350 JRME (WINTER 2006), VOLUME 54, NUMBER 4, PAGES 350–362

The purposes of the current study were to (1) determine the relationship between the number of practice strategies students could articulate and their performance improvement scores, (2) identify trends in students' 5-minute practice behaviors, and (3) compare students' achievement based on their practice procedures. Participants were 65 eighth-grade students from five middle schools. Results documented a positive correlation between performance improvement and number of verbalized practice techniques. Based on the participants' 5-minute practice behaviors, four categories of practicers were determined: holistic, noncorrective practicers, *who did not stop for errors in their run-throughs;* holistic, corrective practicers, *who stopped only for errors in their run-throughs;* analytic, reactive practicers, *who stopped to remediate sections of music; and* analytic, proactive practicers, *who jumped around in the music to fix errors. There were significant differences between the holistic and analytic practicers, as well as between the pre- and postperformances, and a significant interaction between practicers and performances. From the baseline to the final performance, the analytic practicers made significantly more gains than did the holistic practicers.*

Debbie Rohwer and Jeremy Polk
University of North Texas

Practice Behaviors of Eighth-Grade Instrumental Musicians

Research findings indicate that musical practice is complex. Investigators have obtained mixed results in terms of the effects of the amount of practice, instrument played, and treatment conditions. In 1993, Ericsson, Krampe, and Tesch-Romer asserted that time spent in deliberate practice serves as a better predictor of achievement than does talent. Since then, other researchers have agreed with the basic tenets of deliberate practice (Lehmann & Ericsson, 1997; O'Neill, 1997; Sloboda, Davidson, Howe, & Moore, 1996). Jorgensen (2002), however, found amount of practice to be related to achievement only for instrumental students; no such relationship was found for vocal or organ students. Findings contradictory to the idea that time spent practicing directly improves performance have

Debbie Rohwer is an associate professor of music education in the College of Music, University of North Texas, PO Box 311367, Denton, TX 76203-1367; e-mail: Drohwer@ music.unt.edu. Jeremy Polk is a doctoral student in music education at the same institution; e-mail: jpolk@music.unt.edu.

been documented by Wagner (1975), Zurcher (1975), Sloboda and Howe (1991), and Williamon and Valentine (2000).

Researchers have pondered the reasons for these conflicting results. Hallam (1998) highlighted the debate in her conclusion that in certain situations such as examinations, aspects such as understanding instructions may better foretell success than the amount of time practiced. Differences in study findings may also be attributable to the procedures of measuring practice behaviors, since self-report procedures and authentic practice may differ. Hallam (1997) found that novice participants commonly reported using more analytic practice, whereas in actual practice, a large percentage of the participants tended to practice in a more repetitive, less analytic fashion. Jorgensen (2002) hypothesized that results from playing one composition may differ from more general performance ability measures. Williamon and Valentine (2000) speculated that the definition of deliberate practice itself may be a possible source of concern, stating, "Ericsson et al.'s (1993) definition of deliberate practice appears to be too global. It simply does not account for possible differences in the content and quality of each performer's deliberate practice" (p. 371).

In looking at details related to specific content and quality aspects of practice, researchers have noted the positive effects of a number of variables on achievement. These include feelings of self-efficacy (a person's judgment of his or her own ability on a given task) (McPherson & McCormick, 1999; Nielsen, 2001), motivation (O'Neill, 1997), self-regulatory skills (McPherson & Renwick, 2001), commitment (McPherson, 2000/2001), attention (Madsen & Geringer, 1981), supervised practice (Davidson, Sloboda, & Howe, 1996; Pitts, Davidson, & McPherson, 2000; Sloboda & Howe, 1991), structured practice (Barry, 1992; Puopolo, 1971), listening to a model (Henley, 2001; Hewitt, 2001; Puopolo, 1971; Rosenthal, Wilson, Evans, & Greenwalt, 1988; Zurcher, 1975), and practicing self-selected repertoire (Renwick & McPherson, 2002).

Studies describing the specific strategy usage reported by high school students (Rohwer, 2002) and teacher-reported practice requirements for preschool through college-age students (Barry & McArthur, 1994) have shown that beginning an exercise slowly and then increasing the tempo is a commonly reported technique, whereas audiotaping practice sessions is less commonly reported. While certain trends may exist in students' practice behaviors, a more common phenomenon may be the use of a wide range of strategies implemented in a variety of ways, from the more novice technique of running an exercise without correcting anything (Pitts, Davidson, & McPherson, 2000) to the more expert technique of systematically breaking down musical material (Chaffin & Imreh, 1997, 2001; Miklaszewski, 1989).

Due to the variety of practice behaviors used by experts as well as novices, Hallam (1995) advocated that instruction about practice should be individualized to each learner. If learners are to approach practice in an individualized way, it seems logical that they would

need to have a variety of strategies available. Researchers have cited the benefits of students having multiple strategies at their disposal for efficient practice (Da Costa, 1999; Hallam, 1998; Nielsen, 1999a; Pacey, 1993), but, clearly, knowledge of strategies alone may be insufficient.

In addition to strategy access, researchers have proposed that efficient practice may be a function of musicians' cognitive understanding of where intensive use of strategies is required in the music (Gruson, 1988; Hallam, 2001a, 2001b; Nielsen, 1999a, 1999b, 2001). Combining both error-detection ability and use of appropriate strategies seems integral to high-level practice. Hewitt (2001) stated that even if students can diagnose problem areas in music, having the prescriptive ability to remediate the problem with an appropriate strategy may be challenging to younger musicians. In Hallam's study (2001b), professional musicians seemed to be better at the reflective aspect of practice than were young musicians, and, according to Barry and McArthur (1994), teachers of college-age students reported different practice approaches than those reported by teachers of younger students.

There is a need for more research on how young students practice. Strategy use and efficiency in practice have been two major research agendas, but clearly these two issues intersect, and more research is needed to understand this complicated phenomenon. An investigation into whether students who have an arsenal of strategies available to them also improve their performance through practice might allow educators to know whether basic exposure to strategies may be an important first step in practice instruction. Furthermore, an understanding of whether students who use different practice procedures differ on their performance skill might allow educators to select practice-instruction choices more effectively.

The purposes of the current study were to: (1) determine the relationship between the number of strategies students could articulate and their performance improvement scores, (2) identify trends in students' 5-minute practice behaviors, and (3) compare students' achievement based on their practice procedures.

METHOD

Participants were 65 eighth-grade students from five middle schools: public (n = 4) and private (n = 1); rural (n = 2), suburban (n = 2), and urban (n = 1); in Texas (n = 3) and Arkansas (n = 2). The five schools served as an accessible population for this study. The volunteer participants in the study were girl (n = 33) and boy (n = 32) instrumentalists playing flute (n = 9), oboe (n = 1), bassoon (n = 2), clarinet (n = 11), alto saxophone (n = 6), tenor saxophone (n = 3), baritone saxophone (n = 2), trumpet (n = 8), French horn (n = 4), trombone (n = 9), euphonium (n = 4), tuba (n = 1), or bells (n = 5).

Each student participated in an individual practice session with the primary researcher. Participants were asked to verbally describe practice techniques that they had used when practicing exercises.

The example of practicing with a metronome to improve rhythmic stability was used as a prompt. The participants were then asked to sight-read a 24-measure exercise adapted from #16 in Rusch (1963) to provide a baseline performance measure. The exercise was in G minor, at a moderate tempo, and in 2/4 meter, with rhythms ranging from half notes to sixteenth notes. It contained accents, slurs, and staccato markings, and it had a range of dynamic markings from *mezzo piano* to *forte* with decrescendo and crescendo markings. After sight-reading the exercise, the participants were asked to improve upon their initial performance as much as possible by practicing the exercise for 5 minutes. At the end of the 5 minutes of practice, participants performed the exercise once again.

All participant sessions were recorded using a Sony MZ-B3 portable minidisc recorder. Performance achievement was scored using a criteria-specific rating scale format as the measurement instrument. Saunders and Holahan (1997) initially studied the feasibility of using their Woodwind and Brass Solo Evaluation Form in measuring high school all-state auditions. Although their complete evaluation form contained three sections (solo, scales, and sight-reading), only the solo section of their evaluation form was used for this study.

The solo rating scale contained the dimensions tone, intonation, melodic accuracy, rhythmic accuracy, tempo, interpretation, and articulation. Based on our pretesting of the rating scale, the dimensions of tone and intonation were not used in the study due to the pretested students' lack of attention to and improvement on intonation and tone aspects in the allotted practice time. Hence, the rating scale used for the purposes of this study had five dimensions: melodic accuracy, rhythmic accuracy, tempo, interpretation, and articulation. The first four dimensions were rated on a 5-category continuous scale ranging from weak/inaccurate performance characteristics to accurate/appropriate characteristics, and the last dimension (articulation) was rated on a 5-category additive scale wherein each characteristic (e.g., accurate tonguing, appropriate slurs) was marked if demonstrated. Each of the 5 categories in a dimension was worth 2 points, and hence the range of possible scores for each continuous dimension was from 2 to 10; the range of possible scores for the additive dimension was 0 to 10. The range of possible scores for the summed solo evaluation form, then, was 8–50.

To assess content validity of the exercise, four middle school band directors with an average of 9 years (SD = 2.94) of public-school teaching confirmed the appropriateness of the level of difficulty of the exercise for the given task. A field test was completed with four middle school students from a comparable school to ensure clarity of instructions and further document the validity of the exercise. To estimate interjudge reliability, the primary researcher scored a set of 13 pilot performances from a comparable but different school district, and then a band director with 6 years of experience also scored the performances (r = .88). The primary researcher scored all the main study data. To assess interjudge reliability for the main study

Table 1
Participants' Verbalized Practice Techniques

Practice Technique	Times Mentioned
Repetition	46
Pinpointing difficult sections	29
Practicing slow to fast	18
Analyzing key/meter	18
Marking music	11
Counting	10
Psychomotor (fingering)	8
Look up notes	5
Write in notes	3
Silent study	3
Tune	2
Play music on another instrument	2
Articulation change	2
Practice for tempo with another instrument	1
Rhythm change	1
Whistle	1
Sing	1
Tap	1

data, 25% of the first performances (n = 17) were also scored by a band director with 5 years of experience (r = .96). Internal consistency of the complete rating scale used with 926 students was documented at .915 (Saunders & Holahan, 1997). In this study, the internal consistency reliability estimate (Cronbach's alpha) was .85 for the shortened (solo section only) version of the rating scale with the 13 pilot participants.

RESULTS

For Research Question 1, to determine the relationship between the number of strategies students could articulate and their performance improvement, a Pearson product-moment correlation coefficient was calculated between all participants' practice gain scores from Performance 1 to Performance 2, and the number of techniques that the participants could verbalize as commonly used practice techniques in their regular practice. The gain scores ranged from –4 to 20 with a mean of 4.14 (SD = 4.76). The number of techniques described verbally by participants ranged from 1 to 6, with a mean of 2.57 (SD = 1.08). See Table 1 for a complete list of verbalized techniques.

Prior to calculating the correlation coefficient, the data were analyzed for violations of statistical assumptions. The scatterplot revealed a linear path to the data, without outliers. The possibility of restriction of scores on the techniques data makes an attenuated result a possible concern. The correlation ($r = .31$, $p = .01$, $r^2 = .10$) displayed the positive relationship found in this study between performance improvement and number of verbalized practice techniques, indicating 10% shared variance between the two data sets.

For Research Question 2, to identify trends in students' 5-minute practice behaviors, the primary researcher inductively analyzed participant practice through the constant comparative method (Glaser & Strauss, 1967) to determine trends in practice behaviors. The constant comparative method is used to take extensive contextual data and condense the data into concise categories. Glaser and Strauss methodologically advocated that "while coding an incident for a category, compare it with the previous incidents in the same and different groups coded in the same category" (1967, p. 106). The second author served as an external auditor to assess and confirm the assigned categories.

After analysis of the practice behaviors across all participants, two global and mutually exclusive types of practicers were determined: "holistic" practicers and "analytic" practicers. Holistic practicers played the exercise straight through repeatedly, after their initial baseline performance of the exercise. Analytic practicers systematically broke the exercise down, either by stopping at a difficult section and applying remedial techniques or specifically pinpointing a difficult section for practice after their initial baseline performance of the exercise. Thirty-three participants were categorized as holistic practicers, and 32 participants were categorized as analytic practicers.

Within each of the two categories, participants were further divided into two mutually exclusive subgroups. Within the category of holistic practicers ($n = 33$), there was a group of 16 participants whose practice behavior showed a trend of starting at the beginning of the exercise and playing the exercise without stopping for errors. These "noncorrective" subgroup participants made no attempt to remedy errors while they continuously played the exercise. Skills were so low for 4 of these 16 participants that they only made it through the exercise once, even without fixing anything. Eight of these participants used practice techniques of either psychomotor (fingering) practice or silent study during their practice session. The mean gain practice score for these 16 participants was .37 ($SD = .81$), with an initial baseline mean of 15.63 ($SD = 4.91$) and a final performance mean of 16.00 ($SD = 5.27$).

Also within the category of holistic practicers ($n = 33$), there was a subgroup of 17 participants whose practice behavior showed a trend of corrective understanding. These "corrective" subgroup participants played the exercise from start to finish multiple times, but stopped and restarted when an error made it difficult to continue. When the errors weren't distinct enough to cause the participants to

need to stop, the participants would continue on, playing the exercise multiple times. Any improvements were made during the contextual practice of the exercise, therefore, as opposed to practicing the measures out of context. The mean gain practice score for these 17 participants was 3.29 (SD = .64) with an initial baseline mean of 21.47 (SD = 6.89) and a final performance mean of 24.76 (SD = 6.59).

Within the category of analytic practicers (n = 32), there was a "reactive" subgroup of 13 participants whose practice behavior showed a trend of starting the exercise at the beginning and stopping to intentionally repeat 2- to 8-measure sections as difficulties were noted. The number of repetitions of troublesome measures ranged from 1 to 4 times. All these participants initially approached their practice by playing and fixing straight through the exercise; in the last minute of practice, 5 of the participants jumped to various sections for spot-check improvements. One practicer used the technique of playing slowly and then increasing the tempo. All other practicers used rehearsal of small sections as their major practice technique. The mean gain practice score for these 13 participants was 7.08 (SD = 1.93) with an initial baseline mean of 22.54 (SD = 5.21) and a final performance mean of 29.62 (SD = 10.53).

Also within the category of analytic practicers (n = 32) was a subgroup of 19 participants whose practice behavior showed a trend of jumping to challenging sections at the very beginning of their practice time. Most of these "proactive" practicers (n = 16) did not start at the beginning of the exercise when starting their practice. Fourteen of the 16 participants who jumped to a specific section to begin their practice chose the more technical "B" section of the exercise as their highest practice priority. Three participants started at the beginning of the exercise, jumping to a different section within the first 4 measures of the exercise. The number of intentional repetitions of troublesome measures ranged from 1 to 4 times. Specific practice techniques used by these practicers included: psychomotor (fingering) practice (n = 2), silent practice (n = 1), changing rhythms (n = 1), playing slowly and then increasing the tempo (n = 3), lip slur practice (n = 1), and change of articulation (n = 1). The mean gain practice score for these 19 participants was 6.05 (SD = .98), with an initial baseline mean of 22.42 (SD = 9.29) and a final performance mean of 28.47 (SD = 11.55).

For Research Question 3, to compare student achievement based on their practice procedures, student performance from the initial baseline performance was compared to the final performance based on the participants' self-selection of practice behavior during the 5-minute practice time. Based on sample size and power considerations, two levels of practicers were used for the independent variable (holistic and analytic) instead of the possible use of the four sublevels of practicers (two holistic and two analytic). Further research investigating the effect of all four levels of practicers using large sample sizes for each level of the independent variable would be a valuable addition to the literature.

While the data met the assumption of normality, the assumption of homogeneity of variance was violated, and hence, the data were transformed to meet the assumptions of the between-subjects analysis of variance (ANOVA) variable. For the within-subjects variable assumption, sphericity was not of concern, because there were only 2 levels of the variable. All parametric comparisons were calculated on the transformed data.

There was a significant main effect for the within-subjects variable of performance, with the final performances receiving higher mean scores than the baseline performances, F (1, 63) = 69.36, $p < .0001$, $\eta_p^2 = .52$. Using partial eta-squared as an effect-size estimate, performance accounted for 52% of the variability in the dependent measure. There was a significant main effect for the between-subjects variable of group, favoring the analytic practicers over the holistic practicers, F (1, 63) = 7.80, $p = .007$, $\eta_p^2 = .11$. Thus, group accounted for 11% of the variability in the dependent measure. The significant interaction between group and performance highlighted the greater performance improvement for the analytic group over the holistic group from the baseline to the final performance, F (1, 63) = 13.78, $p = .0004$, $\eta_p^2 = .18$. The interaction between group and performance accounted for 18% of the variability in the dependent measure.

CONCLUSIONS

Given the nature of the controlled environment of the current study, clear generalizations to other settings cannot be made. Participants may have practiced in a different way than they normally would at home; hence, the quality of practice might be different in a less-structured and less-supervised environment. The results of the current study should also be qualified because all participants were volunteers.

The positive correlation found in this study between the number of practice techniques participants could verbalize and their improvement from Performance 1 to Performance 2 is in alignment with results of previous studies that documented the benefits of musicians having multiple strategies available for practice (Da Costa, 1999; Hallam, 1998; Nielsen, 1999a; Pacey, 1993). The relatively small nature of the correlation coefficient (10% of variance explained) stresses the need for a deeper investigation of practice techniques, since, clearly, there are many other components of practice skill beyond simple technique verbalization.

The small number of strategies the participants could describe (an average of 2.57 strategies across all participants) was itself a notable finding, with repetition being the only strategy that some participants could describe. It may have been that participants in this study had been exposed to a wide variety of practice strategies but could not describe them. If, however, participants do not have a wide variety of strategies available to them, music teachers may want to consider this

basic step of learning as a component in private lesson or group-ensemble curriculum planning.

When considering the relationship between verbalization and performance improvement, one of the factors interacting with these two skills may be the participant's personality and willingness to be extroverted enough to speak with a researcher in an extended fashion. It also may be that students who know what techniques would be ideal to use while practicing don't necessarily apply those techniques when practicing. This difference between knowledge and application was found in the current study, where many students verbalized techniques that they never used in their 5-minute practice time, even though these techniques (e.g., pinpointing difficult sections or practicing slow to fast) might have been perfectly appropriate to use. Hallam (1997) also reported participants verbalizing practice procedures in an interview that the subjects did not use in their recorded practice sessions. The difference between self-report and actual technique usage in the current study may be an issue of not having enough time in their 5-minute session to purposefully use practice techniques,. Not applying remediation practice techniques may, however, be common in extended home practice as well. Further studies investigating extended contextual practice would be beneficial to more fully understand technique knowledge and application.

An additional factor that may interact with verbalization of strategies and improvement is the student's basic skill level. Based on the analysis of how students practiced, it could be seen that while some students had the cognitive wherewithal to understand practice technique usage, they simply could not get beyond the basic skill production of correct notes and rhythms to improve their overall performance scores to a great extent. Further research attempting to home in on the practice skills of those struggling with basic note and rhythm issues would be a valuable contribution to music education research.

As in the previous literature, there was a variety of practice behaviors demonstrated during the 5-minute practice session in the current study, ranging from continuously running the exercise without fixing anything (Pitts, Davidson, & McPherson, 2000) to a systematic breakdown of musical material (Chaffin & Imreh, 1997; Miklaszewski, 1989). Those participants who did not fix anything during their practice had the lowest mean gain practice score of all of the practicers. Those participants who fixed errors in their practice had the next-highest mean gain practice score, followed by those participants who jumped to challenging sections early in their practice. Last were those participants who stopped to intentionally repeat and remediate sections of the exercise.

It is not surprising that the participants with the lowest mean gain practice score also did not fix anything. The ability to be reflective about errors may be beyond these participants' basic skill level. While they may see their teachers start and stop when errors happen, they may not be able to detect the errors in order to know when to stop.

Also, they may not have experienced specific practice strategies designed to improve note and rhythm errors, since many teachers may assume that this form of instructional sequencing would have happened in first year band or at home for the student to "woodshed" on his or her own.

The group that might be labeled the most analytic—the participants who jumped to the challenging sections early in their practice—did not also have the highest mean improvement score. It may be that participants who approached the exercise in a linear and systematic way felt the most grounded in the music and were thus best able to improve. The amount of repetition and context needed before analysis and remediation can be useful may indeed vary greatly across individuals.

The participants who jumped to the challenging sections early in their practice did have a notable characteristic about their practice. These participants used the greatest variety of practice techniques of all the participants, including the commonly cited technique of playing slowly and then increasing the tempo (Barry & McArthur, 1994; Rohwer, 2002). The finding that proactive practicers used a variety of techniques to remediate errors in place of the practice technique of extended repetition was also noted for analytic practicers by Hallam (1995).

The lowest-scoring holistic, noncorrective practicers who continuously played the exercise without fixing anything also had notable techniques in their practice. These participants tended to use silent practice techniques of silent study and psychomotor (fingering) practice more than the other participants in the study. It may be that these participants needed the extra remediation steps that the silent practice techniques provided before they could approach the exercise repetitively. These students may also have been avoiding repetitive practicing that did not lead to a feeling of improvement. Clearly, more research is needed to understand the thought processes of low-skilled practicers. Field dependence and feelings of self-efficacy may be two additional variables for further research to investigate when considering low-skilled, holistic, noncorrective practicers.

The finding that those who approached their practice analytically improved significantly more than those who approached their practice holistically aligns with past research that has found that professional musicians tend to practice systematically (Chaffin & Imreh, 1997; Miklaszewski, 1989). Novice musicians tend to practice less intentionally, with more playing from the beginning to the end of an exercise (Pitts, Davidson, & McPherson, 2000). Even within more advanced professionals, however, Hallam (1995, 2001a, 2001b) noted a wide variety of practice approaches, highlighting the possible need to tailor instruction on how to practice to each individual learner. As in this study, context was more important for some practicers in their analytic practice, and less important for others.

Since analytic practicers did improve their performances more than holistic practicers, it may be important to consider how students

could receive more training in analytic practice procedures. Hewitt (2001) found that self-evaluation alone did not improve student performance scores. Reflective modeling may serve as a viable, contextual, and authentic tool in teaching a variety of analytic practice protocols that would be commonly used by advanced musicians. For instance, when stopping for an error during a lesson or rehearsal, an educator could first have the students consider whether they heard an error and can identify it, and then discuss ways to remediate the error. While this procedure may be more time-consuming than the teacher simply fixing the problem, students may benefit from exposure to a variety of procedures that could enable them to approach practice more systematically and successfully.

REFERENCES

Barry, N. H. (1992). The effects of practice strategies, individual differences in cognitive style, and gender upon technical accuracy and musicality of student instrumental performance. *Psychology of Music, 20,* 112–123.

Barry, N. H., & McArthur, V. (1994). Teaching practice strategies in the music studio: A survey of applied music teachers. *Psychology of Music, 22,* 44–55.

Chaffin, R., & Imreh, G. (1997). Pulling teeth and torture: Musical memory and problem solving. *Thinking and Reasoning, 3,* 315–336.

Chaffin, R., & Imreh, G. (2001). A comparison of practice and self-report as sources of information about the goals of expert practice. *Psychology of Music, 29,* 39–69.

Da Costa, D. (1999). An investigation into instrumental pupils' attitudes to varied, structured practice: Two methods of approach. *British Journal of Music Education, 16,* 65–77.

Davidson, J. W., Sloboda, J. A., & Howe, M. J. A. (1996). The role of parents and teachers in the success and failure of instrumental learners. *Bulletin of the Council for Research in Music Education, 127,* 40–44.

Ericsson, K. A., Krampe, R. T., & Tesch-Romer, C. (1993). The role of deliberate practice in the acquisition of expert performance. *Psychological Review, 100,* 363–406.

Glaser, B. G., & Strauss, A. L. (1967). *The discovery of grounded theory.* Chicago: Aldine.

Gruson, L. M. (1988). Rehearsal skill and musical competence: Does practice make perfect? In J. A. Sloboda (Ed.), *Generative processes in music: The psychology of performance, improvisation, and composition* (pp. 91–112). Oxford, UK: Oxford University **<<Press?>>**.

Hallam, S. (1995). Professional musicians' orientations to practice: Implications for teaching. *British Journal of Music Education, 12,* 3–19.

Hallam, S. (1997). Approaches to instrumental music practice of experts and novices: Implications for education. In H. Jorgensen & A. C. Lehmann (Eds.), *Does practice make perfect? Current theory and research on instrumental music practice* (pp. 89–107). Oslo: Norges Muikkhogskole.

Hallam, S. (1998). The predictors of achievement and dropout in instrumental tuition. *Psychology of Music, 26,* 116–132.

Hallam, S. (2001a). The development of expertise in young musicians: Strategy use, knowledge acquisition and individual diversity. *Music Education Research, 3,* 7–23.

Hallam, S. (2001b). The development of metacognition in musicians: Implications for education. *British Journal of Music Education, 18,* 27–39.

Henley, P. T. (2001). Effects of modeling and tempo patterns as practice techniques on the performance of high school instrumentalists. *Journal of Research in Music Education, 49,* 169–180.

Hewitt, M. P. (2001). The effects of modeling, self-evaluation, and self-listening on junior high instrumentalists' music performance and practice attitude. *Journal of Research in Music Education, 49,* 307–322.

Jorgensen, H. (2002). Instrumental performance expertise and amount of practice among instrumental students in a conservatoire. *Music Education Research, 4,* 105–119.

Lehmann, A. C., & Ericsson, K. A. (1997). Research on expert performance and deliberate practice: Implications for the education of amateur musicians and music students. *Psychomusicology, 16,* 40–58.

Madsen, C. K., & Geringer, J. M. (1981). The effect of a distraction index on improving practice attentiveness and musical performance. *Bulletin of the Council for Research in Music Education, 66 & 67,* 46–52.

McPherson, G. E. (2000/2001). Commitment and practice: Key ingredients for achievement during the early stages of learning a musical instrument. *Bulletin of the Council for Research in Music Education, 147,* 122–127.

McPherson, G. E., & McCormick, J. (1999). Motivational and self-regulated learning components of musical practice. *Bulletin of the Council for Research in Music Education, 141,* 98–102.

McPherson, G. E., & Renwick, J. M. (2001). A longitudinal study of self-regulation in children's musical practice. *Music Education Research, 3,* 169–186.

Miklaszewski, K. (1989). A case study of a pianist preparing a musical performance. *Psychology of Music, 17,* 95–109.

Nielsen, S. (1999a). Learning strategies in instrumental music practice. *British Journal of Music Education, 16,* 275–291.

Nielsen, S. (1999b). Regulation of learning strategies during practice: A case study of a single church organ student preparing a particular work for a concert performance. *Psychology of Music, 27,* 218–229.

Nielsen, S. (2001). Self-regulated learning strategies in instrumental music practice. *Music Education Research, 3,* 155–167.

O'Neill, S. A. (1997). The role of practice in children's early musical performance achievement. In H. Jorgensen, & A. C. Lehmann (Eds.), *Does practice make perfect? Current theory and research on instrumental music practice* (pp. 53–69). Oslo: Norges muikkhogskole.

Pacey, F. (1993). Schema theory and the effect of variable practice in string teaching. *British Journal of Music Education, 10,* 91–102.

Pitts, S., Davidson, J., & McPherson, G. (2000). Developing effective practice strategies: Case studies of three young instrumentalists. *Music Education Research, 2,* 45–56.

Puopolo, V. (1971). The development and experimental application of self-instructional practice materials for beginning instrumentalists. *Journal of Research in Music Education, 19,* 342–349.

Renwick, J. M., & McPherson, G. E. (2002). Interest and choice: Student selected repertoire and its effect on practicing behavior. *British Journal of Music Education, 19,* 173–188.

Rohwer, D. (2002). Understanding practice: An investigation and applications. *Music Education International, 1,* 15–25.

Rosenthal, R. K., Wilson, M., Evans, M., & Greenwalt, L. (1988). Effects of different practice conditions on advanced instrumentalists' performance accuracy. *Journal of Research in Music Education, 36,* 250–257.

Rusch, H. W. (1963). *Advanced band method.* Winona, MN: Hal Leonard.

Saunders, T. C., & Holahan, J. M. (1997). Criteria-specific rating scales in the evaluation of high school instrumental performance. *Journal of Research in Music Education, 45,* 259–272.

Sloboda, J. A., & Howe, M. J. A. (1991). Biographical precursors of musical excellence: An interview study. *Psychology of Music, 19,* 3–21.

Sloboda, J. A., Davidson, J. W., Howe, M. J. A., & Moore, D. G. (1996). The role of practice in the development of performing musicians. *British Journal of Psychology, 87,* 287–309.

Wagner, M. J. (1975). The effect of a practice report on practice time and musical performance. In C. K. Madsen, R. D. Greer, & C. H. Madsen, Jr. (Eds.), *Research in music behavior* (pp. 125–130). New York: Teachers College Press.

Williamon, A., & Valentine, E. (2000). Quantity and quality of musical practice as predictors of performance quality. *British Journal of Psychology, 91,* 353–376.

Zurcher, W. (1975). The effect of model-supportive practice on beginning brass instrumentalists. In C. K. Madsen, R. D. Greer, & C. H. Madsen, Jr. (Eds.), *Research in music behavior* (pp. 131–138). New York: Teachers College Press.

Submitted February 20, 2006; accepted November 2, 2006.