Intercorrelations among the 18 improvisation items based upon the composite of the blues and ii-V7-I tasks are shown in Table 3. Most of the correlations were significant at the .001 level. Correlations among the composite tonal, rhythmic, and expressive dimensions also indicated strong relationships, all significant at the .001 level. The correlation between the tonal and rhythmic dimensions was .79, the correlation between the tonal and expressive dimensions was .82, and the correlation between the rhythmic and expressive dimensions was .76. The strength of these intercorrelations suggests that vocal jazz improvisation skill may be composed of related, not discrete, musical abilities. These findings differ from Pfenninger's (1990) results, which suggest that the tonal, rhythmic, and expressive dimensions of jazz improvisation are relatively discrete.

Table 4 presents Pearson correlations between the independent variables and the 18 items of vocal jazz improvisation. Imitative ability, jazz theory knowledge, and jazz experience all demonstrated strong correlations with the tonal items. The significant relationships between instrumental lessons and the tonal items demonstrated little practical significance. Nonsignificant relationships were also identified between

Table 3
Pearson Correlations among Improvisation Variables (N = 101)

Tonal	Correct	Language	Variety	Origin	Develop	Unity	Inton
<i>Tonal</i>							
Language	.80						
Variety	.57	.82					
Origin	.64	.92	.95				
Develop	.70	.90	.84	.90			
Unity	.75	.93	.88	.91	.90		
Inton	.87	.67	.45	.53	.62	.66	
<i>Rhythmic</i>							
Feel	.48	.71	.68	.66	.63	.68	.39
Figures	.42	.74	.76	.72	.69	.72	.32
Variety	.39	.72	.82	.78	.69	.73	.29
Origin	.42	.74	.82	.80	.72	.76	.32
Develop	.43	.73	.75	.76	.78	.76	.37
Unity	.49	.78	.82	.80	.76	.77	.41
<i>Expressive</i>							
Syllable	.58	.80	.76	.77	.71	.76	.53
Sound	.63	.75	.66	.69	.69	.75	.67
Varysound	.42	.58	.62	.62	.57	.62	.40
Range	.28	.46	.56	.54	.50	.54	.21
Dynamics	.32	.45	.51	.51	.50	.49	.25
<i>Rhythmic</i>							
Feel		Figures	Variety	Origin	Develop	Unity	
<i>Rhythmic</i>							
Figures	.88						
Variety	.74	.83					
Origin	.77	.84	.97				
Develop	.81	.84	.87	.90			
Unity	.86	.90	.89	.90	.91		
<i>Expressive</i>							
Syllable	.80	.78	.76	.77	.73	.82	
Sound	.68	.63	.60	.61	.63	.69	
Varysound	.48	.50	.63	.66	.57	.57	
Range	.43	.49	.61	.58	.57	.54	
Dynamics	.38	.44	.61	.57	.55	.53	
<i>Expressive</i>							
Syllable		Sound	Varysound	Range			
Sound	.84						
Varysound	.66	.66					
Range	.48	.47	.68				
Dynamics	.48	.48	.74	.74	.73		

Table 3 continues on next page

Table 3, continued
Pearson Correlations among Improvisation Variables (N = 101)

	Tonal Composite	Rhythmic Composite
Rhythmic Composite	.79	
Expressive Composite	.82	.76

Note: Correct = correct note choices; Language = stylistically appropriate tonal materials; Origin = originality; Develop = motivic development; Inton = intonation; Figures = stylistically appropriate figures; Syllable = stylistically appropriate scat syllables; Sound = stylistically appropriate tone quality; Varsound = variety of timbre; Range = variety of range; Dynamics = variety of dynamics. All correlation coefficients above .20 are significant beyond the .05 level; all correlation coefficients above .26 are significant beyond the .01 level; all correlation coefficients above .32 are significant beyond the .001 level.

the tonal aspects of vocal jazz improvisation achievement and creativity score, gender, and voice lessons.

It can be seen that the same variables that were associated with tonal improvisation were significant with the rhythmic dimension. Jazz theory knowledge had the strongest correlation with the rhythmic items, indicating at least 25% shared variance between jazz theory knowledge and rhythmic improvisation achievement. Previous instrumental lessons also demonstrated significant correlations with the rhythmic items. However, there were no significant relationships for creativity score, gender, or voice lessons.

Among the expressive improvisation items, the strongest correlation was identified between jazz theory knowledge and stylistically appropriate scat syllables. Instrumental lessons were correlated with variety of timbre and variety of range, and voice lessons were correlated with stylistically appropriate scat syllables, stylistically appropriate sound, and variety of timbre, but the practical significances were modest. No significant relationships were identified between the expressive dimension of vocal jazz improvisation achievement and creativity score or gender.

In order to examine relationships between aspects of the blues and ii-V7-I improvisation performances, Pearson correlations were computed for each item, as well as for the composite tonal, rhythm, and expression dimensions (see Table 5). All correlations were significant at the .001 level and ranged from .57 for variety of range to .92 for variety of dynamics. Most of the correlations were relatively strong, which suggests that the individual aspects of performance in improvisation were related between the blues and ii-V7-I tasks. Particularly strong correlations between tasks were found for stylistically appropriate sound (.90), tonal originality (.86), stylistically appropriate scat syllable (.86), rhythmic originality (.81), stylistically appropriate language (.81), and rhythmic unity (.80).

The composite correlations for the dimensions of tone (.82), rhythm

Table 4
Correlations between Independent and Dependent Variables

	Imitate Theory	Jazzexp	TTCT score	Gender	Instrument	Voice
Tonal						
Correct	.42	.22	.18	.20	.01	.02
Language	.50	.43	.40	.19	.00	.18
Variety	.50	.46	.48	.14	-.01	.32
Origin	.49	.46	.47	.16	-.05	.24
Develop	.53	.45	.40	.17	-.01	.21
Unity	.54	.47	.40	.17	-.04	.22
Inton	.40	.16	.09	.12	-.10	-.07
Rhythmic						
Feel	.38	.56	.35	.14	-.06	.24
Figures	.36	.55	.50	.15	.10	.29
Variety	.41	.51	.55	.14	.05	.29
Origin	.43	.51	.40	.14	.04	.28
Develop	.43	.51	.52	.14	.01	.23
Unity	.47	.57	.57	.16	-.06	.27
Expressive						
Syllable	.41	.56	.44	.15	-.04	.19
Sound	.42	.44	.32	.09	-.14	.13
Varsound	.40	.37	.20	.09	-.18	.21
Range	.29	.37	.35	.14	-.05	.32
Dynamics	.23	.36	.25	.18	-.09	.18

Note: Imitate = imitative ability; Theory = jazz theory knowledge; Jazzexp = jazz experience; = Torrance Tests of Creative Thinking; Instrum = instrumental lessons; Voice = voice lessons; Correct = correct note choices; Language = stylistically appropriate language; Origin = originality; Develop = motivic development; Inton = intonation; Figures = stylistically appropriate rhythmic figures; Syllable = stylistically appropriate scat syllables; Sound = stylistically appropriate sound; Varsound = variety of timbre; Range = variety of range; Dynamics = variety of dynamics. All correlation coefficients above .20 are significant beyond the .05 level; all correlation coefficients above .26 are significant beyond the .01 level; all correlation coefficients above .32 are significant beyond the .001 level.

(.84), and expression (.87) were also relatively strong, suggesting that performance on one dimension in the blues was predictive of performance on that same dimension in the ii-V7-I task. The correlation between the composite for all blues scores and all ii-V7-I scores was .88 ($p < .001$). This strong correlation indicates that overall performance on one task was highly predictive of overall performance on the other.

In order to determine whether the composite blues and ii-V7-I improvisation means were significantly different from one another, a paired t-test was performed. Results indicated that there was a statistically significant difference between performance on the blues improvisation task and performance on the ii-V7-I improvisation task ($t = 9.00$, $df = 100$, $p < .001$). The composite means for the two tasks indicate that

Table 5
Pearson Correlations between Blues and *ii-V7-I* Improvisation Items (N = 101)

Variable	r
<i>Tonal</i>	
Correct pitches	.65****
Language	.81****
Variety	.77****
Originality	.86****
Development	.73****
Unity	.77****
In tonation	.80****
<i>Rhythmic</i>	
Feel	.69****
Figures	.78****
Variety	.78****
Originality	.81****
Development	.78****
Unity	.80****
<i>Expressive</i>	
Syllable	.86****
Sound	.90****
Varysound	.75****
Range	.57****
Dynamics	.92****
<i>Composite</i>	
Tonal	.82****
Rhythmic	.84****
Expressive	.87****
<i>Combined Tonal/Rhythmic/Expressive</i>	.88****

Note: Figures = stylistically appropriate rhythmic figures; Syllable = stylistically appropriate scalar syllables; Sound = stylistically appropriate sound; Varysound = variety of timbre; Range = variety of range; Dynamics = variety of dynamics.

*** Significant beyond the .001 level

subjects performed better on the blues task ($M = 21.87$, $SD = 3.99$) than on the *ii-V7-I* task ($M = 20.06$, $SD = 4.16$).

In order to determine the best set of predictors for achievement in the blues task, the *ii-V7-I* task, and the composite of the two vocal jazz improvisation tasks, multiple stepwise regression analyses were computed using the following independent variables: (a) imitative ability (Imitate), (b) jazz theory knowledge (Theory), (c) jazz experience (Jazzexp), (d) instrumental lessons (Instrument), (e) voice lessons (Voice), and (f) general creativity (TTCT). The stepwise method used the statistical criteria of tolerance (0.0001), PIN [Probability of F-

Table 6
Stepwise Multiple Regression for Blues Improvisation Achievement (N = 101)

Variable	Step	MR	R ²	F	df	p
Theory	1	.50	.25	31.55	1, 94	< .0001
Jazzexp	2	.61	.37	27.18	2, 93	< .0001
Imitate	3	.68	.46	26.00	3, 92	< .0001

Note: Theory = jazz theory knowledge; Jazzexp = jazz experience; Imitate = imitative ability.

to-enter] (0.05), and POUT [Probability of F-to-remove] (0.1).

The results of the stepwise regression for the blues task are presented in Table 6. Jazz theory knowledge entered on the first step of the equation as a significant predictor of blues vocal jazz improvisation achievement and accounted for 25% of the variance. Jazz experience entered second, accounting for an additional 12%, and imitative ability entered third, accounting for an additional 9%. These predictors together accounted for a total of 46% of the variance of blues improvisation. Instrumental lessons, voice lessons, and creativity score did not enter the equation.

Table 7 shows the results of the stepwise multiple regression for the *ii-V7-I* improvisation task. Unlike the results found for the blues task, imitative ability entered first, accounting for 26% of the variance. Jazz theory knowledge entered second, accounting for an additional 14%, and jazz experience entered third, accounting for an additional 7%. The three variables accounted for a total of 47% of the variance of the *ii-V7-I* improvisation task. Instrumental lessons, voice lessons, and creativity score did not enter the equation.

These same six predictor variables were used in a multiple stepwise regression procedure for composite improvisation achievement, and the results are presented in Table 8. The same three variables entered the equation in a different order than for the blues and the *ii-V7-I* and accounted for slightly more variance. Jazz theory knowledge accounted for 27%, imitative ability for an additional 13%, and jazz experience for

Table 7
Stepwise Multiple Regression for *ii-V7-I* Improvisation Achievement (N = 101)

Variable	Step	MR	R ²	F	df	p
Imitate	1	.51	.26	33.66	1, 94	< .0001
Theory	2	.63	.40	30.42	2, 93	< .0001
Jazzexp	3	.68	.47	26.76	3, 92	< .0001

Note: Imitate = imitative ability; Theory = jazz theory knowledge; Jazzexp = jazz experience.

Table 8
Stepwise Multiple Regression for Composite Vocal Improvisation (N = 101)

Variable	Step	MR	R ²	F	df	p
Theory	1	.52	.27	34.96	1, 94	< .0001
Imitate	2	.63	.40	80.59	2, 93	< .0001
Jazzexp	3	.70	.49	29.30	3, 92	< .0001

Note: Theory = jazz theory knowledge; Imitate = imitative ability; Jazzexp = jazz experience.

an additional 9%. These three predictors accounted for 49% of the variance of the composite vocal jazz improvisation tasks. Instrumental lessons, voice lessons, and creativity score did not enter the equation.

DISCUSSION

The three variables that have consistently shown to be predictors of vocal jazz improvisation achievement in this study are jazz theory knowledge, imitative ability, and jazz experience. Instrumental lessons, voice lessons, general creativity, and gender demonstrated nonsignificant relationships with achievement in vocal jazz improvisation.

Although there seems to be no other study in which researchers have examined the relationship between imitative ability and jazz improvisation achievement, the results of interviews with many accomplished jazz instrumentalists indicate that the aural imitation of models was critical to their improvisational development (Madura, 1981; Shaw, 1979).

Cognitive music achievement appears to be a significant predictor of achievement in both instrumental (McDaniel, 1974) and vocal jazz improvisation (Madura, 1991), although this assumption is based on only a few studies. In the research published in 1974, McDaniel used the Aliferis Music Achievement Test, Madura (1991) used a nonjazz music theory examination from a major Midwestern university, and this study used a jazz theory measure.

The identification of previous jazz experience as a significant predictor of jazz improvisation achievement supports studies by McDaniel (1974), Shaw (1979), and Madura (1991). These experiences include extensive studying, practicing, and listening to jazz.

General creativity, as measured by the TTCT (verbal form), was found to be unrelated to achievement in vocal jazz improvisation in both the present study and Madura (1991). A significant relationship was identified, however, between the TTCT (figural form) scores and improvisational creativity by Webster (1979). Additional research into creativity is necessary before conclusions can be drawn.

There has been a good deal of interest in the relationship between vocal jazz improvisation achievement and instrumental experience. Berendt (1975) claims that the best vocal jazz improvisers have almost

always been instrumentalists. Trumpeter Louis Armstrong was one of the first famous scat singers. Perhaps the reason Madura (1991) and the present study found little practical significance between instrumental lessons and vocal jazz achievement is that the question of instrumental study did not differentiate between jazz and nonjazz lessons on an instrument. It may be that a question regarding jazz lessons on an instrument may have produced different results. Voice lessons also demonstrated little practical significance with regard to achievement in vocal jazz improvisation.

This study revealed nonsignificant relationships between gender and all aspects of vocal jazz improvisation achievement. Olson (1987) found gender to be related to instrumental jazz improvisation achievement in professional musicians, but Hores (1977) and Bash (1984) did not find gender to be significantly correlated with jazz improvisation achievement in high school instrumentalists.

IMPLICATIONS

The results of this study suggest several implications for the teaching of vocal jazz improvisation in the college setting. Given that jazz theory knowledge is a predictor of achievement in the blues and it-V7-I tasks, the importance of jazz theory to a course in vocal jazz improvisation should not be underestimated. The instructor would be wise to teach the spellings and sounds of jazz chord types, scale types, and their relationships.

Imitative ability is a primary factor in performance on tonal items and in overall achievement in it-V7-I and blues tasks. Therefore, the teacher of vocal jazz improvisation should emphasize the importance of accurately imitating melodies, including solos by students' favorite improvisors.

The importance of jazz experience to achievement in vocal jazz improvisation is evident. It appears that the more time spent participating in jazz activities, the greater the achievement in improvisation. Class assignments might involve requirements to attend jazz performances, listen to jazz recordings, and practice jazz improvisation.

This study was exploratory in nature. Consequently, the majority of findings are preliminary and in need of further research if generalizability is to be increased. It is critical that the music education profession become informed so that it can provide students with the opportunity to participate fully in an important American art form—jazz—whose essence is improvisation.

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