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ABSTRACT

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By Nancy H. Barry, Florida State University

Abstract

The purpose of this study was to determine the effect of different practice conditions upon technical accuracy and musicality of student instrumental performance. High school instrumental students attending summer music camps at the Florida State University were randomly assigned to one of three different practice groups: (a) teacher-designed practice (n=22), in which subjects used practice procedures recommended by music instructors, (b) student-designed practice (n=19), in which subjects developed their own structured practice method, and (c) free practice (n=20), in which subjects practiced in their "usual manner." The same experimental etude was used for both pre- and posttest data collection. Subjects in all groups were assigned to an individual practice room for two fifteen-minute practice sessions one day apart. The differences between pre-test and posttest scores for pitch, rhythm, general technical accuracy, and general musical effect were calculated for each subject and the resulting gain scores were analyzed via the Kruskal-Wallis One-Way Analysis of Variance. Significant differences ($N=61$, $p<.05$) were observed among the three groups for the number of individual pitch errors recorded and for the technical rating. Dunn's Multiple Comparison Procedure revealed significant differences ($N=61$, $p<.05$) between each of the three groups for both pitch errors and technical ratings. Similar trends were observed in the scores for rhythmic accuracy and for overall rating for musicality. Results of this study suggest that subjects using a structured approach to practice (teacher and student methods) were able to correct more performance errors than those subjects not using a specific method (free practice).

The importance of a structured, organized approach to practice is a familiar topic to music educators. Practice strategies advocated in recent literature include mapping:

> A Gestalt approach to learning that starts from the basic structure and gradually fills in the details, instead of starting with details and adding more until the whole structure is pieced together. It is in direct opposition to the one-measure-at-a-time approach many students take, where the accumulation of details without awareness of the whole results in a patchy performance that lacks unity, direction, and musical meaning" (Shockley, 1986, p. 21).

DeRoche (1987) suggested a specific approach to musical practice stressing the importance of slow repetition of new materials. He pointed out that "students need guidance to establish practice habits" (p.58). A specific practice strategy described by Minahan (1986) includes warm-up, hyper-consciousness, concentration on musical details, second run-through, and homework.

In *The Inner Game of Music* (Green & Gallwey 1986), a popular text professing "to reduce mental interferences that inhibit the full expression of human potential" (p. vii), the authors discuss many aspects of musical performance and practice including the value of listing specific learning goals for the practice session. Gordon's *Systematic Approach to Daily Practice for Trumpet* (1968) is "designed to systematically develop strength and muscle coordination along with wind control so that the student will play naturally and easily" (p. 4). Another commercial publication by Kaplan (1985) takes a time management approach to practice and provides daily and weekly practice logs, summary sheets, practice profile graphs, and technique, repertoire, and performance achievement sheets designed specifically for practice organization.

The aforementioned literature is representative of the proliferation of "how to" guides for effective musical practice. These essays provide interesting descriptions of practice methods that have "worked" for a given instructor in a given situation. Without empirical evidence, however it is difficult to determine which method will be most effective for a particular population. A search of the literature revealed relatively few research studies pertaining directly to musical practice.

A technique referred to as "mental practice" involving cognitive rehearsal of a skill without physical activity has been the subject of numerous studies in physical education and sports psychology. In a review of mental practice literature. Weinberg (1982) reported seventy articles. His summary of this research revealed the following conclusions:

1. Mental practice combined with physical practice is more effective than either mental practice or physical practice alone.

2. Mental practice is most effective during the early stage of learning or during the later stage.

3. There may be an optimal time for the length of the mental practice interval.

4. When imagining themselves performing, individuals should try to "feel" themselves going through the movements.

5. Mental practice seems to be associated with muscular responses in the muscles that would actually perform the movement (p. 203).

One study investigating the effectiveness of mental practice in a music setting was carried out by Ross (1985). The relative effectiveness of mental practice in improving trombone performance was examined by comparing the performance of trombonists (N=30) randomly assigned to one of five experimental practice conditions: (a) all physical practice in which subjects

physically performed an etude three times, (b) all mental practice in which subjects attempted to mentally perform the etude three times, (c) a combination of physical and mental practice in which subjects physically played the etude two times, attempting a mental trial between them, (d) mental practice with simulated slide movement in which subjects were instructed to hold their trombone in normal playing position while moving the slide to the correct positions, mentally practicing instead of actually playing the etude, and (e) a control group in which subjects did not practice the etude and instead read an article about the importance of sight-reading music well. Pretest and posttest performances of the etude were evaluated on the basis of one point for each measure of the etude played correctly. The relative improvements of each of the five groups were compared. Significant differences were found between combined practice and no practice, combined practice and mental practice, and physical practice and no practice. These findings were consistent with research in physical education in that combined practice resulted in higher scores than mental practice or no practice, and physical practice resulted in higher scores than no practice.

Music educators acknowledge practice as a vital element in the development of basic musical skills (e.g., Applebaum & Applebaum, 1972; Fox, 1974; Holz & Jacobi, 1966; Leimer, 1972; Merrick, 1958; Westphal, 1990). Specific references to practice, however, are noticeable absent from many standard music references (e.g., Apel, 1972; Sadie, 1980).

Zurcher(1972) investigated the use of cassette practice tapes (model) by beginning instrumentalists. Forty-three beginning elementary brass students were randomly assigned to an experimental group or a control group for the first week of practice. The groups rotated treatments on subsequent weeks. During the experimental treatment sessions, subjects received a method book, a cassette player, and a cassette tape containing instructions, reminders, and model "play-along" performances of the music performed on the subject's own instrument. Posttests of assigned material were administered and recorded during weekly 15-minute individual lessons. Results indicated that model-supportive practice was significantly more effective than traditional practice on gross pitch discrimination, pitch matching, rhythmic discrimination, and time spent in practice.

A recorded model was also used in a study by Rosenthal, Wilson, Evans, and Greenwalt (1988). This experiment examined the effects of five different practice conditions on advanced instrumentalists' performance accuracy. Subjects were assigned to one of five experimental practice conditions: (a) modeling, in which subjects used their practice time to listen to a recording of the etude with the written music available; (b) singing, in which subjects used their practice time to sing the etude; (c) silent analysis, in which subjects used their time to silently study the music; (d) free practice, in which subjects practiced the etude by continuously playing their instruments; and (e) control, in which subjects practiced a different etude before playing the experimental etude (sight-reading). Subjects' performances were evaluated on the basis of correct notes, rhythms, articulation, phrasing, and tempo. Rhythmic accuracy scores were highest for subjects in the silent analysis group, whose scores were significantly higher than those of the singing and control groups. Subjects in the practice and modeling groups phrasing scores were significantly higher than those of subjects in the singing and control groups. Tempo accuracy of subjects in the modeling, practice, and silent analysis groups was significantly better than that of subjects in the singing group.

The effect of a practice report on practice time and musical performance was investigated by Wagner (1975). In this study, 48 music students were randomly selected and asked to play an etude of their choice. Subjects were randomly assigned to one of four groups. Subjects in Group 1 completed practice reports for eight weeks. Subjects in Group 2 completed practice reports during weeks one and two and weeks five and six. Subjects in Group 3 filled out practice reports only during weeks five and six. Subject assigned to Group 4 (control group) did not receive practice reports. After the eight-week experimental period, each subject was asked to play a second etude. Each student performance was assigned a number and rated by a panel of three judges. Results indicated that all groups improved from pre- to posttest and that Group 3 practiced significantly more than Groups 1 and 2 during weeks five and six of the experiment. There were, however, no significant differences in scores among groups. These findings suggest that use of a practice report alone does not significantly effect musical performance. Subjects in Group 3 practiced significantly more than subjects in Groups 1 or 2, but they did not perform significantly better. This suggests that musical performance and improvement are not solely determined by the amount of time practiced.

Another study dealing with the amount of practice time (Wolfe, 1984) examined the use of behavioral contracts in motivating a student to practice. An individual contract was prepared for each of three private piano students. A multiple baseline design across subjects was used to determine the effect of the use of contingency contracts on practice behavior. Results indicated that the amount of daily practice time per week increased for each student during the contract condition. Follow-up data indicated that, for two of the subjects, practice criterion continued to be reached without the use of the structured contract.

Santana(1978) attempted to develop a method for time-efficient skill acquisition in instrumental music study. This method emphasized "technical development under time-controlled situations, with carefully staged and graded progress measured metronomically and remediated immediately through prescribed procedures" (p.ii). The method was evaluated through a series of individual and group experiments. A preliminary investigation revealed no significant correlation between teacher-judged performance achievement and the amount of time an individual spent practicing. One test involving individual university students revealed a signific nt reduction of practice time required to prepare an etude to criteria for those students using the practice method. A separate study involved three groups of high school students assigned to one of three conditions: no instruction, teacher modeling instruction, or instruction in the practice method. Performances were scored according to the number of errors with no more than one error per measure at criterion tempo. Results of this study indicated significantly higher performance scores for those students assigned to the practice method group. A third test of the method with a group of junior high students revealed significant improvement in performance scores when post-instruction scores were compared with scores after instruction in the practice method. Performances were scored on the basis of one error per measure with total errors subtracted from 100.

Music educators certainly recognize the importance of practice for musical development and progress. The existence of many

popular essays and books stressing the value of various approaches to practice attest to this. There are, however relatively few research studies designed to investigate and isolate specific variables involved in musical practice and the way those variables effect student progress. The present study was designed to determine the effect of three different practice techniques upon technical accuracy and musicality of student instrumental performance.

Purpose

The purpose of the present study was to determine the effect of (a) teacher-designed practice techniques, (b) student-designed practice techniques, and (c) free practice upon technical accuracy and musicality of student instrumental performance. Four null hypotheses were tested:

1. There will be no differences in the number of pitches played correctly among subjects using teacher-designed practice techniques, subjects using self-designed practice techniques, and subjects assigned to free practice.

2. There will be no differences in the number of rhythms played correctly among subjects using teacher-designed practice techniques, subjects using self-designed practice techniques, and subjects assigned to free practice.

3. There will be no differences in ratings for technical accuracy among subjects using teacher-designed practice techniques, subjects using self-designed practice techniques, and subjects assigned to free practice.

4. There will be no differences in ratings for musicality among subjects using teacher-designed practice techniques, subjects using self-designed practice techniques, and subjects assigned to free practice.

An alpha level of .05 was selected for rejection of the null hypotheses.

Definition of Terms

Correct Pitch. Correct performance of the pitch component of music notation was rated with one point awarded for each note played without error. The term "pitch" usually implies "intonation." In the present study, however, "pitch " was considered correct if two independent judges perceived that the subject "played the correct note."

Correct Rhythm. Correct performance of the rhythm component of music notation was rated by two independent judges with one point awarded for each rhythmic note value played without error.

Musicality. Musicality refers to appropriate interpretation and performance of music in regard to phrasing, tempo, dynamics, and expression. Musicality was evaluated on a rating scale of 1 (poor) to 10 (excellent) by two independent judges.

Technique. Musical technique involves many skills, but in the present study technique is defined as the aspect of music performance involving correct articulation, technical fluency, and correct execution of the pitch and rhythm components of music notation. Technical accuracy was evaluated on a rating scale of 1 (poor) to 10 (excellent) by two independent judges.

Methods and Procedures

The melody used for evaluating the subjects' performance on the dependent variable soft pitch accuracy, rhythmic accuracy, technique, and musicality was selected from *Develop Sight Reading by Dufresne* (1972, p.4). This particular source was selected for the following reasons (a) appropriate difficulty level for the target population, (b) parts available for all instruments, (c) not part of the standard high school repertoire, and, therefore, not likely to be familiar to the subjects, and (d) variety of rhythmic and melodic patterns present in a relatively short etude.

High school instrumental students attending summer music camps at the Florida State University were selected as subjects (N=84). As a pretest, all subjects were asked to sight-read the experimental etude. Subjects were tested individually in a private room. All subjects' performances were taped for later evaluation using a BX-300 Discrete Head Cassette Deck recorder with Maxell IEC Type II High Bias Cr02 tape. Subjects were also asked to complete a brief questionnaire.

Subjects were randomly assigned to one of three different groups. One experimental group (n=28) was instructed to use a specific practice procedure recommended by experienced music instructors. Fourteen instrumental music instructors were asked to list in order and describe the steps involved in the efficient practice of a new piece of music. The steps were rated according to the number of times each step's relative position in the instructor's list. A structured practice technique representing a consensus of all 14 music instructors' suggestions was developed by listing the steps in order from highest to lowest rating.

Subjects in a second experimental group (n=28) were asked to develop their own structured approach to practice. A set of general directions was devised to aide these subjects in this task.

The third group served as a control (n=28). Subjects in this group received no special instruction in "how to practice." These students were instructed to "practice this etude in your usual manner."

Subjects in the teacher method group and the student method group participated in a 15-minute group meeting during which procedures for the particular group were explained and questions were answered. Subjects in all groups were assigned to an individual practice room. Envelopes containing special instructions, a pencil (for marking music and completing portions of the instruction sheets), and a copy of the experimental etude were distributed to the two experimental groups. Subjects in the control group received a copy of the etude. All materials were collected after fifteen minutes. This procedure was repeated on a rotating schedule so that each group of subjects had a total of two fifteen-minute practice sessions one day apart. All subjects were posttested under physical conditions identical to the pretest. A second questionnaire was administered at this time.

Results

The results of the present study suggest that subjects using a structured approach to practice (teacher method and student method) were able to correct more performance errors than those subjects not using a specific method (free practice).

Some subjects did not complete all phases of the experiment. Data from those subjects were not included in the final analysis. This resulted in 22 subjects (8 male, 14 female) in the group using

the teacher recommended method, 19 subjects (5 male, 14 female) in the group using the student developed method, and 20 subjects (7 male, 13 female) in the control group. Each subject's performances on the pretest and posttest were evaluated on a note-by-note basis by two independent judges. The number of individual pitch and rhythm errors was recorded separately for each performance. Judges also rated each performance on the basis of general technical accuracy and musicality on a scale of one to ten. Judge reliability (agreements divided by agreements plus disagreements) was 93% for pitch, 91% for rhythm, 91% for technique, and 90% for musicality.

The difference between pretest and posttest scores was calculated for pitch, rhythm, technique, and musicality for each subject and the resulting gain scores were analyzed via the Kruskal-Wallis One-Way Analysis of Variance using *Basic Statistical Subroutines* (Dynacomp, Inc., 1983) software with the Sanyo 1250 MBC computer. Four separate statistical tests were conducted to test each of the four null hypotheses. Significant differences (n=61, p.<.05) were observed among the three groups for the number of individual pitch errors recorded and for the technical rating. Dunn's Multiple Comparison Procedure was used following the Kruskal-Wallis to determine which means were significantly different (Table 2). Significant differences (N=61, p<.05) were found between each of the three groups for both pitch errors and technical ratings.

Table 1

Kruskal-Wallis One-Way Analysis of Variance for Pitch, Rhythm, Technique, and Musicality by Group

Rating	Obtained H	Critical H	DF
Pitch	7.23	5.99	2
Rhythm	2.40	5.99	2
Technique	10.69	5.99	2
Musicality	2.56	5.99	2

Table 2

Treatment Means for Pitch, Rhythm, Technique, and Musicality Gain Scores

Rating	Teacher Method	Student Method	Free Practice
Pitch	20.59	11.13	9.40
Rhythm	12.02	9.18	8.55
Technique	1.26	.66	.04
Musicality	.83	.50	.28

Responses to the two questionnaires were recorded and analyzed using the SPSS (1984) program for frequencies. Results of the pretest questionnaire provided the following information:

1. Most subjects (70%) were between 14 and 15 years of age.

2. The majority of the subjects were female (67%).

3. Between four and nine years of previous musical experience (including piano and/or voice lessons) was reported by most subjects (82.6%).

4. Most subjects (74%) reported between three and six years of experience on the musical instrument used for the present experiment.

Practice techniques reported by students varied. Practicing small sections of the piece (52%), reading through the entire piece (50.82%, studying the key and time signature (41%), and visual study of the music (notes, rhythms, dynamics, etc.) before playing (31%) were the practice strategies mentioned most often.

All groups were relatively homogeneous. Crosstabulations using the SPSS program for Crosstables revealed no significant differences among groups (p) for age, sex, years of musical experience, or years of experience on present wind instrument.

The second questionnaire was administered to determine whether or not subjects attempted to follow instructions. Results of this questionnaire were as follows:

1. The majority of the subjects (90%) stated that they did not discuss details of the experiments with other students.

2. Most subjects (82%) reported that they attempted to follow all instructions for their group.

3. Sixty-two percent of the subjects stated that, as a result of the present experiment, they planned to change the way they practice.

Crosstabulation of group by the question regarding whether subjects attempted to follow all instructions revealed that five of the ten subjects responding "no" to this item were in the free practice group. Additional crosstabulation revealed that 50% of the subjects in the teacher method group, 20% of the subjects in the student method group, and 40% of the subjects in the free practice group reported intentions to change current practice habits as a result of their participation in the experiment.

Discussion

Results of the Kruskal-Wallis One-Way Analysis of Variance indicated significant differences among subjects' gain scores for pitch accuracy and for overall technical rating. Dunn's Multiple Comparison Procedure revealed significant mean differences between subjects in the teacher method group and subjects in the student method group, subjects in the teacher method group and the free practice group, and subjects in the student method group and the free practice group for both pitch and technique scores. Similar trends were observed in the scores for rhythmic accuracy and for overall rating for musicality. Statistical results, however, were not significant for those sets of scores.

The possibility that students assigned to the free practice group might already be using a structured practice method from a book, teacher, or of self-design was taken into consideration. Results of a pretest questionnaire, however, did not indicate that any of the subjects in the present experiment were using a consistent and structured approach to practice. All 15-minute practice sessions were self-monitored. An importance consideration, therefore, is whether subjects did indeed follow the instructions required to their particular group. On an anonymous posttest questionnaire, 10 (16%) of the subjects stated that they did not follow all instructions. Since evaluation of the three practice conditions was contingent upon the subjects' use of the particular method to which

they were assigned, this must be taken into consideration when reviewing the results of the present study.

Another caveat concerning this study involves the evaluation of student performance. The overall ratings for technique and musicality were obviously quite subjective. Ratings for pitch and rhythmic accuracy involved counting individual errors. There was some disagreement between judges, however, reflecting that even these relatively straightforward tasks were not without some degree of subjectivity. This was particularly the case when a subject made a series of pitch and rhythmic errors, or when portions of the etude were omitted, making it quite difficult for the judges to pinpoint exactly where errors occurred. Ongoing research in computer technology should ultimately provide the music educator/researcher with more effective tools for objective evaluation of technical performance accuracy.

Gain scores for pitch accuracy, rhythmic accuracy, musicality, and technique for subjects in the teacher method group and the student method group were consistently higher than gain scores for subjects in the free practice group. This suggests that some form of structure, whether of teacher design or of student design, is conducive to more efficient musical practice. Gain scores for subjects in the teacher method group were consistently higher than gain scores for subjects in the student method and free practice groups. The specific step-by-step nature of the teacher method may have contributed to the significantly higher gain scores for the teacher method compared to the student-developed method. It is probable that these students simply did not have sufficient musical experience to devise a structured practice method as efficient and comprehensive as the method based upon the recommendations of 14 studio teachers with an average of 19 years of teaching experience. It is important to note that the purpose of this study was not to endorse a particular method of practice, but rather to explore the differences among a highly structured approach, a student-devised approach, and the students' usual approach to practice. The teacher method used for the present study represents a relatively generic structured approach to music practice. It is likely that use of any logical step-by-step approach would produce similar results.

Much additional research is needed to ascertain the optimal conditions and techniques for time-efficient music practice. Questions for future consideration include:

1. What are the minimum and maximum time periods for efficient on-task music practice and how do those thresholds vary as a function of age and musical experience?

2. What specific practice activities result in the most efficient use of the practice session?

3. Is it possible to "customize" a structured practice method for the strengths and weaknesses of an individual student?

4. Are there certain activities that are essential to all efficient practice sessions or does this vary with the individual?

Future research in this area may yield diagnostic tools and specific procedures for the development of a time-efficient, structured approach to music practice.

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