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# Elements Associated with Success in the First-Year Music Theory and Aural-Skills Curriculum

M. Rusty Jones

Martin Bergee

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## Abstract

A total of 156 students enrolled in first-year music theory and aural-skills courses at the University of Missouri during the fall semesters of 2004 and 2005 were asked to participate in a study intended to determine which elements of their prior musical or scholastic training might be associated with success in freshman-level music theory and aural-training courses. We employed multiple regression analysis to determine results and provide implications for teachers of these courses. The following elements were studied: high school class rank percentile, composite score on the American College Test (ACT), mathematics score on the ACT, prior music theory experience, prior experience with solfège or scale-degree numbers, major (music or non-music), performing medium (vocal or instrumental), prior experience with a chording instrument (e.g., piano, guitar), and score on a theory diagnostic exam administered at the beginning of the first semester of theory study. Results were analyzed separately for the music theory and the aural-skills courses. For the music theory course, the general scholastic elements of high school class rank percentile and ACT-math scores emerged with the strongest associations, followed by prior experience with solfège or numbers, music major status, and prior theory experience. Diagnostic exam scores, performing medium, and chording instrument experience were not associated with final scores in the music theory course. With regard to the aural-skills course, associated with final scores were the diagnostic exam, ACT-composite scores, high school class rank percentile, and chording instrument experience. Prior experience with solfège or numbers, prior theory experience, performing medium, and major were not associated. Among other things, these findings suggest that it would be advantageous to begin the aural-skills sequence a semester later than the first-semester written theory course, thus allowing time for the students to familiarize themselves with the written concepts.

## Introduction

Every year, teachers of music theory at numerous institutions of higher education face the challenge of presenting an introduction to musical structure and syntax to a new group of first-year students. The experience often proves to be frustrating; while many students flourish in the music-academic environment, a disproportionate number seem to struggle with the material and are at risk of abandoning their music studies, in part because of the challenges presented by their introductory experiences with music theory. While some of these students may discover that they lack the intrinsic motivation necessary for the rigorous study of fine art music, others present a more complex case in that they are quite successful in music performance, but considerably less so in their music-academic studies. This unfortunate lack of connection between performance ability and classroom success raises an important issue: perhaps elements of pre-college experiences or training of first-year music students might accurately predict their success in university-level theory courses. If this is so, what are these elements?

The present study examines the following questions in the hope of providing broader solutions for students and teachers alike. Are there associations among general academic indicators and academic performance in first-semester music theory and aural-skills courses? Specifically, is there an association between mathematical and musical skills? Does declaring a major in music make a difference? (At this university, non-majors can take the first-semester theory course as well.) Does it matter whether a student is an instrumentalist or a vocalist? Is a diagnostic exam covering prior knowledge of rudiments (intervals, scales, keys) related to academic performance in theory and aural skills? Are prior experiences with music theory course work, a chording instrument, or a solfège or number system related to performance in written theory or aural skills? If these types of associations can be established, perhaps college and pre-college music educators can use this information to prepare students for success in music theory course work.

The current reader may find that she/he has formulated *a priori* judgments about a number of the topics addressed in our study. One hears statements such as "of course I'm terrible at theory. I'm a singer . . . ." from students on a regular basis, and they become the sources for popular misconceptions. The results of our study will likely contradict a few of the readers' personal assumptions about the pedagogy of undergraduate theory. It is hoped that the reader will keep an open mind in her/his evaluation of our data, and, more importantly, towards the ramifications that our findings might have upon teaching and curriculum design.

In this study, multiple regression analysis, a statistical technique for determining associations among given variables and quantifying the strength of the associations, was employed.[1] The following variables were selected and examined for their associations with final scores in music theory and aural-skills course work: high school class rank percentile, composite score on the American College Test (ACT), mathematics score on the ACT, prior music theory experience, prior experience with solfège or scale-degree numbers, major (music or non-music), performing medium (vocal or instrumental), prior experience with a chording instrument (e.g., piano, guitar), and scores on a theory diagnostic exam administered at the beginning of the first semester of theory study. This paper relates the methods, results, and implications of the two-year study.

Most of the variables selected for the study are self-explanatory. Others, however, warrant further comment. Prior experience with a chording instrument was selected as a variable primarily to analyze the potential advantage gained from a student's experience in reading chords rather than single melodic lines. More extensive experience with a chording instrument was anticipated to yield improved facility with the perception of sonorities and greater preparation for harmonic dictations. Many teachers assume that prior experience with a solfège system yields improved comprehension of the structural implications of melodic lines and the relationship between melodies and scales.

## Method

### *Description of Courses*

A brief description of these courses is necessary, because there is generally a wide diversity of pedagogical approaches between universities. At the University of Missouri, first-semester music

[1] Knowledge of multiple regression analysis is not required to understand our findings. Readers well versed in this technique are encouraged to review the Appendix, which includes greater detail about the development of the regression model.

students enroll concurrently in separate classes for music theory (entitled Syntax, Structure and Style 1—hereafter Theory 1) and aural skills (Aural Training and Sight Singing 1—hereafter Aural Training 1). Theory 1 meets twice a week for 50 minutes per class. The first class session of the semester consists of a diagnostic exam, which tests the students' facility with fundamental written theory concepts, such as key signatures, scales, intervals, and chord spelling.[2] The course material itself begins with the rudiments of music (scales, intervals, and chords) and progresses into the study of diatonic harmony and an introduction to musical form (phrase structure). Activities for the entire semester include part writing, analysis, and composition of a double period in Classic style. Aural Training 1 meets three times a week for 50 minutes per class session. This course presents strategies for the identification of meter and interval types, the written dictation of rhythm, melody, and harmony, and regular work with sight singing via movable-*do* solfège. Tables 1 and 2 in the Appendix provide greater detail about the weekly organization and content of each course.

*Participants*

University of Missouri students enrolled in the first semester of Theory 1 and Aural Training 1 in the fall semesters of 2004 and 2005 were asked to serve as participants. A mix of music majors, minors, and non-majors had enrolled in Theory 1. Its two-year enrollment ($N$ = 156) was larger than the enrollment in Aural Training 1 ($N$ = 90 for the same period), whose enrollees typically are music majors only. The 156 students who agreed to participate in the project constituted 95% of Theory 1 enrollees.

*Procedures for Data Collection*

At the conclusion of the Fall 2004 and 2005 semesters, students enrolled in Theory 1 were asked to complete a brief questionnaire. They were informed that completing the questionnaire was optional and that their course grade would not be affected in any way. In addition to asking students for their name and student number, the form asked students to indicate (a) whether or not they were a

[2] The Theory 1 diagnostic exam does not evaluate aural skills in any way. There is no diagnostic exam for Aural Training at our institution, although this paper will argue that the Theory 1 diagnostic is an excellent predictor of success in the Aural Training course.

music major (performance, education, or bachelor of arts in music); (b) whether prior to Theory 1 they had completed with a passing grade at least one music theory course in high school (*music theory course* was defined for them as a non-performance class dealing with such concepts as scales, chords, harmonic movement, etc.) or whether they had completed with a passing grade at least one college music theory course[3]; (c) how many years they had played piano or another instrument capable of chording, such as guitar; and (d) whether they had had prior experience with movable-*do* solfège or using scale-degree numbers to sing melodies.[4]

## Results

### *Student Demographics*

Of the 156 students who completed and turned in the questionnaire, 104 (67%) indicated a major in music, while the remainder (52, 33%) indicated music minor, non-music major, or undecided. Vocalists totaled 40 (26%) of the participants, while instrumentalists comprised the remainder. About two-thirds of the students (105, 67%) had no prior theory course experience, whereas the remaining third (51, 33%) did. Regarding prior experience with solfège or numbers, 96 (62%) indicated yes, and 60 (38%) indicated no. Students were about evenly divided into the three chording-

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[3] Although this study evaluates students in the first-semester theory course, the questionnaire included "a passing grade in a college-level music theory course" to address the possibility of transfer students enrolled in the course. (Our university does not automatically exempt transfer students from the core theory curriculum courses taken at other institutions.) Additionally, it is possible (although unlikely) that some non-majors enrolled in the class could have taken a preparatory fundamentals course, which is not required for our music majors.

[4] For the item concerning major, we scored a response either 0 if the student indicated minor, non-major, or undecided, or 1 if the student indicated a music major. For the question regarding prior music theory experience, we recorded responses 0 if a student indicated no and 1 if yes. The third question, years playing a chording instrument, had three response options: "zero years", scored 0; "1 to 4 years total (all chording instruments combined)", scored 1; or "5 or more years total", scored 2. The final question, concerning prior experience with solfege or scale-degree numbers, was scored 0 if "no" and 1 if "yes". We obtained the remainder of the information from the university's student records database or directly from music theory area faculty members.

instrument experience categories: 53 (34%) indicated 0 years, 43 (28%) 1-4 years, and 60 (38%) 5 or more years.

Among the participants, the mean composite ACT score was 27.1 (36 maximum, standard deviation [sd] = 4.3), while the mean math ACT score was 26.2 (36 maximum, sd = 4.7). The mean high school class rank percentile was 80.8 (sd = 18.1). The diagnostic exam mean was 63.6 (100 possible, sd = 23.9). The mean of the final Theory 1 scores (*N* = 156) was 79.2 (100 possible, sd = 12.7), while the mean of the final Aural Training 1 scores (*N* = 90) was 85.4 (100 possible, sd = 11.9).

Pairwise correlation coefficients are found in Table 3. Few strong relationships were found among the independent variables. Exceptions were the anticipated close relationship between the first-day diagnostic exam and prior experiences with theory and solfège/numbers. We also anticipated the relatively strong negative correlation between performing medium and prior experience with solfège/numbers, indicating that vocalists (coded 0) had more experience than had instrumentalists (coded 1).

Table 4 Part A presents the preliminary regression model for Theory 1 final scores. The model as a whole appears to be moderately strongly associated (the $R^2$ value, statistically significant, demonstrates that the model as a whole accounts for almost 50% of the variability in Theory 1 final scores). The strongest associations, in order, were high school class rank percentile, ACT-math scores, and prior experience with solfège or numbers. Prior theory course experience and major emerged with modest associations. Performing medium seemed to have contributed weakly to the model, and diagnostic exam scores and chording instrument experience did not appear to contribute at all. Consequently, we dropped these variables from further analyses and focused on high school class rank percentile, ACT-math scores, prior experience with solfège/numbers, prior theory course experience, and major for the final Theory 1 association model.

Table 4 Part B presents the preliminary model for Aural Training 1 final scores. Only two of the variables, high school class rank percentile and ACT-math scores, reached the .05 level of statistical significance. For statistical reasons (a relatively high *beta* coefficient), the diagnostic exam variable was retained as well. Although the chording instrument variable did not seem to be strongly associated at this point, we decided to retain it based on its potential to influence aural-skills performance. The other variables (prior experience with solfège/numbers, prior theory experience, and performing medium) did not contribute substantively and were dropped from further analyses.

Based on an examination of various versions of the Aural Training model, we determined that the ACT-composite score was more strongly associated than ACT-math scores and as a consequence used it (ACT-composite) for subsequent Aural Training analyses. Accordingly, we retained high school class rank percentile, ACT-composite scores, diagnostic exam scores, and chording instrument experience for the final Aural Training 1 model.

The final models are found in Table 5. The models account for 47% and 40% of the variability in Theory 1 and Aural Training 1 final scores respectively (cf. the $R^2$ values at the bottom of the tables. *Adjusted* $R^2$ values adjust the value to reflect more accurately the true difference found in the population). For Theory 1 final scores (Table 5 Part A), in addition to high school class rank percentile and ACT-math scores (Model 1), the variables of prior theory course experience, prior experience with solfège or numbers, and music major status (added in Model 2) emerged with strong and unique associations. Associations in order of strength were high school class rank percentile, ACT-math scores, prior experience with solfège or numbers, major, and prior theory course experience.

For Aural Training 1 final scores (Table 5 Part B), the general academic variables were similarly blocked and entered in the first step. The two remaining variables—diagnostic exam scores and chording instrument experience—were entered in the second step. Diagnostic exam scores and ACT-composite scores were associated about equally strongly; high school class rank percentile and chording instrument experience were associated less strongly, but of about equal magnitude. The Aural Training outcomes need to be interpreted with some caution, however, as the Aural Training 1 sample was smaller than the Theory 1 sample.

In addition to specifying a set of associations, regression yields a linear *prediction equation.* Equations for Theory 1 and Aural Training 1 final scores can be drawn from Table 5. The *constant* is the point on the regression slope that crosses the *y* axis. That is, the constant projects the final score with all predictor variables set to zero. As expected, a student whose ACT-Math score is 0, is at the very bottom of his or her class, is not a music major, and has no prior music theory course work or experience with solfège or scale-degree numbers will not do well in the first semester of written music theory (cf. the constant of 22.27 in the Theory 1 equation). Aural-skills predictors operated along similar lines. A student whose class rank and ACT-Composite scores are zero, who did so poorly on the diagnostic exam as to receive no points, and who has no chording instrument experience is not expected to perform well (cf. the Aural Training 1 constant of 40.17). On the other hand, a student who enters Theory 1 with a high school class rank percentile and ACT-math score of, say, 90 and 27 respectively, who has committed to a major in music, and who has had prior theory and solfège/numbers experience, is more likely to do well (cf. the Theory 1 prediction equation: 22.27 + .36(90) + .84(27) + 5.2 + 3.78 + 3.99 = 90.3). A student entering Aural Training 1 with a similar academic background, who did well on the diagnostic exam, and who has a minimum of five years experience with a chording instrument similarly is more likely to be successful (cf. the Aural Training 1 prediction equation: 40.17 + .13(90) + .84(27) + .15(90) + 2.72(2) = 93.5).

## Implications of the Findings

### *Syntax, Structure and Style (Theory 1) Outcomes*

A deeper look into the data reveals some trends and implications that might help both secondary and university-level educators better prepare their students for these types of courses. Most strongly associated with success in Theory 1 is high school class rank. Interestingly, this is positioned much higher than any *musically* related variable. Clearly, successful high school students have learned the necessary study skills and have the intrinsic motivation to succeed at the collegiate level. For the university adviser and professor, this would seem to stress the importance of encouraging student participation in freshman seminars in study skills and better acclimating students to the heightened academic challenges presented in the university environment.

Interestingly, the second strongest association with success in Theory 1, the ACT-math score, is again *not* directly related to prior musical experience. The degree of interrelationship between math and music has been frequently debated. Suggestions of a relationship between the two fields date to the time of Pythagoras and have continued throughout the history of music theory. Contemporary studies by Bahna-James (1991)[5] and Boettcher/

[5] Bahna-James, "The Relationship Between Mathematics and Music: Secondary School Student Perspectives."

Hahn/Shaw (1991)[6] corroborate this point of view. Bahna-James's study involves a sampling of 124 New York City high school arts students and finds that the "correlation between mathematics grade and music theory grade increases when the mathematics being taught is of a more elementary level and the numerical relationships are relatively simple."[7] Although their methodology is beyond the scope of the present study, Boettcher, Hawn and Shaw are noteworthy for investigating the possibility of common themes of pattern development relating to music, mathematics, and chess found in higher brain functions. While their work does not ultimately definitively correlate the fields, it does provide the implication for a deep physiological relationship.

A contrasting opinion is provided by Howard Gardner, whose 1985 *Frames of Mind* introduced the popular theory of multiple intelligences. His theory postulates the existence of seven distinct and separate intellectual regions, including music and mathematics. Gardner states that the "core operations of music do not bear intimate connections to the core operations in other areas; and therefore, music deserves to be considered an autonomous realm."[8] In short, although music might be inherently mathematical from an intellectual standpoint, musicians do not have an inherent affinity for mathematics.

So what does this mean for the theory professor? The assumption that non-motivated or underprepared students will take advantage of a university's tutoring programs is one that we dare not make, as these kinds of students tend to ignore such opportunities. The theory department can take more direct control over a predictably weak student's potential chance for success in the first year by developing a separate section of Theory 1, with enrollment being determined by class rank and ACT-math scores. Students in this section would cover the same material that is presented in the other Theory 1 sections, but might be required to attend an extra class session devoted to drills and review that the motivated student might perform on her/his own time. This solution will obviously not work for everyone, as the institution will need to have sufficient theory faculty to allow for the staffing of another section of the course.

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[6] Wendy S. Boettcher, Sabrina S. Hahn and Gordon L. Shaw, "Mathematics and Music: A Search for Insight into Higher Brain Function."

[7] Bahna-James, "The Relationship Between Mathematics and Music: Secondary School Student Perspectives," 481.

[8] Gardner, *Frames of Mind*, 126.

While high school class rank and math achievement were the highest associations with success in the Theory 1 course in our study, perhaps more interesting are the variables that did *not* prove to be associated. Most notably, a first-day diagnostic exam, which tests preexisting knowledge of musical rudiments such as key signatures, scales, intervals, and triad spelling, seems to have no particular relationship with a student's final results in the course.[9] While a mastery of musical rudiments is surely of utmost importance to a student's success in the music theory classroom, the present study seems to indicate that this is not a prerequisite to the first-year course.[10]

Furthermore, a student's primary performing medium does not seem to be pertinent to succeeding in freshman music theory. One might surmise that a harmony course would be biased toward students with experience on a chording instrument, but our study does not support this notion. A related study by Douglas Engelhardt investigates relationships between success in the music classroom and music performance.[11] In this study, Engelhardt sampled 144 students at Morehead State University from 1968-1971 to determine if there was a link between success in the classroom and success in the private studio (with performance success perhaps dubiously determined solely through earned GPA in the private studio). Engelhardt's findings somewhat dispute ours in finding that brass players earned a lower GPA in theory, history, and English than students studying other primary performance media; however, his study tracks the collegiate experience, rather than using pre-college variables to predict first-semester success. Ultimately, Engelhardt concluded that there is no link between success in studio performance and in the academic classroom.[12]

Many theory professors will simply not believe that a student's

[9] The MU diagnostic exam tests the students' knowledge of musical rudiments (key signatures, scales, intervals and chord spelling). The results indicated here are not meant to infer that *all* diagnostic exams do not have an association with success in the theory classroom, only that this specific exam does not seem to have a particularly significant association.

[10] Of course, the pacing of the first-semester course would typically require a motivated student to master this material.

[11] Engelhardt, "An Investigation of Levels of Achievement in Music Theory, Music History and Literature, and English as Predictors of Achievement in the Major Performing Medium."

[12] Ibid., 5.

instrumental medium is not related to her/his success in the theory classroom. A surprising number of colleagues have expressed personal biases over the years, with the primary assumption seeming to be that vocalists are weaker at theory than instrumentalists. A more likely scenario is not that vocalists have an *inherent* disadvantage at all; rather, they may become disenfranchised over time with the non-inclusive theory class that fails to include a more broad-based repertoire for study. A successful theory instructor should take great care to vary the repertoire studied in class. Many textbooks have acquired a heavily "piano-centric" approach, which will (perhaps understandably) yield a diminished enthusiasm for the course material by non-piano majors. The onset of the digital music age should make it extremely easy for the instructor to incorporate a variety of performance media into her/his musical examples in order to generate a greater intrinsic motivation among the student group.

*Aural Training and Sight Singing (Aural Training 1) Outcomes*

While the Theory 1 course consists of both music majors and a substantial number of nonmajors, virtually 100% of the students enrolled in Aural Training 1 are music majors, resulting in a smaller student sample for the present study.[13] Therefore, Aural Training findings should be interpreted with some caution. Unlike Theory 1, the essence of aural-skills training would seem to indicate that some students will have a natural predisposition to the material that might be hard to predict. Given this fact, one might surmise that a student's past academic success would not be as relevant in the aural-skills classroom. Indeed, our study shows that this assumption is true, as high school class rank percentile is not the strongest association with success in Aural Training.

Strangely, what *is* highly associated in Aural Training is the Theory 1 diagnostic exam. While one might discount this finding as an anomaly resulting from the smaller student sampling, perhaps this result stresses an important pedagogical concept: the need to stagger the aural-skills sequence a semester behind written theory. Many schools employ this pacing of courses with the belief that it is important to master the written skills before linking the aural reinforcement. For example, students with a full semester of written

[13] Music minors occasionally take the first-year Aural Training courses, although they are not required to do so.

theory would already have a nascent conception of basic harmonic function and progression, in addition to musical rudiments such as intervals and scales. This preexisting foundation might lead to greater success and confidence with the aural identification of these concepts.

Our belief that the Aural Training sequence should be staggered to begin a semester later than the written-theory sequence is certainly not intended to undermine the importance of relating written-theory concepts to their associative sounds. Rather, we believe that our data show the need to ingrain firmly the written concepts in a student's mindset before beginning rigorous Aural Training study. Of course, the role of the written-theory instructor does not (and should not) lie exclusively in the domain of conceptual knowledge. She/he should be incorporating sound as much as possible into the daily lectures. By doing so, the instructor also continues to show the relevance of the course to the student's performance studies, addressing a common student complaint about the practical utility of music-academic work.

Pre-college experience with a chording instrument (piano, guitar, harp, etc.) was also modestly associated with Aural Training scores. These students have perhaps a greater experience with listening to harmony, rather than melodic line exclusively, and therefore might have an advantage with harmonic dictation. The remaining variables studied (including prior experience with movable-*do* solfège and the student's gender) did not predict final aural-training grades.

Some colleagues have expressed assumptions that female students would have greater difficulty with harmonic dictations because they cannot match the low bass register with their own voices. On the contrary, our data do not show that a student's gender plays any role in determining Aural Training success. We suggest instead that difficulty with harmonic dictations stems more frequently from a lack of knowledge about paradigmatic tonal progressions. ("What do you mean, I, ii, iii isn't a good harmonization of this bass line?") Staggering the written- and aural-theory sequences is a step towards solving this problem. The aural-training instructor certainly should review these concepts in class, and the typical student will have a much greater comprehension upon this second presentation.

Although our Aural Training program relies heavily on a student's fluency in movable-do solfège, our data show that *prior* experience in this system is not a predictor of success. By no means does this indicate that successful students at the end of the semester are not fluent in solfège. Quite the opposite is usually true in our program. Instead, we interpret these data to mean that success with solfège is clearly related to fluency in music fundamentals (reading skills, knowledge of scales and intervals). Our proposal to stagger the Aural Training sequence behind the written-theory sequence once again addresses this predictable problem for many students.

Finally, although the data for both the Theory 1 and Aural Training 1 course clearly show that a student's instrumental medium is not strongly associated with success in the *first-year* curriculum, we do believe that certain groups might fare poorly *later* in the sequence at many institutions. We believe the reason for this subsequent lack of success is directly related to intrinsic motivation. Instructors who make an effort to vary the repertoire studied in class will keep the interest (and relevance) for a greater student group, and will almost surely find a higher rate of success in the classroom.

*Implications for the high school music instructor*

Thus far, our study has addressed the implications for the instructor of college-level music theory courses. How might the high school instructor use these data to help her/his music students? While the primary focus of most high school music programs is performance based, opportunities do exist in many schools for introductory music theory instruction. The implications of the data point to the necessity of including the rudiments of music in the high school music curriculum (including reading on the treble and bass clefs, in addition to scales, keys, and intervals), especially since most universities do not stagger the written- and aural-theory sequences. In our experience, many students entering our institution have only a performance-related background, with no music-academic preparations at all. Many of these students are then overwhelmed by the challenges presented in the theory classroom.

Additionally, the high school student would likely be better prepared with some exposure to a chording instrument. Although the data do not indicate this to be strongly associated with success, we believe that experience on a chording instrument yields a greater facility with reading music on two clefs: a fundamental skill that, when underdeveloped, is a significant hindrance for entering students in the music classroom. Exposure to movable-do solfège is not indicated to be strongly associated with success, but its use is encouraged at the high school level to yield an increased comprehension of tendency-tone functions, as well as presenting a clearer relationship between written-theory work (scales and keys at this level) and performance.[14]

*Implications for future research*

This discussion of elements associated with success for the first-year theory curriculum represents, in part, our attempt to identify some of the barriers to success faced by freshman students. We would be very interested to see a similar study exploring issues that arise after a student has had a year or two of theory study. Do students become uninterested? Does the material become too difficult too soon? Is the material sufficiently relevant to the modern-day student? Forward-thinking pedagogues always question their curricula, and the pursuit of a more effective strategy should be a lifelong journey. Studies such as this can guide our pedagogical development in the right direction.

## Conclusions

The implications of our study are encouraging for teachers of music theory. According to our analysis, neither written theory nor aural skills seem inherently biased toward any specific performing medium (vocal or instrumental). Students' prior musical experiences also do not seem to be strongly associated with success in the classroom, although, not surprisingly, students with good academic records in high school tend to perform well at the collegiate level. There is a potentially important link between success in Aural Training 1 and the written-theory diagnostic exam, which supports the concept of beginning the aural-skills curriculum after a semester of written theory. We are encouraged, because the data show that the majority of students enter the first-year theory curriculum as

[14] Although the high school teacher might be able to help better prepare incoming freshman music students, the irony is that, in the vast majority of cases, only advanced and motivated students taking an AP music theory class would be enrolled. Our data indicate that this demographic has the highest predictability for success in freshman theory courses. It therefore seems incumbent upon the college instructor to change her/his pedagogy in order to most effectively help students to succeed.

*tabulae rosa*. All have the potential ability to succeed, regardless of their backgrounds in the study of music. By shifting the curriculum to allow students to grasp the rudiments of music before beginning with aural training study, we believe that students will begin their university music training on more solid ground and be better equipped to realize their musical potential.

*Appendix: Development of the Regression Model*

Developing a model of association using multiple regression usually involves a number of stages. At each stage, we based decisions on how to proceed on the empirical information available at a given stage and on informed judgment. The first stage involved a diagnostic examination of the variables we included in the analysis, followed by a perusal of a matrix of pairwise correlations among all the variables. Correlation coefficients range from -1.00 (a perfect negative linear relationship) through .00 (no relationship) to +1.00 (a perfect positive linear relationship). We studied correlations for evidence of *multicollinearity*, that is, evidence that some of the variables were too strongly related to function independently in a regression equation. The diagnostics indicated the extent to which variables met certain fundamental assumptions for regression analysis (see Berry & Feldman, 1985, for a description of these assumptions). Diagnostics indicated that the variables we selected for study met the assumptions for regression analysis.

Pairwise correlations (found in Table 3) labeled with an asterisk are statistically significant. Statistical significance indicates how often one would expect to find the observed sample value if the value in the population was actually 0. For correlations labeled with an asterisk, the probability is less than one in 100 that in a large population of similar first-year theory students there is actually no relationship between those two variables. The correlation between the ACT composite and math scores, of course, was quite high. Owing to this, and because ACT-math scores are a component of the ACT composite score, both variables could not be included in the same regression equation. Bivariate correlations between the other independent variables were not high enough to cause multicollinearity concerns.

The second stage involved the development and refinement of a preliminary regression model for Theory 1 final scores and then for Aural Training 1 final scores. Variables achieving statistical significance at the .05 level and showing a relatively high *beta* (a standardized weight that allows the influence of the different variables to be compared directly) were considered the strongest associations. We employed ACT-math scores rather than ACT-composite scores in these preliminary analyses, as the ACT-math scores seemed to function better.

The final stage was directed toward specification of the final model. Methodologists (e.g., Nunnally & Bernstein, 1994) often recommend that the effects of generalized associations identified in prior research be accounted for first. The ability of high school class rank and standardized test scores to predict college first-semester academic achievement has been well documented. Therefore, for both models we used a hierarchical approach in which the general predictors of high school class rank percentile and ACT scores were entered as a block in a first step and the remaining predictors entered as a block in a second step.

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## Tables

**Table 1:** Weekly syllabus for Theory 1 course. (Text is Gauldin, Harmonic Practice in Tonal Music, 2nd ed.)

| | |
|---|---|
| **1** | Diagnostic Examination |
| | Introduction to Course; properties of musical sound; notation, clefs<br>Pg. 3-7 |
| **2** | Half-steps and Accidentals; Intervals<br>Pg. 7-19 |
| | Rhythm and Meter I<br>Pg. 20-23 |
| **3** | Tonic, Scale and Melody<br>Pg. 32-44 |
| | Melody and Scale Degrees; Melodic Cadences<br>Pg. 44-54 |
| **4** | Triads and Seventh Chords<br>Pg. 55-63 |
| | Seventh Chords Continued<br>Pg. 63-66 |
| **5** | **EXAMINATION #1** |
| | Introduce Finale |
| **6** | Finale Continued |
| | Musical Texture and Chordal Spacing<br>Pg. 67-81 |
| **7** | Part writing in Four-voice Texture<br>Pg. 82-93 |
| | Melodic Figuration and Dissonance<br>Pg. 94-113 |
| **8** | Introduction to Diatonic Harmony; Tonic and Dominant Harmony; Cadences<br>Pg. 117-125; 126-131 |
| | Voice-leading Reductions<br>Pg. 137-145 |
| **9** | **EXAMINATION #2** |
| | The V7<br>Pg. 146-163 |

**Table 1:** *Continued*

| | |
|---|---|
| **10** | Tonic and Subdominant Triads in 1st Inversion<br>Pg. 164-178 |
| | Phrase structure; contrasting and parallel periods<br>Pg. 179-184; 193-197 |
| **11** | Phrase structure continued; double period<br>Pg. 184-199 |
| | Keyboard Accompaniment Style |
| **12** | Linear Dominant Chords (Ch. 13)<br>Pg. 201-221 |
| | Predominant II and II7<br>Pg. 222-241 |
| **13** | **EXAMINATION #3** |
| | Suspensions-Melodic Figuration II<br>Pg. 242-266 |
| | **THANKSGIVING VACATION** |
| **14** | The Six-four Chord and other Linear Chords<br>Pg. 267-289 |
| | The Six-four Chord and other Linear Chords<br>Continued |
| **15** | The Vi, vi, III, and other Diatonic Chords<br>Pg. 290-306 |
| | Rhythm and Meter II<br>Pg. 307-322 |

**Table 2:** *Syllabus for Aural Training 1 Course.*

| | |
|---|---|
| Weeks 1-4: | |
| Aural Training: | Identification of simple and compound meters<br>Rhythmic dictation: whole, dotted half, half, quarter and eighth notes<br>Melodic intervals: P1 through P5 (ascending and descending)<br>Melodic dictation: pitch sets, short melodies mostly conjunct, skips in tonic chord only |
| Singing: | Tetrachords<br>Major scales, introduction to movable-*do* solfège<br>Isolated scale degrees from tonic triad<br>Intervals: same as above<br>Assigned melodies from Berkowitz text |
| Weeks 5-8: | |
| Aural Training: | Rhythmic dictation: dotted quarters, sixteenth groups<br>Melodic intervals: add m6--P8 + TT, emphasizing m6 and M6<br>Melodic dictation: some disjunct motion, tonic and dominant implied harmonies, introduction to minor keys<br>Harmonic intervals: all |
| Singing: | Natural, melodic, and harmonic minor scales (with movable-*do* solfège)<br>Isolated scale degrees emphasizing 6 and 7<br>Intervals: all (ascending and descending)<br>Major and minor triads in root position<br>Assigned melodies from Berkowitz text |
| Weeks 9-12: | |
| Aural Training: | Rhythmic dictation: eighth/sixteenth groupings, dotted eighth notes<br>Melodic dictation: triadic outlines in various inversions, various final cadences (implied tonic, subdominant, and dominant harmonies)<br>Melodic intervals: all, emphasizing m7, M7 and TT<br>Harmonic intervals: all<br>Sonorities: identification of M and m triads in root position<br>Harmonic dictation: cadential patterns using 3-4 chords |

| | |
|---|---|
| Singing: | Major and minor scales<br>Intervals: all, emphasizing 7ths and TT<br>I, ii, IV, V Triads in root position (using appropriate syllables)<br>Assigned melodies from Berkowitz text |
| Weeks 13-15: | |
| Aural Training: | Rhythmic dictation: eighth/sixteenth groupings<br>Melodic dictation: longer melodies with triadic outlines in various inversions<br>Sonorities: M, M6, m, m6 and o6<br>Harmonic dictation: 4-5 chord patterns using I6,V6, ii6 and viio6 |
| Singing: | Review all intervals and scales<br>M, M6, m, m6 and o6 triads<br>Assigned melodies from Berkowitz text |

**Examinations:** Each four-week unit ends with exams in aural training and sight singing. Extra-credit opportunities are available for students who submit optional assignments using MacGamut software.

**Table 3:** *Correlations among Variables and Theory 1 and Aural Training 1 Final Scores*

| Variable | Theory1 | AT1 | HS% | ACC | ACM | Diag | PM | Maj | ChEx | PrSN | PrTh |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Final Score, Theory 1 | --- | .60* | .55* | .46* | .45* | .41* | -.05 | .13 | .24 | .29 | .23 |
| Final Score, AT 1 | | --- | .43* | .46* | .36* | .49* | -.14 | .09 | .34* | .27* | .21 |
| HS Class Rank % | | | --- | .48* | .36* | .21 | -.14 | -.10 | .24 | .03 | -.07 |
| ACT Composite | | | | --- | .81* | .35* | .08 | .03 | .09 | -.05 | .11 |
| ACT Math | | | | | --- | .30* | .25 | -.08 | .09 | -.19 | -.01 |
| Diagnostic Exam | | | | | | --- | -.13 | .11 | .40* | .39* | .58* |
| Performing Medium | | | | | | | --- | -.03 | -.21 | -.42* | -.16 |
| Music or Other Major | | | | | | | | --- | -.04 | .10 | .09 |
| Chording Inst Experience | | | | | | | | | --- | .26* | .15 |
| Prior Exp w/ Solf or Num | | | | | | | | | | --- | .35* |
| Prior Exp w/ Theory | | | | | | | | | | | --- |

*$p < .01$.

**Table 4:** *Summary of Preliminary Regression Analyses (Simultaneous Entry) for Variables Associated with Theory 1 and Aural Training 1 Final Scores*

**Part A: Theory 1**

| | B | Std. Error | Beta | *t* | *p* |
|---|---|---|---|---|---|
| (Constant) | 20.98 | 6.13 | | 3.42 | =.001 |
| HS Class Rank % | .37 | .05 | .53 | 7.35 | =.000 |
| Prior Exp with Solf/Num | 5.61 | 1.98 | .21 | 2.84 | =.005 |
| Prior Theory Experience | 3.85 | 2.22 | .14 | 1.73 | =.086 |
| Major | 3.73 | 1.88 | .13 | 1.99 | =.049 |
| ACT Math | .74 | .23 | .24 | 3.09 | =.002 |
| Diagnostic Exam | .01 | .05 | .02 | .27 | =.790 |
| Performing Medium | 3.09 | 2.05 | .11 | 1.51 | =.134 |
| Chording Inst Experience | -.05 | 1.07 | -.01 | -.05 | =.961 |

Dependent Variable: Final Score, Theory 1. $R^2 = .49$, $p < .01$.

**Part B: Aural Training & Sight Singing 1**

| | B | Std. Error | Beta | *t* | *p* |
|---|---|---|---|---|---|
| (Constant) | 43.20 | 8.25 | | 5.23 | <.001 |
| HS Class Rank % | .14 | .06 | .22 | 2.26 | =.027 |
| Prior Exp with Solf/Num | 2.59 | 2.58 | .11 | 1.03 | =.319 |
| Prior Theory Experience | .11 | 2.83 | .01 | .04 | =.968 |
| ACT Math | .76 | .29 | .27 | 2.62 | =.010 |
| Diagnostic Exam | .12 | .07 | .23 | 1.76 | =.082 |
| Performing Medium | -3.42 | 2.65 | -.13 | -1.29 | =.200 |
| Chording Inst Exp | 2.12 | 1.46 | .15 | 1.45 | =.151 |

Dependent Variable: Final Score, Aural Training & Sight Singing. $R^2 = .41$, $p < .01$.

**Table 5:** *Summary of Hierarchical Regression Analyses for Variables Associated with Theory 1 (N = 156) and Aural Training 1 Final Scores (N = 90)*

**Part A: Theory 1**

| Model | | B | Std. Error | Beta | *t* | *p* |
|---|---|---|---|---|---|---|
| 1 | (Constant) | 34.52 | 5.79 | | 5.96 | <.001 |
| | HS Class Rank % | .35 | .05 | .50 | 6.87 | <.001 |
| | ACT Math | .62 | .22 | .20 | 2.80 | =.006 |
| 2 | (Constant) | 22.27 | 5.95 | | 3.74 | <.001 |
| | HS Class Rank % | .36 | .05 | .51 | 7.50 | <.001 |
| | ACT Math | .84 | .21 | .28 | 3.96 | <.001 |
| | Prior Exp w/Sol/Num | 5.20 | 1.75 | .20 | 2.97 | =.004 |
| | Prior Theory Exp | 3.78 | 1.79 | .14 | 2.11 | =.037 |
| | Major | 3.99 | 1.69 | .15 | 2.36 | =.020 |

Dependent Variable: Final Score, Syntax Structure & Style 1. Model 1 $R^2$ = .37, Model 2 $R^2$ = .47. The difference between the two $R^2$ values is statistically significant. Adjusted $R^2$ for Model 2 = .45.

**Part B: Aural Training & Sight Singing 1**

| Model | | B | Std. Error | Beta | *t* | *p* |
|---|---|---|---|---|---|---|
| 1 | (Constant) | 43.52 | 8.26 | | 5.27 | <.000 |
| | HS Class Rank % | .17 | .07 | .27 | 2.53 | =.013 |
| | Comp ACT | 1.05 | .35 | .32 | 3.03 | =.003 |
| 2 | (Constant) | 40.17 | 7.58 | | 5.30 | <.001 |
| | HS Class Rank % | .13 | .06 | .20 | 1.99 | =.050 |
| | Comp ACT | .84 | .33 | .26 | 2.58 | =.012 |
| | Diagnostic Exam | .15 | .05 | .27 | 2.76 | =.007 |
| | Chording Inst Exp | 2.72 | 1.49 | .19 | 1.93 | =.056 |

Dependent Variable: Final Score, Aural Training & Sight Singing 1. Model 1 $R^2$ = .25, Model 2 $R^2$ = .40. The difference between the two $R^2$ values is statistically significant. Adjusted $R^2$ for Model 2 = .37.