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## Effects of practice strategies, metronome use, meter, hand, and musical function on dual-staved piano performance accuracy and practice time usage of undergraduate

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EFFECTS OF PRACTICE STRATEGIES, METRONOME USE,  
METER, HAND, AND MUSICAL FUNCTION  
ON DUAL-STAVED PIANO PERFORMANCE ACCURACY  
AND PRACTICE TIME USAGE  
OF UNDERGRADUATE NON-KEYBOARD MUSIC MAJORS

A Dissertation

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Doctor of Philosophy

in

The School of Music

by  
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## ABSTRACT

The purposes of this study were: 1) To assess the effects of practice strategies, metronome, meter, hand, and musical function on piano performance accuracy of undergraduate music majors enrolled in piano class ( $N=39$ ), and 2) To assess the effects of practice strategies on practice time relative to two unfamiliar pieces of keyboard music. Throughout an eight-week training session, treatment subjects were provided strategies for practicing unfamiliar pieces of keyboard music and were allowed time in class to apply the strategies while practicing. Strategies included score analysis, isolating hand position shifts, practicing unfamiliar chords, practicing measures with accidentals, and using the metronome to provide a slow practice tempo. Control subjects practiced the same pieces but were not taught the strategies.

Pretests and posttests were conducted. Subjects were randomly assigned one piece with right hand melody and one piece with left hand melody. Half of treatment and half of control subjects were selected randomly to perform pretest and posttest pieces with the metronome set to 60 beats per minute. Following each 8-minute practice session, subjects performed each selection.

Analyses of pretest and posttest performance data revealed main effects of test (posttest scores were higher than pretest scores with regard to pitch, rhythm, and beat), function (melody scores were better than accompaniment scores with regard to pitch), and meter (scores on the piece in 2/4 were higher than scores on the piece in 3/4 with regard to rhythm and beat consistency). Significant interactions among group and metronome; test, meter, and group; and meter and metronome were detected. No significant differences in pitch, rhythm, or beat consistency accuracy between groups due

to the practice strategies were detected. Analysis of posttest practice sessions revealed that subjects spent the majority of their practice time performing the given selections at the piano, and the least amount of practice time analyzing the scores. Treatment subjects used score analysis techniques presented during treatment, but their practice did not reflect the strategies listed on their scores. Subjects in both groups devoted most of the performance aspect of their practice sessions to practicing both hands together.

## CHAPTER 1

### INTRODUCTION AND REVIEW OF LITERATURE

#### Introduction

Degree requirements for undergraduate non-keyboard music majors include successful completion or testing out of a multi-semester sequence of group piano. These group piano classes are designed to guide students to acquire functional piano skills such as sight-reading, harmonization, transposition, score reading, and improvisation. The empirical literature addressing these issues in the group piano setting is a small but increasing body. Students at most institutions are expected to exhibit a functional level of competence in all of these areas by passing performance examinations throughout the group piano sequence and a proficiency examination at the end of the sequence.

Results of a recent survey indicated that accompanying and score reading were considered to be the two most important functional piano skills for music education students (Christensen, 2001). Results of another survey suggested that sight-reading and harmonization would be potentially more useful to students than other skills presented in piano class (Chin, 2002). Smith (1979) found that 65% of practicing music teachers reported a “great need” for keyboard facility at their respective work places, while 26% of those surveyed reported that keyboard facility was a “moderate need” (p. 107). Timmons (1980) found that music graduates were experiencing difficulty meeting keyboard expectations (e.g., accompanying, sight-reading, improvisation, transposition) in the public schools. Hence, instruction in the aforementioned areas is indispensable for students who will one day rehearse a choir or band and will play multiple voice parts, instrumental solo or ensemble lines, the piano reduction of an instrumental score, or

accompany a choir. It is also considered essential for those who will be teaching music theory, score analysis procedures, or applied lessons.

Members of undergraduate piano classes come from varying backgrounds of music study. Within each of these classes are students with differing levels of training in piano and in music study as a whole. These students are at minimum modestly accomplished musicians with eight or more years of experience on a major instrument, but they may be beginners on the piano. Others may have had a few years of piano lessons as children or teenagers before enrolling in college. Still others may be talented but relatively new to music study. With the wide range of prior music training come varying levels of music reading and performance ability.

For the group piano student, performance opportunities at the piano generally include solo repertoire, sight-reading, harmonization, transposition, and score reading activities. Within these performances, numerous hindrances may occur. A number of these students are accustomed to reading a single staff rather than the two staves they must read in piano class. Some students are unable to read bass or treble clef (or both) fluently. It is a challenge for many of these students to process simultaneously two hands playing multiple pitches on two staves. They often encounter difficulty when reading pitches in groupings and have problems playing melodies with chordal accompaniments. They frequently perform selections at an unreasonably fast tempo, contributing to errors in pitches or rhythms, or disrupting the beat continuity of the pieces. These issues become performance obstacles for group piano students, often leading to frustration or anxiety.

In the college group piano classroom, it is a common assumption that because these students are majoring in music, they know how to practice. Often, they have trouble

transferring practice skills developed on a major instrument to the piano, or they may tend to practice at a tempo that is too fast for them to sustain accurately. Students may not have adequate time to devote to practicing the piano because time is limited. Hence, it is crucial that these students develop the skill to practice efficiently.

Aside from simply not practicing or neglecting instructions given to them by teachers during lessons, students may not realize that what they do during practice does not necessarily constitute quality practicing, or that quantity of practice does not equal quality of practice (Williamon & Valentine, 2000). For example, practicing with many correct repetitions is a logical and sound means of achieving success at the piano. However, playing the entire piece from beginning to end over and over again regardless of errors is neither efficient nor effective (Barry & Hallam, 2002). Many factors influence students' understanding and act of practicing. Oftentimes, teachers give instructions during lessons and expect students to understand and apply them during practice. In reality, perhaps students do not understand what the teachers say or why it is applicable to them at all. They may be told to practice hands-separately, for example, so they willingly oblige all week long, never attempting to put the hands together. They misunderstood in this case that practicing hands-separately is a means to the end of playing hands-together, rather than an end in and of itself. Clearly, practicing in a manner that leads expediently to success is desirable.

Many students likely are left to their own devices when practicing, getting little or no guidance from teachers. The information that teachers give to students must be specific rather than general or vague (Duke, 2001; Price, 1983). It is important that teachers do not rely solely on practice instructions such as “work harder” or “practice

longer.” Practice tactics such as using the metronome, hands-separate practice, slow practice, and repetition are common to the teacher’s repertoire (Barker, 2002; Nelson, 2002; Pace, 1992; Pearce, 2002; Roberson, 1993). However, these techniques sometimes seem foreign to students who struggle when learning new pieces. Teaching students how to use these strategies to help them practice efficiently is a vital part of any music curriculum (Barry & McArthur, 1994). Whether students are second grade beginning piano students or undergraduate music majors, they require guidance as they begin practicing instruments with which they are unfamiliar. Giving them a means of finding a problem, teaching them to use a specific technique to fix it, and having them evaluate their own playing are steps to teaching them how to learn on their own and become independent musicians.

There is a growing body of research in piano pedagogy isolating obstacles to performance success. Because little empirical research exists to guide the pedagogue in training students to practice, the present study serves to identify inhibitors of performance success and suggest strategies for improving practice.

### Review of Literature

This review of the literature begins by addressing selected theories and taxonomical structures of learning, the purpose of which is not to provide an exhaustive or in-depth review. It is instead to frame the current study – its purpose, methodology, and ultimately results – in a theoretical context or contexts. Though the current study is not theory-based, elements of it are consistent with ideas of Edwin Guthrie, Clark Hull, B. F. Skinner, Jerome Bruner, Alfred North Whitehead, and Benjamin Bloom.

Successful accomplishment of tasks or goals often is dependent on previous learning. Many documents have been written in an attempt to establish models and theories of how people learn. Guthrie (1952), an early behaviorist, believed that learning consisted of forming habits. His belief stressed the replacement of bad habits with good ones. The relevance of habit formation to performance-based music learning can be observed, for example, when musicians replace an incorrect pitch with a correct pitch during practice sessions. Hence, treatment in the current study stresses the importance of forming correct habits during practice.

Skinner (1968) supported the study of observable behavior. He held the view that learning took place via stimulus-response associations wherein the learner had to act to produce the response. He believed that learning should be structured and sequenced and should proceed via correct repetition in small sequential steps. In the private music studio or group piano classroom, requiring students to apply correct repetition to pieces within a structured lesson format is an ideal means of teaching them to practice. Therefore, treatment in the current study includes application of correct repetition to selected practice pieces on a daily basis.

Hull (1943) believed that learning was goal-oriented. His view of learning consisted of incremental steps towards a goal and that as the goal became closer, the learner's responses became more active. Incremental steps towards a larger goal is a frequently-used process in the music setting. For example, performers use small steps towards a goal to prepare small sections of pieces at a slow tempo during practice sessions, eventually working to play the pieces in their entirety at the performance tempo.

Thus, incremental acceleration from practice to performance tempos is an important aspect of treatment in the current study.

Bruner (1960), a cognitive theorist, believes in the ideas of structure in learning, readiness to learn, and desire to learn. He also believes that learning is transferable from one situation to another. In his spiral curriculum, the learner is presented with general principles, but more complex applications of these principles spiral from the general presentation of the principles. In the group piano setting, it is common for students to have an initial desire to learn to play the piano and a readiness to learn. However, they do not always know how to structure their approach to learning music. Consequently, they frequently encounter difficulty when left to their own devices in the practice room as they teach themselves during practice sessions. The more structure instructors can provide for these students, whether in the classroom or the practice room, the greater the possibility of increasing students' ability to learn and transfer information from one setting to another. Hence, the structured presentation of practice strategies to treatment subjects is a major aspect of the current study.

Writers and researchers in the music field have attempted to base their findings on these and other theories. Sosniak wrote of three stages of learning that were experienced by concert pianists (Bloom, 1985). After identification of these phases, Sosniak related them to the longitudinal stages of learning in Alfred North Whitehead's (1929) *The Aims of Education*. Whitehead defined the three stages of learning as romance, precision, and generalization. The first phase, romance, occurs during the elementary years and includes enjoyment at the piano, constant encouragement by parents, and informal instruction by kind teachers. Beginning group piano students chronologically are well beyond the age



group included in the romance phase and often are forced to skip this phase altogether. The second phase, precision, occurs during the middle school years and includes intense attention to detail by both student and teacher. Group piano students often begin their study of piano in this phase, with emphasis on performing accurately. The third stage, generalization, includes the importance of personal expression at the piano, and occurs from the late teenage years to the early twenties. This fits the chronological ages of most group piano students, but because of time constraints they are not skilled enough for the generalization phase at this point in their piano studies.

Gagné (1965), a leader in educational thought with influence in music education, believes that learning cannot fully be explained by theories. He does, however, believe that learning takes place under certain conditions, with the most simplistic being signal learning, and the most sophisticated being problem solving. According to Gagné, a number of conditions are required for problem solving to occur: formulating a goal, recalling relevant principles, combining relevant principles to form a new principle, and arriving at a solution. “Problem solving results in the acquisition of new ideas that multiply the applicability of principles previously learned. Learning by problem solving leads to new capabilities for further thinking” (p. 57). In the music field, practicing consists of frequent acts of problem solving. Piano students must work out problems such as performing a passage with frequently changing harmonies, a passage in which the hands move up or down the keyboard, or a passage containing added accidentals. They may also encounter problems such as how to maintain a steady tempo or how to achieve a continuously steady beat during practice. Once students discriminate that problems occur and identify where those problems occur, they are ready to begin solving them.

Unfortunately, according to Uszler (2000), problem solving skills are not utilized in piano lessons as often as they should be. Therefore, problem solving skills are included as an aspect of treatment in the current study.

In addition to learning theories and conditions that have attempted to describe the learning process, the Taxonomy of Educational Objectives was developed to “provide for classification of the goals of our educational system” (Bloom, 1956, p. 1). The taxonomy includes three domains: cognitive, which deals with the “recall or recognition of knowledge and the development of intellectual abilities and skills,” affective, which describes “changes in interest, attitudes, and values, and the development of appreciations,” and psychomotor, which deals with motor skills (Bloom, 1956, p. 7). Music students engage all three domains when learning a new piece of music. They use cognitive skills to solve problems, they use affective skills to form opinions of pieces, and they use psychomotor skills to practice pieces. The current study involves both the cognitive and psychomotor domains. Daily treatment sessions require subjects to utilize their cognitive abilities for score analysis procedures, and as they learn, discriminate among, and apply practice strategies. Subjects use their psychomotor skills, especially finger movement, while practicing and performing daily selections.

### Performance

This review of the literature continues by addressing sight-reading, error-detection, and dual-staved keyboard music. Because these selected elements play a central role in the acquisition of music reading skills, specifically in the group piano classroom, the enhancement of teaching and learning in these areas is critical to student success. Because group piano students are faced with these and other tasks throughout

their musical development, the following section approaches sight-reading, error-detection, and dual-staved music reading as they have been covered in the literature.

One of the chief objectives of group piano classes is to help students develop ease in learning to read and perform dual-staved music at the piano. Because many of the students enrolled in these classes have never been required to read dual-staved music, they often consider sight-reading to be one of the greatest performance challenges with which they are faced throughout the group piano curriculum. Some students will be asked to play traditional selections such as patriotic songs, school spirit songs, or holiday songs at school functions. Others may be required to accompany their own students during lessons, at festivals, or at competitions. Performing these dual-staved piano works with a minimal amount of rehearsal time and maximum accuracy will be an essential responsibility for many of these students. Consequently, sight-reading, practicing, and performing dual-staved music efficiently and accurately when given a limited rehearsal time are basic components of the group piano sequence. The current study is guided by research and expert opinion on keyboard performance issues including sight-reading, reading dual-staved keyboard music, error detection in performance, and the role of the eyes in music reading.

A survey by Lowder (1983) directed college faculty and in-service teachers to rank 17 keyboard skills on a scale from 1 (least important) to 6 (most important). Results revealed sight-reading to be the second-most important piano skill. In the group piano setting, undergraduate non-keyboard music majors enrolled in piano class ranked sight-reading as a skill they valued highly but had difficulty understanding (Kostka, 1997). Results of a survey of piano teachers certified by the Music Teachers National

Association (Hardy, 1992) indicated that sight-reading is not being addressed regularly. Sixty-six percent of those surveyed reported teaching sight-reading in lessons, but only 47% reported teaching sight-reading weekly. Responders conveyed reluctance to teach sight-reading because it was not specifically outlined in elementary piano course books.

Sight-reading is a skill that musicians exercise regularly, and one of a pianist's most important skills (Craige, 1993). Components of sight-reading as established by Hunter (1973) include duet and ensemble sight-reading, daily reading of unfamiliar music, reading of single-line music such as band or vocal scores, pre-analysis of the selection's tonal plan, looking ahead, and maintaining a pre-established tempo (p. 23). Several predictors of successful sight-reading have been identified, including experience in sight-reading, field independence, a thinking personality type (Kornicke, 1995), and experience in accompanying (Lehmann & Ericsson, 1996). Additionally, sight-reading skill can increase significantly following practice (Lehmann & Ericsson, 1993). Other factors that seem to be linked to sight-reading success include prior choral, keyboard, or instrumental experience (Demorest & May, 1995), scanning the selection before playing it to identify difficult sections or patterns in the score (Stebbleton, 1987), chunking, or grouping units of information (Dodson, 1983; Hodges, 1992), and engaging in group instruction that is systematic and structured (Cassidy, 1993). Waters, Townsend, and Underwood (1998) speculated that good readers are able to make more accurate predictions of music in the upcoming measures.

Students at all levels encounter various problems when sight-reading at the piano. Many of these difficulties stem from rhythm inaccuracies, the inability to continue playing after a mistake occurs, stopping at every barline, or problems processing two

staves simultaneously. Part of the problem could be attributed to the lack of focus exhibited by some students as they read a piece of music for the first time (Chronister, 1992), or that students begin at too fast a tempo to maintain accuracy throughout (Guhl, 1992). Students also may have problems knowing what to look at as they sight-read dual-staved music. Eye skills such as looking ahead to the next measure or using peripheral vision to see more of the score could contribute to effective music reading (Price, 1994).

Results of eye movement studies by Goolsby (1989, 1994a, 1994b) revealed that the appearance of music notation (e.g., placement of pitches, dynamics, articulation, breath marks) on the score affects the way sight-readers see it. Subjects in his studies used fewer and shorter fixations (“the pause of the eyes while reading melodies,” 1994a, p. 70) when looking at the notation on scores in which the notation was closely spaced than scores in which the notation was spaced further apart. Goolsby’s studies (1994a, 1994b) also found that skilled sight-readers use shorter fixations than less skilled readers, exhibit more eye movement than less skilled readers, look farther ahead in the music than less skilled readers, and may be looking ahead to see where the melody is going. His later study (1994b) concluded that less skilled readers use long fixations to look at each note of the melody, but skilled readers fixate on all areas of the notation, rather than on each note. His study also revealed that a large number of fixations of skilled and less skilled readers were directed to barlines and areas between notes where no visual information was available.

Piano pedagogues have offered a variety of suggestions for improving sight-reading skills. Some offered practice techniques such as covering piano students’ hands while they sight-read to inhibit glancing back and forth between the keyboard and the

hands (Eaton, 1994; Lapp, 1995). Others maintained that students should have a solid understanding of the rhythm of a piece before attempting to play it at the keyboard (Jones, 1995; Wood, 1995). Jones (1995) offered pre-performance strategies such as clapping and counting aloud, “playing” the piece in the air while counting aloud, and playing the piece on the keyboard while counting aloud. Other sight-reading suggestions included using peripheral vision to show students that they can see their hands on the keys without actually looking down at them, using black keys for tactile awareness of keyboard topography (Berenson, 1996; Pace, 1999a), and finding patterns in the score before playing the piece (Eaton, 1994; Pace, 1999a). Solutions for maintaining the metrical integrity of a piece during sight-reading were suggested by Wood (1995). Students had a tendency to hesitate at barlines in pieces with a meter of 3 more frequently than in pieces with a meter of 4. Wood offered solutions such as conducting a 3/4 pattern while counting aloud and tapping the rhythm of a sight-reading piece on the fallboard of the piano before sight-reading the piece. Other strategies for successful sight-reading include spending time in sight-reading, playing duet and ensemble repertoire, reading from instrumental ensemble scores, and forcing the eyes to move smoothly and steadily across the page (Eaton, 1994; Fuszek, 1994; Lowder, 1974; Price, 1994).

Various types of training can improve sight-reading (Streckfuss, 1984; Watkins & Hughes, 1986). Grutzmacher (1987) indicated that among fifth and sixth grade band students, harmonization and vocalization activities featuring 20 tonal patterns (major and minor patterns such as do-mi-sol and la-do-mi) improved sight-reading more than traditional sight-reading activities in which the students read directly from the score without engaging in harmonization or vocalization. Bozone (1986) indicated that among

university second-semester group piano students, those using sight-singing as a study aid for sight-reading at the piano scored significantly higher than those who did not. It also has been reported that better sight-readers had more sight-reading practice than less-skilled sight-readers (Banton, 1995). Subjects who reported practicing sight-reading on a somewhat frequent basis incurred less melodic errors on reading tasks than subjects who reported rarely practicing sight-reading.

Various methods of teaching sight-reading have been explored throughout the research community. In the undergraduate piano classroom, Kostka (2000) compared three methods of teaching sight-reading: error-detection practice (listening to a recorded example containing errors and visually following along on a correct copy of the score) plus shadowing (lightly touching the piano keys without depressing them completely), shadowing only, and self-guided independent practice. Results of her study showed that there were no significant differences among groups due to treatment. However, pitch and rhythm scores increased from pretest to posttest, while hesitation scores did not improve from pretest to posttest. It is possible that subjects in this study and in others (Betts & Cassidy, 2000; Cassidy, Betts, & Hanberry, 2001) sacrificed beat continuity for accuracy in other areas of their performances. Contrastingly, freshman group piano students in a sight-reading study by Lowder (1974) committed many pitch errors at barlines, generally accompanied by rhythm errors, at the expense of beat continuity. Hardy (1995) indicated that students stop to correct errors when sight-reading, rather than maintaining beat continuity. It has been theorized that students who sacrifice the continuity of the steady beat would benefit from efficient ways to practice and perform music gleaned from

further research. Lehmann and McArthur (2002) suggested sight-reading with the metronome, MIDI recordings, or an ensemble to facilitate increased beat continuity.

Beeler (1995) examined the effects of interval prestudy (studying melodic intervals within a piece before sight-reading it) and a cue for rhythmic continuity (sight-reading with a metronome or digital sequencer accompaniment) on group piano students' sight-reading achievement. Sight-reading performances of subjects in four groups – sight-reading with interval prestudy, sight-reading with digital sequencer accompaniment, sight-reading with a combination of the two, and sight-reading with neither – were graded on pitch, rhythm, and beat accuracy. Results of this research indicated that sight-reading with accompaniment improved both rhythm and beat continuity scores, and that rhythm scores improved through silent prestudy as well. It is possible that using a metronome or digital sequencer accompaniment during sight-reading or practicing could, in fact, increase rhythm accuracy and beat consistency.

Comparing high school instrumentalists who scored in the top 25% of those who completed a sight-reading task to students who scored in the bottom 25% on the same task offered insight into factors that influenced their sight-reading (McPherson, 1994). Of the 101 subjects in the study, eight low-scoring sight-readers were asked to describe their thought processes immediately preceding their performances. Only two of these low-scoring subjects referred to looking at key or time signatures. Others mentioned identifying the starting note or singing the rhythm of the first measures. Eight high-scoring sight-readers who were questioned responded that they looked at the key and time signatures and stated them out loud, looked throughout the music for difficult sections, and fingered those sections on their instruments. McPherson also stated that



many of the poorest sight-readers seemed unable to process what they were seeing on the page; contrastingly, the best sight-readers had greater success in predicting what was to come in the music and physically were more coordinated than the poorer sight-readers. McPherson then suggested a brief period of mental rehearsal before sight-reading a piece of music, followed by self-evaluation throughout the performance in order to correct performance errors as they occur.

Kornicke (1995) recommended that the teacher provide students with a list of drill sequences to aid in increased recognition of notes, chords, and melodic and rhythmic patterns. She believed that focusing the students' attention on those details would help the student learn to discover musical patterns in the score that would contribute to improved sight-reading. Because there is no formal guide for improvement in reading dual-staved music at the keyboard, further research is necessary.

Although there is limited research on error detection at the piano as it relates to the group piano student, further investigation guiding students to locate errors in performance may contribute to greater efficiency in practice time. Music teachers spend a great amount of lesson and rehearsal time listening to student performances. During these performances, teachers listen for inaccuracies in areas such as pitches, rhythms, beat continuity, and interpretation. All music students who are studying to become music teachers and intend to teach in the classroom or studio must also learn to error detect and accurately assess student performances as well as their own. A survey of music teachers, music consultants, and music faculty revealed that error detection ability ranked as one of the most important skills that they used in teaching (Taebel, 1980).

Many research efforts to examine the complexities of error detection have been conducted in recent years. Results of this research have indicated that students are better at detecting errors in rhythms than pitches (Byo, 1993, 1997; Sheldon, 1998), and that students with keyboard and theory background are better at error detection than those who do not have similar previous experiences in piano and theory (Hodges, 1992). Computer-assisted instruction also seems to improve error detection abilities of graduate and undergraduate music students (Deal, 1983; Gruner, 1993; Jones, 1990). Training (Stwolinski, Faulconer, & Schwarzkopf, 1988) and practice in aural perception (Byo, 1993, Sheldon, 1998) can improve error detection ability. Additionally, listening to accurate aural examples while viewing a score seems to be more effective than score study alone in preparing subjects to detect pitch and rhythm errors (Crowe, 1996).

Kostka (2000) studied the effects of error detection practice on keyboard sight-reading achievement of undergraduate music majors enrolled in piano class. Subjects listened to three performances of a pre-recorded piano piece while visually following on the score. Subjects were informed that each recording contained three performance errors, but the score was accurate. Results of her study (the error detection group improved more than other groups) suggested that error detection practice might contribute to improved sight-reading at the piano.

The role that the hands play in reading dual-staved music is of great importance. Many music majors who are excellent musicians and accomplished performers on their primary instruments often encounter immense difficulty when faced with keyboard music that requires simultaneous use of both hands on separate staves. One pedagogue proposed that this is because students are focusing their complete attention on only one staff

instead of both (Pace, 1999a). He offered solutions such as reading exercises in contrary motion and pattern recognition on both treble and bass staves. Pace suggested that when students were challenged with the vertical issue of a melody and accompaniment on separate staves, complete and instantaneous recognition of chords and their location on the keyboard would help students keep their eyes on the score instead of searching the keyboard for the next chord. He maintained that reading problems resulted from students' insecurity with the coordination of what their eyes saw on the page and how that translated to the keyboard via specific fingers.

Several studies (Furneaux & Land, 1999; Sloboda, 1974; Truitt, Clifton, Pollatsek, & Rayner, 1997) have been conducted on the eye-hand span, "the separation between eye position and hand position when sight-reading music" (Furneaux & Land, 1999, p. 2435). Furneaux and Land gathered data on dual-staved sight-reading and found that pianists read the two staves independently, focusing on one hand at a time. Professional pianists were more capable of reading larger groupings of information at a time than were amateur pianists, and therefore could read a group of right hand pitches and store them in short-term memory while simultaneously reading and playing left hand pitches. Amateur pianists were less skilled at accomplishing this task.

Betts and Cassidy (2000) gathered investigative data on the ability of undergraduate non-keyboard music majors to sight-read and harmonize dual-staved melodies at the keyboard. Results showed that the right hand was significantly more accurate with pitches and rhythms than the left hand on sight-reading and harmonization tasks. Melodies of all examples were notated on the treble staff and were played with the right hand, and accompaniments were notated on the bass staff and played with the left

hand. Results of this study, coupled with configuration of the sight-reading and harmonization examples, raised several issues including increased left hand practice, hand dominance, the staff of the student's primary instrument, and whether placing the melody on the bass staff and the accompaniment on the treble staff would contribute to improved reading of left hand pitches.

A subsequent study by Cassidy, Betts, and Hanberry (2001) investigated the effects of structured left hand practice on piano performance accuracy of sight-reading and harmonization tasks among undergraduate non-keyboard music majors. Questions to be answered included whether increased left hand practice would contribute to improvement in left hand accuracy and whether pieces in which both melody and accompaniment were on bass staves, encouraging increased bass note reading, would be a factor in greater left hand proficiency.

Subjects were divided into treatment and control classes. During the first week of class, subjects were given a pretest containing two sight-reading and two harmonization activities, each of which they were allowed to study for sixty seconds. Treatment across the semester included, but was not exclusive to, sight-reading and harmonization activities that emphasized bass staff reading. Posttests were given at the end of the semester. Videotaped pretests and posttests were analyzed for pitch and rhythm accuracy.

Results of this study indicated a significant difference between accuracy of the right and left hands. Both left hand and right hand scores increased across the semester; however, treatment did not produce as great an increase in left hand scores as right hand scores gained without treatment. Frequent occurrences of hesitations within measures in meters of 3 and 4 as well as hesitations at barlines in a meter of 3 were noted. Further

research warranted by this study included hand accuracy in relation to melodic and harmonic function, metronome use as a guide for increasing beat continuity, and a specific amount of practice time paired with a detailed practicing plan to guide students towards efficiency during practicing. Given the moderately small amount of empirical evidence in the class piano setting, these studies serve to guide continued research.

In summary, previous research relating to performance at the piano has indicated that successful sight-reading can be predicted, that training can improve sight-reading, and that beat continuity may improve when sight-reading with a background accompaniment. Other research has suggested that error detection is an important facet of music teaching and learning, that students more readily detect errors in rhythms than in pitches, and that error detection may contribute to improved sight-reading at the piano. Research has also shown that students perform more accurately with the right hand than with the left hand, and that they often sacrifice beat continuity for pitch accuracy. Information gleaned from sight-reading research is important when minimal practice time must result in maximum accuracy. Because of the questions left unanswered by this research and the fact that not all of these studies relate directly to group piano, the present study will address these areas as they concern non-keyboard music majors in the group piano setting.

### Practicing

The review of the literature continues by focusing on elements of practicing, especially as they concern group piano students. Specifically, the areas of structuring practice, setting goals, using practice strategies, solving problems, practicing mentally, using the metronome, practicing slowly, practicing hands-separately, using repetition,

relying on motor skills, and self-evaluating will be discussed. Because the selected elements are crucial to the acquisition of efficient practicing skills, specifically in the group piano classroom, the following paragraphs emphasize their importance as they have been addressed in other texts.

Professional musicians, both performers and teachers, are continually involved in many aspects of practicing. Practicing solo repertoire, chamber and ensemble repertoire, student repertoire, and teaching students how to practice are only a few of the contexts in which practicing occurs. Mature musicians know the importance of structured daily practice and use different types of practicing to generate desired results during rehearsal sessions. In two surveys of attitudes and expectations about practicing (Kostka, 2001, 2002), a majority of music majors indicated that practicing was challenging, while a majority of their studio teachers indicated that for them, practicing was fulfilling. Results of a survey of pre-college piano students (Duke, Flowers, & Wolfe, 1997) indicated that 42% of those students liked practicing, 36% of students thought it was okay, and 17% disliked practicing.

Discussions, ideas, and studies on practicing are offered throughout music trade journals, books, and research journals. These include identifying and solving problems (Berr, 1995; Breth, 2001; Byo, in press; Minahan, 1986; Pace, 1992), organizing and structuring practice (Barry, 1992; Duke, Flowers, & Wolfe, 1997; Kostka, 2001; Pearce, 1992; Price, 1990; Puopolo, 1970), setting goals for practice (Barry, 2003; Kenny, 1998; Wolfe, 1984), slow practice (Bruser, 1997; Kraehenbuehl, 1988; Voorhies, 1988), mental practice (Coffman, 1990; Freymuth, 1994; Ross, 1985; Rubin-Rabson, 1941), using practice strategies (Barry & McArthur, 1994; Breth, 2001), using the metronome as a

practice aid (Blickenstaff, 1993), practicing hands separately (Bastien, 1995; Berr, 1995; Bruser, 1997; Chronister, 1988; Horton, 2002; Pace, 1992; Pearce, 2002), repetition in practice (Brittin, 2004; Barry & Hallam, 2002; Byo, in press; Chronister, 1988; Clark, 1992; Hallam, 1997; Pedrick, 1998; Roberson, 1993; Sitton, 1992), self-evaluation throughout practice sessions (Byo, 2001; Kostka, 1997), the effects of practice on motor skill development (Kerr & Booth, 1978; Lee & Magill, 1983; Shea, Lai, Black, & Park, 2000; Shea & Morgan, 1979), and other related types of practicing (Rosenthal, 1984; Rosenthal, Wilson, Evans, & Greenwalt, 1988). Practicing is an important and worthy topic to be explored, and a valuable area in which the continual gathering and analysis of data will serve to guide the process of music teaching and learning.

According to a recent survey of undergraduate music education majors (Byo & Cassidy, 2004), nearly three-fourths of these students reported following a structured approach to practicing. However, novices may not adhere to a specific practicing plan and may not view practicing in the same way as students who follow a structured routine. Some may approach practicing as spending a set amount of time at the instrument each day (Kenny, 1998). Others may view practicing as playing through a piece a certain number of times (Sitton, 1992). Still others may believe that practicing consists of playing a piece until it is correct only one time, after playing it incorrectly multiple times (Byo, in press).

Because organization and structure are natural parts of the lives of many people, it seems that organizing and structuring daily practice sessions would be a logical undertaking for most music students. “A daily guide for structured practice is a MUST for maximum accomplishment in those six days between lessons” (Pearce, 1992, p. 8).

Practice is more effective when it is structured and organized in a sensible fashion (Barry, 1992, 2003; DeNicola, 1990; Price, 1990; Puopolo, 1970; Santana, 1978). Hinson (2000) stated, “Security in performance can only be achieved by thoughtful and systematic methods of correct practice” (p. 40). Many teachers ask their students to follow practice routines that are organized in a logical sequence (Horton, 2002; Pedrick, 1998); others may not offer specific practicing guidelines to their students (Kostka, 2001). In a survey of 951 pre-college piano students, their parents, and their teachers, only 25% of students surveyed reported adhering to a regular practice routine (Duke, Flowers, & Wolfe, 1997). In a survey of college music education majors and their teachers, Kostka (2001) reported that only 45% of students surveyed followed a specific practice routine, while a majority of the teachers fully expected their students to utilize some sort of plan for practicing.

There are documented reasons for having students follow an organized practice routine. Puopolo (1970) found that the use of self-instructional practice materials for fifth-graders was more effective than less structured practice. Pedrick (1998) offered a specific practice routine and discussed that when students followed his prescribed sequence of events during practice, their sessions became more efficient and productive, and led to greater opportunity for successful performance. Pedrick defined a successful practice session as having five components: “setup, preparation, warm-up, maintenance, and advancement” (p. 33). Setup included preparing the practice area and removing all distractions. Preparation involved both mental and physical activity. The warm-up included various technical exercises. Maintenance involved sustaining previously learned material. Advancement consisted of reading through new material and then going to the



problem areas and working on them first, as well as listening critically to subsequent performances and evaluating them.

It is commonly understood by teachers that structured practice is more effective when it is goal-oriented (Barry, 2003; Maris, 2002). Mauro and Beard (2001) suggested viewing practice sessions as goal-oriented work sessions. Structuring a practice session and setting goals are two suggestions made by Barry (2003). Of the applied music teachers in a survey conducted by Barry and McArthur (1994), 70% said that they “always” or “almost always” request their students to establish specific practice goals (p. 51). However, defining and setting goals are not automatic for all students (Kenny, 1998). If this is the case, Kenny suggests that teachers ask leading questions so that students can formulate their own goals from the questions and answers. According to Kenny, having students set their own practice goals is much more effective than having the teacher set the goals, as it allows students to take ownership and begin to internalize the goals they have set. For students who are not mature enough to select their own goals, Kenny provides a sample checklist from which student practice goals may be chosen. He also advocates asking questions such as “What are the goals for this practice session?” and “How do these goals relate to what was worked on during the last practice session?” (p. 22). Goals, however, do not have to be performance-specific to be justifiable. Even practice goals such as those provided in individual contracts between student and teacher have resulted in the benefit of increased practice time for those students who signed the contracts (Wolfe, 1984).

Once students have been taught to identify goals for practice, oftentimes they will need to employ the use of practice strategies to help them attain those goals. Sitton (1992)

said that teachers have neglected systematic development of practice approaches. Kostka (2001) believes that a greater understanding of effective practice procedures would likely improve music teaching and learning. It is the teacher's job to teach students to use specific techniques during daily practice (Berr, 1995). Breth (2001), in her *Piano Student's Guide to Effective Practicing*, offers specific practice strategies for students and teachers to use when encountering problems in keyboard music. However, knowledge of "strategies is usually not enough to promote student achievement; students must also be motivated to use the strategies as well as regulate their cognition and effort" (Pintrich & De Groot, 1990, p. 33).

In a study of college-level music students' and teachers' practicing expectations and attitudes, Kostka (2001) discovered that while 100% of teachers believed they discussed specific practicing strategies with their students during lessons, only 69% of students reported recalling the instruction. Barry and McArthur (1994) investigated the extent to which applied pre-college and college music teachers taught practice strategies in their studios. Most teachers in the applied studio, both pre-college and college, stated that they discuss the importance of practice and using specific practice techniques on a frequent basis; additionally, according to the survey, college instructors seemed to provide specific instruction in how to practice more often than pre-college teachers.

Berr (1995) advocates the use of practice strategies, or what he refers to as transformational practice techniques (TPTs) for piano. These are techniques that would in some fashion transform the pitches on the printed page by adding to (additive), subtracting from (reductive), or substituting within them (p. 12). Two of the more elementary reductive TPTs are each-hand-separate (EHS) practice and blocking broken

chords. In addition to the TPTs he discusses, Berr lists two skills that must be incorporated when using a TPT: slow practice and repetition. Berr also lists five steps for using a TPT: problem recognition, diagnosis of the problem, deciding which transformation might solve the problem, practice and mastery of the chosen transformation, and incorporating the corrected passage back into the score (p. 15).

The ability of students to identify and solve their own problems during practice is a valuable skill, and one that many teachers and students advocate. According to Pace (1999b), teachers should provide optimal opportunities for students to develop and increase problem solving techniques during home practice. Expert pedagogues have offered information and suggestions concerning this topic in research journals, trade journals, and other sources. Invariably, these pedagogues present similar means of solving problems in the practice room: locating the most difficult passages of the piece (Mauro & Beard, 2001; Pace, 1992), isolating and refining difficult passages (Pedrick, 1998), breaking the problem down into its smallest part or parts, defining specifically where the difficulty is, and then working on that segment (Minahan, 1986), and asking questions such as “Are there any notes that I don’t [*sic*] know very well?” “Are there notes that are in a difficult range for me?” and “Are there any rhythms that require special attention?” (Kenny, 1998, p. 22). Breth (2001) advocates asking questions such as “What did I hear?” “Why did it happen?” and “How can I solve it?” Mauro and Beard (2001) also propose asking self-evaluative questions throughout practice sessions.

Byo (in press) describes the practice segment as the “work place,” or the measure in which the student “hesitates, stops, or it just doesn’t [*sic*] sound good.” These are areas to which the student should devote more practice time, effort, and correct repetition. Byo

then illustrates the process a student should go through when solving the problems that recur in his pieces. He should find a tempo that allows him to play the difficult section without errors and locate that tempo on his metronome. Next, he should play the work place twice in a row without committing any errors, gradually incorporating expressive elements if he omitted them, and gradually increasing the tempo. He then puts the work place back into the context of the piece, and plays the phrase that contains it twice in a row with no mistakes. This of course, is the type of successful practice that teachers find ideal. If teachers train their students during lessons to employ these and other practice techniques, making practicing an important and structured part of each lesson, the likelihood that students will be successful in solving problems on their own is increased.

A technique known as mental practice has received some attention in the musical setting in recent years. Mental practice is “the cognitive rehearsal of a skill that takes place within the individual in the absence of any gross muscular movements” (Ross, 1985, p. 221). Freymuth (1994) defined mental practice as “a process of creating an accurate mental image of a physical action, with the intention of affecting one’s physical performance of the task in question” (p. 18). A seminal study on mental practice in the music field (Rubin-Rabson, 1941) found that subjects who engaged in mental practice midway through learning a piece at the keyboard were better at retaining memorized selections than subjects who engaged in physical practice alone. She recommended that piano students learn a new piece by analyzing, practicing at the piano, practicing mentally until the selection is memorized and mental performance can be done smoothly, and practicing physically until performance at the keyboard can be accomplished smoothly. Ross (1985) conducted one of the next pioneer studies on mental practice in

the music field. He randomly assigned subjects (graduate and undergraduate trombone students) to five different practice conditions: physical practice, mental practice, combined practice (alternation of physical and mental), mental practice with slide movements, and no practice. He found that among college trombonists, mental practice was comparable to physical practice when alternated with physical practice.

Subsequently, Coffman (1990) studied the effects of different types of practice on piano performance accuracy among undergraduate and graduate music education and music therapy majors who had completed at least two semesters of piano study. He found that mental practice was better than no practice; physical practice, used alone or alternately with mental practice, achieved better results than mental practice; and, in support of Ross (1985), that alternating physical and mental practice was as effective as physical practice alone.

The research literature also contains evidence that listening to model performances as a practice aid increases accuracy scores (Novak, 1999; Rosenthal, 1984; Rosenthal et al., 1988). Rosenthal's (1984) study examined the effects of model-only (a pre-recorded aural example of a musical selection), guided model (a pre-recorded aural example with verbal explanation of elements in a musical selection), guided practice (a pre-recorded verbal explanation only), and practice-only (no verbal explanation or aural example) on the performances of graduate and undergraduate woodwind and brass instrumentalists. Subjects experienced a randomly assigned treatment on cassette tape, and were allowed to practice for 3 minutes (the exception was the practice-only group, which was allowed to practice for 10 minutes) before performing the given selection.

Results indicated that subjects in the model-only group achieved higher scores on all variables (4 out of 5 variables were significantly higher) than subjects in any other group.

Rosenthal, along with Wilson, Evans, and Greenwalt (1988), examined the effects of modeling (subjects listened to a recording and looked at a score during practice time), singing (subjects sang the composition during practice time), silent analysis (subjects used practice time to study the music silently), free practice (subjects practiced on their instruments for the entire practice time), and control (subjects practiced an unrelated selection before performing the experimental selection) on the performance accuracy of graduate and undergraduate woodwind and brass students. Following a 3-minute practice session, subjects played through a given composition one time to warm up their instruments, and then performed the same selection. This study presented evidence that listening to a model and practicing were more beneficial than singing, silent analysis, or practicing an unrelated selection in helping subjects to master a given musical selection, as scores of subjects in these two groups were more accurate than scores of subjects in the other groups.

Using a metronome as a practice aid to help students maintain beat continuity is another common practice strategy. The ability to perform at a set tempo throughout a piece of music is a desirable skill for all musicians. Students receive training in the importance of a steady beat from the first lesson. However, not all students are able to feel a steady internal pulse, and thus have problems maintaining a consistently steady beat. Blickenstaff (1993) gave pre-college students a list of eight practice methods. He asked the students to list the methods in the order in which they helped students achieve accurate rhythm during home practice sessions. Students responded that they chose to

practice with a metronome to work on rhythm problems, to check rhythms, to maintain a steady beat, or to support counting aloud. The metronome can also be used to document daily progress in practice (Byo, in press). When practicing with the metronome, students can write down the tempo they achieved during that practice session. The next day, they would have a documented tempo from which to begin, and concrete evidence of progress, rather than a vague idea of a tempo and no evidence of any progress that had been made on the previous day.

The research literature on metronome use as a practice aid is limited, but a few studies have addressed the topic of tempo perception in relation to the metronome. Helping students become aware of their practicing tempos and setting practicing tempos slow enough to aid in mastery of their pieces is a relevant issue to piano performance. Using the metronome during practice is one means of aiding students in achieving and maintaining the slower practicing tempo.

Many of the studies on tempo perception determined that subjects increase tempo during performance of a given task (Kuhn, 1977; Kuhn & Gates, 1975). Some studies have indicated that subjects anticipate the beat when tapping along with a metronome (Vos, Mates, & van Kruysbergen, 1995), while others have indicated that subjects either anticipate or fall behind the beat (Collyer, Broadbent, & Church, 1992). Kuhn and Gates (1975) gathered data on students who clapped a notated rhythm while trying to maintain the steady pulse that was presented to them with a metronome set to 90 beats per minute. Results indicated that once the metronome clicks were stopped, subjects tended to increase the tempo when clapping the rhythmic example.

Not only do subjects increase tempo once the metronome has been turned off, they detect these increases in tempo more slowly than they detect decreases in tempo (Kuhn, 1974; Madsen, 1979; Wang, 1984; Wapnick, 1980). Wang (1984) tested variables including the beat location of a change in tempo (beat 1, 2, 3, or 4), and the direction of the tempo change (increase or decrease), to determine factors that affect tempo perception among music majors and education majors who were enrolled in music classes. Subjects listened to prerecorded excerpts in which the tempo changed by one beat per minute per measure from a specified starting place within the example until the end of the excerpt. They were instructed to mark the place on the score in which they first perceived a change in tempo, and then they were directed to identify whether the tempo increased or decreased. Wang found that, when listening to recordings, subjects needed significantly more time to detect an increase in tempo than they needed to detect a decrease in tempo.

Another study addressed the effects of simultaneous music reading and performance on subjects' abilities to detect a change in the tempo presented to them via prerecorded metronome clicks (Ellis, 1989). Subjects for this study were music faculty, graduate students in music, and members of two high school bands. Ellis played prerecorded metronome clicks with tempo fluctuations for subjects in one group who merely listened for tempo changes without reading or performing any music. He also played the same prerecorded clicks for subjects in another group who read and performed a musical selection in real time with the clicks. Results indicated that subjects in the listen-only group detected the tempo changes significantly more quickly than subjects in the playing-listening group. Simultaneous reading and performance greatly inhibited



subjects' ability to detect tempo changes that occurred within the performance as the result of the fluctuating prerecorded clicks.

Killian (1985) tested the effects of feedback on performance and tempo perception. Subjects divided into three groups listened to a metronome set to 60 beats per minute for eight beats and were instructed to clap that tempo for an additional twenty-five beats without the metronome. Groups were given one of three types of differential feedback between each of the three trials: listening to their own performance before proceeding to the next trial, listening to their own performance along with the metronome before proceeding to the next trial, or not listening to anything before proceeding to the next trial. Results indicated that the average tempo increased across trials, as in previous and more recent studies conducted on tempo acceleration (Gordon & Martin, 1994; Kuhn & Gates, 1975; Mito & Murao, 2001), and that subjects more accurately perceived tempo variations when they were given feedback. Killian suggested that further research be conducted to examine other effective ways of teaching tempo performance accuracy, such as performing tasks with the metronome, to increase tempo stability.

Mito and Murao (2001) investigated the tendency of beginning musicians to accelerate tempo. Sixteen children who were enrolled in piano lessons were given a piano piece that was 16 measures long and had a meter of 4. Subjects were instructed to practice the selection at 100 beats per minute for one week. Following the week of practice, subjects performed the piece with three types of accompaniments (half note chords, quarter note broken chords, and eighth note broken chords) at three different tempos (70, 100, and 130 beats per minute) resulting in nine performances per subject. Prior to each performance, subjects were given the tempo for two measures. Results

indicated that the fifteenth measure was performed at a higher tempo than the first measure in all but three cases, and almost all subjects increased their tempos from the 70 and 100 beats per minute starting tempos. However, subjects did not seem to be aware of the acceleration.

In a study on tempo and pitch discrimination (Geringer and Madsen, 1984), musicians and non-musicians listened to two 30-second excerpts of familiar orchestral music. They were instructed to determine whether the second excerpt was identical to the first, or whether the pitch and/or tempo had been altered (increased or decreased). Subjects identified tempo increase more accurately than tempo decrease, which is inconsistent with other research relating to this subject.

Many reasons for practicing slowly are found throughout the literature. Byo (in press) proposes that it facilitates accurate learning when paired with correct repetition. In the article *Teaching Problem Solving in Practice*, Byo recommends that having students slow the tempo enough that they can play the most difficult portion of the piece with no mistakes is an important step towards becoming an accomplished practicer.

Kraehenbuehl (1988) also offers that slow practice helps students clean up difficult areas of their pieces. Sitton (1992) and Pace (1992) articulate that practicing slowly enables students to maintain the same tempo for the entire length of the practice section without breaking down. Minahan (1986) suggests that practicing slowly encourages students to become more aware of details on the score and helps memorization take place much more easily. According to Voorhies (1988), slow practice helps performers remain in control of what they are thinking and practicing. Pearce (2002) also contends that slow practicing

allows time for students to think and be consciously aware of what is happening at the moment and of what is coming up next.

There is a wide range of opinions on the topic of whether students should practice hands-separately, though it is commonly accepted as being beneficial when appropriate (Barry & McArthur, 1994; Bastien, 1995; Bruser, 1997; Chronister, 1988). Results of a survey of pre-college and college piano teachers (Barry & McArthur, 1994) indicated that approximately 57% of teachers ask students to practice hands-separately when they begin learning a new piece. Some pedagogues believe that hands-separate practice should precede hands-together practice (Breth, 2001; Horton, 2002), though some believe it should not occupy too much of the student's practice time (Berr, 1995; Clark, 1992; Sitton, 1992).

Benefits of hands-separate practice include greater ease when problem solving (Pace, 1992), time for focusing on fingering and articulation, assisting in the attainment of physical comfort with a passage (Berr, 1995), and focusing all of the student's attention on "*seeing, feeling, and hearing* what each individual hand must do in a piece – its fingering, its shape, its pressure into the key, and its shifts from one location to another on the keyboard. Practicing hands alone essentially provides an opportunity to consciously 'program' each hand's individual role in the successful articulation of the musical and pianistic elements of a piece" (Pearce, 2002, p. 10).

The belief that repetition is a fundamental part of practicing permeates the literature (Barry & Hallam, 2002; Byo, in press; Clark, 1992; Sitton, 1992; Pedrick, 1998). According to Johnson, "Automaticity (the ability to perform a process while giving very little conscious attention to it) and fluency in reading musical text are

achieved through practice and repetition” (1998, p. 37). Often, novice musicians have difficulty in locating problematic sections of a piece that require extra repetition, and therefore default to playing through the entire piece in order to practice it (Barry & Hallam, 2002; Hallam, 1997). Many authors offer techniques for achieving success through repetition. Some of these include repeating passages until they are easy (Breth, 2001) and playing passages a specified number of times in a row correctly (Breth, 2001; Byo, in press; Clark, 1992; Pedrick, 1998). Many maintain that it is the repetition of successful performances that leads to advancement in practice (Byo, in press; Sitton, 1992), and that repetition of unproductive practice tactics leads to disappointing results (Barry & Hallam, 2002). Roberson (1993) indicates that slow, correct repetition discourages mindless practice.

Brittin (2004) analyzed the average number of repetitions various levels of performers would practice “target passages” (p. 7), or segments of music on which they spent much time and attention. Subjects for this study were artist teachers, graduate music majors, advanced undergraduate music majors, and beginning undergraduate music majors. Brittin found that the average number of times subjects would rehearse one target passage was 10.7, the minimum number of times was 3, and the maximum number of times was 133. Following drilling of the target passage, the subject would put it back into the context of the piece by performing a longer passage. Subjects spent approximately one to two minutes on each target passage before moving to another target passage. These data indicated that the practice routines of the artist teachers and graduate students were more consistent than for the undergraduate students. Perhaps this is an

indication that repetition of small passages is an efficient means of achieving success in the practice room.

Practicing the piano, or any other instrument, requires the use of repeated and refined motor skills; practicing is also an essential part of motor skill acquisition (Anderson, 1981; Singer, 1980). The body of research on motor skill acquisition and development is an area that continues to grow and has begun to transfer into other domains such as music. Research has shown that immediate success in performing a motor skill is best reached via a blocked rehearsal schedule, or many repeated trials of the same motion (Lee & Magill, 1983; Shea & Morgan, 1979). Research on motor skills has also indicated that learning is best retained following a learning schedule in which subjects vary their approach to performing a specified motor skill (Kerr & Booth, 1978; Shea, Kohl, & Indermill, 1990; Shea & Morgan, 1979; Wrisberg, 1991). In the music field, Pacey (1993) maintains that with young string players, a varied approach contributes to greater learning across time.

Henley (2001) used a varied approach to study high school woodwind and brass students. Subjects sight-read an etude and then practiced the same etude using one of the following practice conditions: steadily increasing tempo throughout the practice session, practicing at the performance tempo, and alternating between a practice and performance tempo. Though there were no significant differences between groups on accuracy measures, the groups who practiced with a steadily increasing tempo or who alternated between the practice and performance tempo made greater gains from pretest to posttest on performance scores than the group who practiced at the performance tempo. Results of this study suggest that when given limited rehearsal time, performance accuracy could be

enhanced by starting at a slow tempo and using a metronome to steadily increase the tempo during practice, or by using a metronome and alternating between the practice and performance tempos during practice, rather than practicing at the performance tempo.

Lee and Magill (1983) propose that the immediate feedback offered through the blocked approach guides subjects' ensuing trials of an activity, whereas feedback offered through the varied approach forces subjects to use problem-solving skills as they approach subsequent trials of an activity. Shea, Lai, Black, and Park (2000) indicated that when learning a motor skill, practicing more frequently for shorter periods seems to be more beneficial than practicing for longer, less frequent sessions. Based on this research, according to Turner (1998), devising lesson plans involving the frequent use of the block approach will increase initial skill acquisition in students' daily learning, whereas teaching lessons involving the varied approach will result in longer retention of skills.

Experimental studies related to self-evaluation at the keyboard are valuable, though limited in number. The importance of these studies as they concern practicing can be established when it is understood that self-assessment is a fundamental part of practicing. Kostka (1997) tested the effects of successive approximations (a series of small, manageable tasks leading to a more difficult task) and self-assessment techniques on certain skills among class piano students. Results indicated that complex keyboard skills could be broken down and approached successfully via successive approximations and self-evaluation. Kostka suggested that researchers continue studying self-assessment and its long- and short-term effects on music students. She further proposed that researchers operationally define self-evaluation procedures so that students gain a clear understanding of how to evaluate their own performances and transfer that knowledge to

other areas of their musicianship. Given the limited amount of experimental research concerning practicing the piano, further investigation in the area could serve to establish specific self-assessment guidelines for students and teachers.

In order for students to improve quickly and efficiently during practice or rehearsals, self-evaluation must take place. Byo (2001) discussed the playing test and how it can promote self-evaluation by challenging students and teachers to begin rehearsals with a clear view of the final product. The playing test included goals to meet during practice and self- or teacher-assessment procedures to use following a performance of the given piece. Though this assessment design was created for wind and string students, piano instructors could easily transform it for use with piano students.

Many expert pedagogues have offered various techniques for teaching students to rehearse music at the piano (Berr, 1995; Breth, 2001; Chronister, 1992; Clark, 1992). Because it is important for all music teachers to know about and to instruct their students about practicing, this study serves to continue the research in that area. Therefore, this study examined the effects of specific practice strategies on the performance of group piano students across a limited rehearsal time. Further, this study examined whether students used specific practice strategies during that rehearsal time. Specifically, the purposes of this study were to examine the effect of practice strategies, metronome use, meter, right hand and left hand, and melody and accompaniment on dual-staved piano performance accuracy of undergraduate non-keyboard music majors, and to assess the effects of practice strategies on practice time use among those same subjects.

## CHAPTER 2

### METHOD

The purposes of this study were twofold. The first was to assess the effects of practicing strategies, metronome use, meter, hand, and melody or accompaniment played with right or left hand, on piano performance accuracy of undergraduate non-keyboard music majors. The second purpose of this study was to investigate the effects of practicing strategies on time usage during two eight-minute practice intervals of unfamiliar keyboard music. The following questions were addressed in a second-semester piano class: Were practicing strategies taught in class used by students when given the opportunity to prepare a piece, and did they contribute to proficiency in piano performance? Was keyboard performance accuracy enhanced by performing with a metronome? Was keyboard performance accuracy affected by meter? Was one hand more accurate than the other? Was melody more accurate than accompaniment? Twice weekly piano classes across a semester were structured in a format conducive to investigating these questions. A pretest-posttest design was employed with data collected on pitch, rhythm, and beat accuracy, and subjects' selected performance tempos. Time usage of the practice sessions was recorded and categorized.

#### Subjects and Setting

Subjects for this study were four sections of non-keyboard music majors ( $N=39$ ) enrolled in their second semester of a four-semester sequence of group piano at Louisiana State University, Baton Rouge, during the spring semester of 2003. Students with piano experience prior to college were tested upon entrance to the university. Those who met competencies were exempted from part or all of the sequence of classes. This resulted in



a relatively homogenous ability level among all students. According to self-report, the average length of piano study for these students prior to Spring semester, 2003, was 1.73 years. These undergraduate students registered for classes according to scheduling preferences and had no knowledge of treatment conditions. This type of class assignment has resulted in equivalent groups and unbiased sampling in previous studies (Betts & Cassidy, 2000; Cassidy, Betts, & Hanberry, 2001; Liske, 1999). Federal regulations require that an authorized university committee review and approve all research conducted on human subjects before commencement of a study. Exemption from oversight was granted from the Louisiana State University Institutional Review Board (IRB) for Human Subject Studies. During the first week of the semester, subjects signed investigator-designed consent forms signifying their agreement to participate in the study. Copies of the Institutional Review Board exemption form and a sample consent form are included in Appendix A.

Classes met for 50 minutes twice a week and included instruction in sight-reading, harmonization, transposition, piano literature, and technique. All classes used the text *Alfred's Group Piano for Adults, Book 1* by E. L. Lancaster and Kenon D. Renfrow (1995) as well as materials that were adapted from this and other piano texts and arranged by the investigator. Classes were taught by two graduate teaching assistants in the piano pedagogy program at Louisiana State University. One was the investigator of this project and the other was a research assistant. Both had previous experience teaching group piano. Each instructor was assigned two sections of students, one randomly designated treatment group and one control group, in order to control for teacher effect. Each instructor taught from an identical syllabus, designed by the supervisor of group piano,

which included specific daily activities and assignments. Both taught treatment and control groups from investigator-designed daily lesson plans. The research assistant observed all treatment segments taught by the investigator so that instruction for treatment groups was the same. The investigator observed treatment sessions taught by the assistant to ensure validity of treatment instruction. Daily lesson plans for treatment and control groups are included in Appendix B.

Classes were held in the keyboard lab at Louisiana State University. The lab contained twelve Roland digital keyboards equipped with headphones, a Roland keyboard and instructor console with a MIDI disk player, a Yamaha *Disklavier* acoustic piano, a Yamaha *Clavinova*, an overhead projector and screen, dry erase staff boards, and a computer. Instructors used the MIDI disks that accompanied the text as well as the Yamaha *Clavinova*'s metronome, rhythm accompaniments, and voice styles during daily class activities.

## Independent Variables

### Practice Strategies

Throughout an eight-week, 16-class training session in practice strategies, subjects in the treatment group were given guidelines for practicing an unfamiliar piece of music that included determining the context of the piece, setting an appropriate practice tempo, conducting score analysis, problem solving via specific strategies, self-evaluating, and increasing the practicing tempo of the piece to performance tempo. Practice strategies in this study were based on strategies discussed in the literature (Berr, 1995; Breth, 2001; Byo, in press; Clark, 1992; Kenney, 1998; Pedrick, 1998; Sitton, 1992). These subjects were given one practicing piece per class meeting plus a specific

strategy for practicing that piece. New strategies were taught each week, and subjects were given the opportunity to review previous strategies as new ones were introduced. Brief quizzes were administered on the second class day of week three and on the first class day of week seven to offer subjects an opportunity to recall, list, and apply practice strategies that they had learned up to that week of the semester. The control group was given the same amount of time to practice the same pieces during each class meeting, but was not taught the practicing strategies nor administered the same quizzes. Instead, control classes were asked to list practicing strategies that they used on a daily basis. Quizzes are included in Appendix C. Regularly scheduled course exams that were independent of the research project were given to all classes throughout the semester.

During the first class meeting of each treatment week, subjects in the treatment group were given instruction in how to approach and practice a specific problem in a piece of keyboard music, and then they practiced one piece according to those guidelines. Based on presentation and practicing data gathered from a pilot study, approximately three to seven minutes of each class period were devoted specifically to teacher presentation of practice strategies and practice pieces, and approximately five minutes were devoted to individual practice time (Hanberry, 2002b). Each practice session included setting a slow practice tempo with the metronome and practicing according to the practicing procedures offered in previous and current treatment classes. Specific weekly practice strategies and a treatment calendar are included in Table 1.

During the second class meeting of each week, subjects were given one piece of music that contained a specific problem related to the strategy they learned earlier in the week. Based on data gathered in a pilot study, subjects were given five minutes to

rehearse the piece while applying the appropriate strategies (Hanberry, 2002b). Control subjects were given the same daily practicing pieces as treatment subjects and had an equivalent amount of practice time each day. Treatment subjects practiced with the *Clavinova*'s metronome set to the predetermined tempo for each specific practicing piece, and control subjects chose their own practicing tempos. All sessions culminated with a play-through of the piece together as a class, using the metronome to govern tempo. Descriptions of daily practice pieces are included in Appendix D. As part of the conventional piano class curriculum, the remainder of class time included daily instruction in sight-reading, harmonization, transposition, technique, and piano literature with both treatment and control classes. As is common in the university setting, not all subjects attended all classes. For subjects who missed treatment classes, review and further application of strategies occurred on the second class day of each week.

During the first week of treatment, subjects were given precise instructions to identify the key, meter, and practicing tempo of the practice piece. Subjects stated the key signature, including sharps and flats, played a one-octave scale in the key, played a chord progression in the key, and circled the first instance of each pitch altered by the key signature. They stated the time signature and the number of beats that occurred in each measure. Then they located the smallest note value to form the basis for a steady pulse at a slow practice tempo. They counted aloud for two measures the smallest note value in the correct meter at the slow practice tempo. Subjects used the metronome at the slow practice tempo to aid them in keeping the slow tempo throughout their practice session.

Further instructions for the first week of treatment included score analysis procedures designed to allow subjects to study the piece of music before practicing it.

Table 1

Treatment Calendar		
Semester Week	Treatment Week	Activity
1-2		Pretests
3	1	Key, meter, tempo, score
4		(Course Exam #1)
5	2	Strategy 1: Hands out of position
6	3	Strategy 2: Unfamiliar chords and Quiz #1
7		(University Holiday)
8	4	Strategy 3: Accidentals
9		(Course Exam #2)
10	5	Strategy 4: Increasing tempo, Part 1
11	6	Strategy 4: Increasing tempo, Part 2
12-13	7-8	Strategy discrimination and Quiz #2
14-15		Posttests

Subjects were instructed to determine melodic and harmonic function of each hand (e.g., melody or accompaniment), determine accompaniment style, label the overall form of the piece, and mark repeated sections or measures.

Instructions for the next seven treatment weeks included strategies for solving problems that occur frequently in early-level piano music. The strategy for the second week of treatment consisted of how to practice segments of a piece in which the hands moved out of the starting position. Subjects were instructed to select a beat where one or both hands moved out of position. They practiced this segment with one hand at a time by playing one measure (or other appropriate length according to the selected piece) plus

one beat for three correct consecutive trials with correct dynamics and articulation (Clark, 1992). Subjects then added one measure and played two measures plus one beat for three correct consecutive trials. Once subjects could correctly play the notes of the hand that moved out of position, they added the other hand and played three times slowly and accurately, or until the passage was solidly learned. Subjects then put the section into the context of the piece by playing one measure before the passage, the passage, and stopping on the downbeat of the measure following the passage. Subjects repeated this process three times correctly. This process was repeated for other sections in which one or both hands moved out of the starting position.

During the third week of treatment, subjects received instruction in how to practice unfamiliar chords. Subjects located unfamiliar chords throughout the piece and circled them, noting whether they were the same as or different from other chords in the piece. They chose one chord with which to begin and identified each note of the chord by letter name, from bottom to top. Subjects then played the chord one note at a time, broken from the bottom to the top three times, and then as a blocked chord three times. Next, subjects compared the unusual chord to the previous chord, noting common and uncommon notes as well as the shape of the hand when moving from chord to chord. Subjects played the two chords, alternating between them, three times, or until they could be played easily. Then, subjects compared the unusual chord to the following chord, again noting common and uncommon notes as well as the shape of the hand when moving from chord to chord. Subjects played the two chords, alternating between them, three times, or until this could be done easily. Once the passage was secure, subjects

played it with the correct rhythm, articulation, and dynamics three times correctly. Subjects then added the other hand, repeating the passage three times accurately.

During the fourth week of treatment, subjects were taught how to practice measures containing accidentals. They began on the downbeat of the measure containing the accidental(s), or in the previous measure if the accidental occurred on a downbeat. Subjects played at the slow practice tempo, with one hand, stopping on the altered note or chord, three times correctly. Subjects then began in the same place, playing the entire measure containing the altered note or chord three times. Next, subjects played the same section hands together, at the slow practice tempo, stopping on the note or chord, three times correctly. Finally, subjects played the section containing the accidental three times with both hands together, at a slow tempo.

The fifth and sixth weeks of treatment included strategies for increasing from a practicing tempo to a performance tempo. First, subjects identified the tempo marking on the score. Next, subjects determined whether the performance tempo was suitable to use as a practicing tempo. Because the performance tempo was too fast to be used for practicing, subjects determined an acceptable slow practicing tempo. Once subjects had practiced the selection at the practice tempo for two minutes, the tempo was increased by eight beats per minute. Subjects continued practicing for one minute and increasing the tempo by eight beats per minute until the five-minute in-class practicing time was complete. If no mistakes occurred, the tempo was increased by eight beats per minute until the tempo indicated on the score was reached. If mistakes occurred, subjects applied the appropriate practicing strategy and tried again. Subjects then played the entire piece together as a class. The second class meeting of weeks five and six was used to further

increase tempos. Subjects were given the same practicing pieces as on the first treatment day of those weeks, and again the tempo was increased by eight beats per minute until the desired performance tempo was reached. Subjects performed the piece together as a class with the metronome set to the performance tempo of the given selection.

The seventh and eighth weeks of treatment included opportunities for subjects to discriminate among strategies and choose the one most appropriate for a specific problem in a given musical selection. Selected problems included unusual chords played by the right or left hand, one or both hands moving out of the starting position, and accidental(s) in one or more measures. Subjects were given four segments of music and were asked to determine the most appropriate strategy to use for each problematic segment. Following determination of strategies, subjects were allowed five minutes to practice the segments, and then performed them together as a class, with the metronome set to the appropriate tempo for each segment.

On the second class day of week three, and the first class day of week seven, subjects in the treatment group were administered brief quizzes before they were given their practicing pieces for those days. The first quiz consisted of a blank page on which they were asked to list as many of the practice strategies as they could recall, and to place them in chronological order according to the sequence in which the strategies were taught. Following the first quiz, the instructor and subjects briefly discussed the practicing strategies that had been introduced up to that week, and subjects were given their practicing piece for that day. The quiz given during week seven consisted of four short segments of music, each with a specific problem. Subjects were required to identify which strategy would be most appropriate to use in order to solve each problem.



Following identification of the appropriate strategies, subjects practiced each segment according to the strategies they identified, increased the tempo to the performance tempo on the score, and then performed each segment together as a class at the given metronome marking.

### Metronome

Subjects in both groups received opportunities during the semester to perform daily selections with a metronome. Performing in this manner helped subjects maintain a slow, steady tempo throughout each piece and sustain beat continuity throughout each performance. Subjects in the treatment group were given further instruction to practice with the metronome and use the metronome systematically and purposefully to aid in increasing the tempo of given practice pieces. Previous research has indicated that subjects have a tendency to increase tempo during performance tasks when they do not use a metronome to govern performance tempo (Gordon & Martin, 1994; Killian, 1985; Kuhn & Gates, 1975; Mito & Murao, 2001). Other researchers have suggested that students play faster than they can control and therefore commit additional errors (Cassidy, Betts, & Hanberry, 2001; Guhl, 1992). This study isolated the tempo by imposing a slow metronome marking on half of the subjects' pretest and posttest performances while allowing the other half of subjects to select their own tempo for pretest and posttest performances.

### Meter

In the piano studio, it is commonly accepted that beginning piano students have a tendency to hesitate after beat three in pieces with a meter of 3, interrupting the beat continuity of the performance. Hesitations at barlines are thought to occur less frequently

in meters of 2 or 4. This has also been implied by Betts and Cassidy (2000), Cassidy, Betts, and Hanberry (2001), and Wood (1995). In the present study, subjects in both groups received weekly practicing pieces and pretest and posttest pieces in meters of 2 and 3 so that the issue of hesitations at barlines, or continuity of the steady beat, could be addressed empirically.

### Hand and Musical Function

Throughout the eight week treatment, both treatment subjects and control subjects received pieces that contained right hand melodies with left hand accompaniments, pieces that contained left hand melodies with right hand accompaniments, and pieces in which the melody and accompaniment alternated between hands. These practicing pieces were designed to strengthen and improve performance scores of both the right and left hands. Treatment in previous research has emphasized right hand melodies and left hand accompaniments (Betts & Cassidy, 2000). Results of previous research (Betts & Cassidy, 2000; Cassidy, Betts, & Hanberry, 2001) have shown that left hand scores on piano performance tasks are much lower than right hand scores. Researchers have questioned whether these scores could be attributed to right hand dominance, or whether melodic function played a role in right hand accuracy. It was hypothesized that subjects may have attended to the right hand, to the detriment of the left hand, because the right hand contained the melody. Therefore, this study was designed to isolate the interaction between these two variables.

## Procedures

### Pretest and Posttest

During the first and second weeks of the semester and again during the last three weeks of the semester, subjects were individually administered pretests and posttests consisting of two piano pieces selected and deemed approximately equivalent in difficulty by a panel of experts. Additionally, the two pieces were included in the same repertoire collection and were suggested by the editor of that collection to be similar in difficulty (Magrath, 1997). One half of the treatment and control subjects received each piece in its original form, and one half received an identical version with the exception that the treble notes were written on the bass staff and the bass notes were written on the treble staff for the purpose of analyzing melodic and harmonic function of the right and left hands. Subjects were randomly assigned one piece with right hand melody and one piece with left hand melody.

The first pretest and posttest performance selection, in its original and altered forms, is included in Figures 1 and 2. Salient features of the first example are listed to emphasize reasons the piece was chosen for this study. *Melody for Left Hand*, Op. 108, No. 12, by Ludwig Schytte (Magrath, 1997), was sixteen measures long, in the key of G major, had a meter of 2 beats per measure, and contained 215 notated pitches. Eleven out of the sixteen measures contained new musical material; five of the measures repeated previous material. The left hand consisted of a melody on the bass staff that included, but was not exclusive to, the diatonic pitches of the G major scale, and the right hand accompaniment consisted predominantly of blocked primary chords in an eighth note rhythm on the treble staff. This selection also included two tied notes, a left hand shift out

of the starting hand position, an unusual right hand chord containing a suspension, an accidental in the left hand, and quarter rests. Based on tempo data gathered from a pilot study, the metronome marking of the performance tempo was 60 beats per minute (Hanberry, 2002a).

The second pretest and posttest performance selection, in its original and altered forms, is included in Figures 3 and 4. Salient features of the second example are listed to emphasize reasons the piece was chosen for this study. *Dance*, Op. 108, No. 1, also by Ludwig Schytte (Magrath, 1997), was sixteen measures long, in the key of C major, in a meter of 3, and contained 105 notated pitches. Nine out of the sixteen measures contained new musical material; seven repeated previous material. The right hand consisted of a melody on the treble staff that included pitches of the C major scale and frequent five-note scales, and the left hand accompaniment consisted of blocked primary and secondary chords on the bass staff. This selection also included a right hand sequence, instances in which both hands shifted out of the starting hand position, an accidental on the bass staff, unfamiliar chords, and quarter rests on beats two and three of each measure of the accompaniment. The metronome marking of the performance tempo was 60 beats per minute.

Pretest and posttest procedures for both groups were the same. Subjects entered a room equipped with a Yamaha *Disklavier* acoustic piano, a video camera, a metronome, a pencil, and a handheld stopwatch. The metronome and pencil were on the piano, and the stopwatch was in the possession of the investigator. Subjects were instructed to complete a subject information form, which is included in Appendix F, before beginning the pretest. Subjects were asked to state their name and the meeting days and time of their

**Melody for Left Hand**  
Op. 108, No. 12

Ludwig Schytte  
(1848-1909)

$\text{♩} = 60$

Piano

Piano

Piano

Piano

Figure 1. Pretest and Posttest Performance Selection with a Meter of 2,  
*Melody for Left Hand*

*Note.* Schytte, L., Melody for left hand, op. 108, no 12. From *Masterwork Classics, Levels 1-2* (p. 23), by J. Magrath (Ed.), 1997, Van Nuys, CA: Alfred Publishing Co., Inc. Copyright 1997 by Alfred Publishing Co., Inc. Reprinted with permission. Permission letter is included in Appendix E.

**Melody for Right Hand**  
Op. 108, No. 12

Ludwig Schytte  
(1848-1909)

$\text{♩} = 60$

Piano

Pno.

Pno.

Figure 2. Pretest and Posttest Performance Selection with a Meter of 2,  
*Melody for Right Hand*

*Note.* Schytte, L., Melody for right hand, op. 108, no 12. From *Masterwork Classics, Levels 1-2* (p. 23), by J. Magrath (Ed.), 1997, Van Nuys, CA: Alfred Publishing Co., Inc. Copyright 1997 by Alfred Publishing Co., Inc. Adapted with permission. Permission letter is included in Appendix E.

**Dance for Right Hand**  
Op. 108, No. 1

Ludwig Schytte  
(1848-1909)

♩ = 60

The musical score is divided into four systems, each with a piano (Piano) part and a prelude (Pno.) part. The piano parts are in the right hand, and the prelude parts are in the left hand. The score includes fingerings and articulation marks.

**System 1:** The piano part starts with a quarter note G4, followed by eighth notes A4, B4, and C5. The prelude part has a quarter note G2, followed by eighth notes F2 and E2. Fingerings: 1, 2, 3, 5.

**System 2:** The piano part starts with a quarter note D5, followed by eighth notes C5, B4, and A4. The prelude part has a quarter note D2, followed by eighth notes C2 and B1. Fingerings: 1, 3, 5, 1, 2, 5.

**System 3:** The piano part starts with a quarter note G4, followed by eighth notes A4, B4, and C5. The prelude part has a quarter note G2, followed by eighth notes F2 and E2. Fingerings: 1, 2, 3, 5.

**System 4:** The piano part starts with a quarter note D5, followed by eighth notes C5, B4, and A4. The prelude part has a quarter note D2, followed by eighth notes C2 and B1. Fingerings: 1, 3, 5, 1, 2.

Figure 3. Pretest and Posttest Performance Selection with a Meter of 3,  
*Dance for Right Hand*

*Note.* Schytte, L., Dance for right hand, op. 108, no 1. From *Masterwork Classics, Levels 1-2* (p. 22), by J. Magrath (Ed.), 1997, Van Nuys, CA: Alfred Publishing Co., Inc. Copyright 1997 by Alfred Publishing Co., Inc. Reprinted with permission. Permission letter is included in Appendix E.

**Dance for Left Hand**  
Op. 108, No. 1

Ludwig Schytte  
(1848-1909)

$\bullet = 60$

The musical score is for a piano piece titled "Dance for Left Hand" by Ludwig Schytte, Op. 108, No. 1. It is in 3/4 time with a tempo of quarter note = 60. The key signature has one sharp (F#). The score is written for piano and consists of four systems of music. Each system has a treble and bass staff. The first system starts with a treble staff chord of F#4, A4, C5 and a bass staff melody starting on F2. The second system continues the bass melody. The third system has a treble staff chord of F#4, A4, C5 and a bass staff melody. The fourth system continues the bass melody. Fingerings are indicated by numbers 1-5 above or below notes.

Figure 4. Pretest and Posttest Performance Selection with a Meter of 3,  
*Dance for Left Hand*

*Note.* Schytte, L., Dance for left hand, op. 108, no 1. From *Masterwork Classics, Levels 1-2* (p. 22), by J. Magrath (Ed.), 1997, Van Nuys, CA: Alfred Publishing Co., Inc. Copyright 1997 by Alfred Publishing Co., Inc. Adapted with permission. Permission letter is included in Appendix E.



piano class while the investigator operated the video camera. The investigator then verbalized instructions for the subject. A copy of the pretest and posttest videotaping instructions is included in Appendix G.

Subjects were given two performance tasks in random order. Subjects practiced and performed identical music on the pretest and posttest but were randomly assigned within their groups to one right hand melody with left hand accompaniment and one left hand melody with right hand accompaniment. Based on practice data gathered in a pilot study, subjects were allowed a maximum of eight minutes to practice each piece in any way they chose (Hanberry, 2002a). Following each eight-minute practice session, which was timed by the investigator, subjects performed the selection they had practiced during respective segments. Subjects who did not need the entire eight minutes to practice and were ready to perform before the eight-minute practice time was complete were allowed to do so. Acoustic audio and visual aspects of the performances were recorded on videotapes. Performance data were digitally recorded using the Yamaha *Disklavier*'s MIDI recording mechanism.

Half of treatment and control subjects were randomly selected to perform the musical examples with the metronome set to the given metronome marking of each selection, 60 beats per minute. Subjects selected to perform with the metronome used the metronome function of the Yamaha *Disklavier*. Following performances and recording of the two pieces, subjects were thanked, dismissed, and instructed to send the next subject into the room. All independent variables were randomly assigned and counter balanced to ensure equivalent numbers of subjects in each group for the purpose of analysis. Tables 2

and 3 contain the organization of metronome use, meter, and performance selections among treatment and control groups.

Table 2

Organization of Treatment Group

Treatment							
Metronome				No Metronome			
Meter of 2		Meter of 3		Meter of 2		Meter of 3	
Melody for RH	Melody for LH	Dance for RH	Dance for LH	Melody for RH	Melody for LH	Dance for RH	Dance for LH

Table 3

Organization of Control Group

Control							
Metronome				No Metronome			
Meter of 2		Meter of 3		Meter of 2		Meter of 3	
Melody for RH	Melody for LH	Dance for RH	Dance for LH	Melody for RH	Melody for LH	Dance for RH	Dance for LH

### Dependent Measures and Instrumentation

Videotape and MIDI data of pretest and posttest performances were analyzed for pitch, rhythm, and beat continuity accuracy, and subject tempo selection. Videotaped practice sessions were analyzed, and time usage was expressed in the categories of performance, score analysis, metronome use, and other.

All digital performance data recorded using the Yamaha *Disklavier's* MIDI recording function were rendered into musical notation using the *Finale*<sup>TM</sup> (2001) music notation software program. After all recordings had been rendered into standard musical notation, they were printed out, compared to the original scores, and analyzed for pitch, rhythm, and beat continuity errors. Pitch, rhythm, and beat continuity errors were counted on three separate but identical copies of each *Finale*<sup>TM</sup> score. Tempo scores were recorded by comparing the performance tempo of the first full phrase of each piece,

measured with a metronome, to the actual metronome marking of each piece, which was 60 beats per minute.

The process for rendering MIDI files into musical notation included several steps. First, the *Finale*<sup>TM</sup> music notation program was opened and each MIDI file was opened into the program. To set up each notated score, the “Import MIDI File Options” dialog box was completed. Within the dialog box the “autoset to channels” option was selected for setting the track to staff, the quantization was set to the eighth note, and the proper key and time signatures were selected. Once each MIDI file was rendered into a musical score, it was edited so that it looked like a standard printed piece of music. For example, some but not necessarily all of the following edits may have been made. A staff was added if only one staff appeared, and each staff was given the appropriate clef. A bracket and barlines were added through the two staves. The split point for the two staves was determined according to the performance selection, and measures were moved from system to system to create a score that was as consistent with the layout of the original performance score as possible. Empty measures at the beginning and ending of the score were deleted. The composer and copyright options were deleted, and the appropriate title was given to each individual musical score. Each title consisted of the subject identification number, title of the musical selection, and whether it was a pretest or posttest performance. Finally, each score was saved as a separate file.

For subjects who did not use the metronome during pretest and posttest performances, it was impossible to grade the *Finale*<sup>TM</sup>-generated scores because the lacking data created numerous inconsistencies in the rendering of the performance data into notation. Because the metronome was not used for half of the pretest and posttest

performances, these performances were rendered with misaligned barlines and incorrectly rendered note values, and therefore could not be graded for rhythm accuracy and beat continuity as they appeared. To compensate for this problem, each file that rendered incorrectly had to be reproduced using each subject's pretest and posttest MIDI files as guides. The investigator listened to each MIDI file, measure by measure and note by note, and notated in a separate *Finale*<sup>TM</sup> file what was heard. The process included several steps. First, the *Finale*<sup>TM</sup> file of the pretest or posttest performance score from which subjects performed was opened to use as a template. Next, the title, composer, and fingering were deleted from the template to create a clean score from which to work. A new title was added, which included subject name and number, the title of the selection, whether it was pretest or posttest, and that it would be used to grade rhythm and beat continuity errors. The MIDI file was played, and the number of eighth notes in the first measure was determined. The time signature for that measure was set, and the MIDI file was played again, this time to listen for pitches and rhythms. Each pitch and rhythm that was different from the template was changed accordingly, and the process of determining the time signature and changing pitches and rhythms was repeated for each measure of the given performance. Once the new score was complete, it was saved, printed, and copied so that it could be used to grade rhythm and beat continuity errors. A *Finale*<sup>TM</sup>-rendered score and a score reproduced by the investigator are included in Appendix H. Reliability with an independent observer was calculated on 30% of the reproduced scores and included time signature, pitches, and rhythms on a measure-by-measure basis. In order to ensure that these scores were accurate reproductions of the performances, reliability was calculated using the formula agreements divided by agreements plus

disagreements. An agreement was one complete measure with no discrepancy (Kostka, 2000). Reliability on 30% of these scores was  $R=.96$ .

In order to determine pitch, rhythm, and beat continuity accuracy as precisely as possible, errors were first defined and counted. A pitch error was defined as any additional pitch played that was not part of the example, any pitch omitted from the example, or an incorrect pitch. Each pitch could receive only one pitch error. Errors related to misreading of the key signature were scored as pitch errors. A rhythm error was defined as any note value that was realized incorrectly, holding through a rest, holding rather than playing repeated notes (Lowder, 1974), and replaying tied notes. Each individual pitch or chord could receive only one rhythm error (Cassidy, Betts, & Hanberry, 2001). Starting over from any point in the example and hesitating for more than one-half of a beat at any point in the example, whether within a measure or at a barline, were labeled as beat continuity errors. Beat continuity errors committed by hesitating at barlines were added to the total number of beat continuity errors that occurred within each measure. Although this type of grading could have resulted in more pitch errors than the total number of pitches in the examples, more rhythm errors than the total number of rhythms in the examples, and more beat continuity errors than the total number of beats in the examples, in reality, this did not occur.

A systematic means of recording errors was necessary and was conducted as follows (Cassidy, Betts, & Hanberry, 2001). Pitches that were added to the example were notated to indicate the error. Omitted pitches were indicated by notating and circling the omitted pitch. Incorrect pitches were circled. Incorrect realization of a rhythm was marked by circling each incorrect value and notating, above the staff, the rhythm played.

Rhythm errors such as holding notes for longer than their values, e.g., holding through a rest or not replaying repeated notes, were circled. Rhythm errors committed by not holding a tie or by replaying the tied note were circled. Beat continuity errors indicating that the subject started over at any point in the example were marked “S.” Beat continuity errors in the form of hesitations lasting longer than one-half of a beat were marked “H.” Tempo was determined by using a metronome to establish exact performance tempo of subjects who did not use the metronome during pretest and posttest performances. Reliability was calculated with an independent observer on all data from the *Finale*<sup>TM</sup>-generated tests. Agreement was determined for each pitch, rhythm, and beat using the formula agreements divided by agreements plus disagreements. Reliability on 15% of all tests was  $R=.91$ . The number of pitch, rhythm, and beat continuity errors were counted, subtracted from the total possible points of each category, and converted to percentages for statistical comparison between groups and tests. All statistical tests were two-tailed and the probability level was set to  $\alpha = .05$ .

Null hypotheses for statistical tests were:

1. There would be no difference in pretest and posttest scores
2. There would be no difference between the treatment and control groups due to practice strategies
3. There would be no difference in scores between subjects who used the metronome and subjects who did not use the metronome
4. There would be no difference in beat continuity errors between the piece in 2/4 and the piece in 3/4
5. There would be no difference in scores of the right and left hands

6. There would be no difference in scores due to melodic and harmonic function

Time usage of the eight-minute practice intervals was recorded via the computerized observation program SCRIBE: Simple Computer Recording Interface for Behavioral Evaluation (Duke & Farra, 1993-1998) for further descriptive analysis. Behavior categories included right hand practice, left hand practice, hands-together practice, score analysis, and metronome usage. While viewing the videotaped pretest and posttest practice intervals, data were entered into the software program by pressing keys on the computer keyboard that had been programmed to correspond with the categories being timed and investigated. The behaviors of right hand practice, left hand practice, hands-together practice, and score analysis were observed and recorded on the first viewing of each practice session since none of these behaviors occurred simultaneously. Metronome use was observed and recorded on the second viewing of each practice session because the metronome could be used concurrently with any of the other categories and had to be recorded independently of them. Following recording of all practice sessions, SCRIBE's calculations of minutes and seconds and percentage of time spent in each activity were printed out for inclusion in the descriptive analysis presented in this study.

In addition to analyses of performance and practicing data, tempo data were examined to compare subject-selected performance tempos to the performance tempo selected by the investigator, 60 beats per minute. A deviation score for each subject was then calculated. Tempo data for each subject were recorded on the subject scoring sheets that are included in Appendix I.

## CHAPTER 3

### RESULTS

The purposes of this study were to examine the effects of training in practice strategies, metronome use, meter, hand, and musical function on pitch, rhythm, and beat piano performance accuracy scores of undergraduate non-keyboard music majors, and to assess time usage of their pretest and posttest practice sessions. Subjects in the treatment group were given strategies for practicing specific problems encountered in keyboard music. Both groups were given practice pieces in a variety of meters throughout the semester arranged such that either the right hand or left hand played melodic material against an accompaniment in the other hand. Pretest and posttest practice time was recorded on videotape and analyzed according to time spent on various practicing techniques and strategies used by subjects. Data were converted to percentages for statistical analysis. Three four-way Analyses of Variance (ANOVAs) were conducted on the performance accuracy data comparing treatment group to control group, metronome use to no metronome use, pretest to posttest, and meter of 2 to meter of 3 on pitch, rhythm, and beat accuracy data. Additionally, two three-way Analyses of Variance (ANOVAs) were conducted on the performance accuracy data comparing right hand to left hand, melody to accompaniment, and pretest to posttest.

#### Performance

Pretests and posttests consisting of two solo pieces to practice and perform were given at the beginning and end of the semester. Pretests and posttests were graded on the bases of right hand and left hand pitch, rhythm, and beat accuracy. Data were analyzed to compare treatment versus control groups, use of the metronome versus self-selected



tempo, meter of one piece in 2 versus meter of the second piece in 3, right hand versus left hand, and melody in the right hand versus melody in the left hand.

A four-way repeated-measures ANOVA comparing treatment, pretest and posttest, metronome use, and meter was used to determine differences in pitch scores between groups. Data were obtained from rendered MIDI performances that had been graded in comparison to the original score for pitch accuracy. The total number of pitches of the melody in the piece with a meter of 2 was 32, of the accompaniment in the piece with a meter of 2 was 183, of the melody in the piece with a meter of 3 was 64, and of the accompaniment in the piece with a meter of 3 was 41. Because the two pieces contained a different number of pitches, raw scores were converted to percentages of correct pitches for comparison. Results of the analysis are presented in Table 4.

A significant difference due to the main effect of test [ $F(1, 35) = 33.06, p < .0001$ ], with posttest scores ( $M = 86.85\%$ ) being higher than pretest scores ( $M = 77.21\%$ ) was found. There were no significant main effects of metronome use [ $F(1, 35) = .84, p = .37$  (with metronome,  $M = 83.54\%$ ; without metronome,  $M = 80.73\%$ )], group [ $F(1, 35) = .02, p = .90$  (treatment,  $M = 82.58\%$ ; control,  $M = 81.31\%$ )], or meter [ $F(1, 35) = 1.15, p = .29$  (meter of 2,  $M = 83.22\%$ ; meter of 3,  $M = 80.83\%$ )]. A significant interaction between group and metronome was detected [ $F(1,35) = 4.99, p = .03$ ]. Means are presented in Table 5 and Figure 5. It is clear from the Figure that the control group played with greater pitch accuracy when the metronome was used than when it was not used. Metronome scores for the control group were approximately 14 percentage points higher than no metronome scores. The opposite was true for the treatment group, who performed with greater pitch accuracy when the metronome was not used, although the difference

Table 4

ANOVA Table for Pitch

Source	DF	Sum of Squares	Mean Square	F-Value	P-Value
Group	1	13.12	13.12	.02	.90
Metronome	1	640.25	640.25	.84	.37
Group x Metronome	1	3828.09	3828.09	4.99	.03
Subject (Group)	35	26830.05	766.57		
Test	1	3665.33	3665.33	33.06	<.0001
Test x Group	1	180.17	180.17	1.63	.21
Test x Metronome	1	171.63	171.63	1.55	.22
Test x Group x Metronome	1	122.50	122.50	1.11	.30
Subject (Group)	35	3879.94	110.86		
Meter	1	185.38	185.38	1.15	.29
Meter x Group	1	8.03	8.03	.050	.83
Meter x Metronome	1	265.01	265.01	1.64	.21
Meter x Group x Metronome	1	75.85	75.85	.47	.50
Subject (Group)	35	5653.94	161.54		
Test x Meter	1	34.40	34.40	.22	.64
Test x Meter x Group	1	277.30	277.30	1.78	.19
Test x Meter x Metronome	1	17.04	17.04	.11	.74
Test x Meter x Group x Metronome	1	8.70	8.70	.06	.82
Subject (Group)	35	5451.17	155.75		

was not as stark as for the control group. Treatment scores when the metronome was not used were approximately 6 percentage points higher than when it was used. No other significant interactions were detected.

Table 5

Pitch Means for Group by Metronome Interaction		
	Metronome	No Metronome
Treatment	79.35	85.27
Control	88.78	74.67

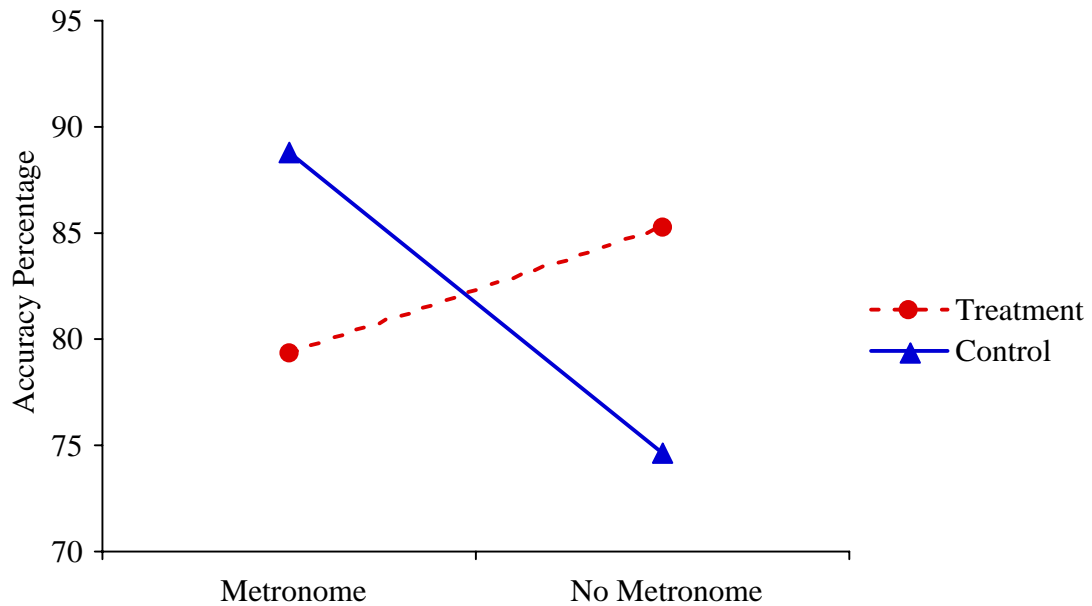


Figure 5. Pitch Means for Group by Metronome Interaction

Due to the fact that all subjects played a left hand melody in one piece and a right hand melody in the other, but conditions alternated between pieces among subjects, the

previous analysis could not compare hand and melodic function because of the empty cells that would have been contained in the statistical analysis. To explore hand and function in relation to pitch, which was a major focus of this study, a separate analysis was conducted.

A three-way repeated-measures ANOVA comparing pretest and posttest, right hand and left hand, and melody and accompaniment was used to determine differences in pitch scores. Results of the analysis are presented in Table 6.

As with the previous analysis, a significant difference due to the main effect of test [ $F(1, 38) = 38.15, p < .0001$ ] was found, with posttest scores being higher than pretest scores. A second significant difference due to the main effect of function [ $F(1, 38) = 30.51, p < .0001$ ] was found, with melody scores ( $M = 86.91\%$ ) being higher than accompaniment scores ( $M = 77.65\%$ ). There was no significant main effect of hand [ $F(1, 38) = .43, p = .51$  (right hand,  $M = 82.84\%$ ; left hand,  $M = 81.72\%$ )]. No significant interactions were detected.

A four-way repeated-measures ANOVA comparing treatment, pretest and posttest, metronome use, and meter was used to determine differences in rhythm scores between groups. Data were obtained from rendered MIDI performances that had been graded in comparison to the original score for rhythm accuracy. The total number of individual rhythms of the melody in the piece with a meter of 2 was 34, of the accompaniment in the piece with a meter of 2 was 62, of the melody in the piece with a meter of 3 was 66, and of the accompaniment in the piece with a meter of 3 was 48. Raw scores were converted to percentages correct for comparison because the two pieces contained a different number of rhythms. Results of the analysis are presented in Table 7.

Table 6

Hand by Function ANOVA Table for Pitch

Source	DF	Sum of Squares	Mean Square	F-Value	P-Value
Subject	38	64451.12	1696.08		
Test	1	7087.08	7087.08	38.15	<.0001
Subject (Group)	38	7058.80	185.76		
Hand	1	98.16	98.16	.43	.51
Subject (Group)	38	8606.72	226.49		
Function	1	6692.39	6692.39	30.51	<.0001
Subject (Group)	38	8334.49	219.329		
Test x Hand	1	30.16	30.16	.40	.53
Subject (Group)	38	2834.29	74.59		
Test x Function	1	256.70	256.70	2.19	.15
Subject (Group)	38	4464.68	117.49		
Hand x Function	1	536.16	536.16	1.58	.22
Subject (Group)	38	12891.22	339.24		
Test x Hand x Function	1	83.08	83.08	.42	.52
Subject (Group)	38	7499.80	197.36		

Table 7

ANOVA Table for Rhythm

Source	DF	Sum of Squares	Mean Square	F-Value	P-Value
Metronome	1	777.70	777.70	1.17	.29
Group	1	667.12	667.12	1.00	.32
Metronome x Group	1	2648.12	2648.12	3.98	.05
Subject (Group)	35	23282.86	665.23		
Test	1	2681.33	2681.33	18.98	.0001
Test x Metronome	1	123.12	123.12	.87	.36
Test x Group	1	30.95	30.95	.22	.64
Test x Metronome x Group	1	5.03	5.03	.04	.85
Subject (Group)	35	4943.24	141.24		
Meter	1	4051.24	4051.24	21.68	<.0001
Meter x Metronome	1	707.14	707.14	3.78	.06
Meter x Group	1	118.68	118.68	.64	.43
Meter x Metronome x Group	1	10.07	10.07	.05	.82
Subject (Group)	35	6540.68	186.88		
Test x Meter	1	12.95	12.95	.10	.76
Test x Meter x Metronome	1	.12	.12	.001	.98
Test x Meter x Group	1	833.45	833.45	6.16	.02
Test x Meter x Metronome x Group	1	17.99	17.99	.13	.72
Subject (Group)	35	4733.46	135.24		

Results indicate a significant difference due to the main effect of test [ $F(1, 35) = 18.99, p = .0001$ ], with posttest scores ( $M = 84.69\%$ ) being higher than pretest scores ( $M = 76.30\%$ ). A second significant difference due to the main effect of meter [ $F(1, 35) = 21.68, p < .0001$ ] was found. Subjects were more accurate with regard to rhythm on the piece in a meter of 2 ( $M = 85.69\%$ ) than on the piece in a meter of 3 ( $M = 75.30\%$ ). There were no significant main effects of metronome use [ $F(1, 35) = 1.17, p = .29$  (with metronome,  $M = 82.32\%$ ; without metronome,  $M = 78.93\%$ )] or group [ $F(1, 35) = 1.00, p = .32$  (treatment,  $M = 82.56\%$ ; control,  $M = 77.82\%$ )].

A significant two-way interaction between meter and group was detected, but it is subsumed within the higher-order interaction among test, meter, and group, and is more appropriately discussed there. A significant higher-order interaction among test, meter, and group was detected [ $F(1, 35) = 6.16, p = .02$ ]. Means are presented in Table 8 and Figure 6. It is clear from the Figure that scores of both groups increased from pretest to posttest, in meters of 2 and 3. The control group made the greatest gains, approximately 15 percentage points, from pretest to posttest on the piece with a meter of 2. However, the treatment group made the greatest gains from pretest to posttest, almost 12 percentage points, on the piece with a meter of 3. The smallest gains were made by the treatment group on the piece with a meter of 2 (approximately 3 percentage points), and by the control group on the piece with a meter of 3 (approximately 4 percentage points). Pretest and posttest scores of both groups were higher on the piece with a meter of 2 than the piece with a meter of 3. No other significant interactions were detected; however, one approached significance: meter by metronome [ $F(1, 35) = 3.78, p = .06$ ].

Table 8

Rhythm Means for Test by Meter by Group Interaction

	Treatment	Control
Pretest, Two	85.27	76.65
Posttest, Two	88.73	91.35
Pretest, Three	72.23	69.59
Posttest, Three	84.00	73.71

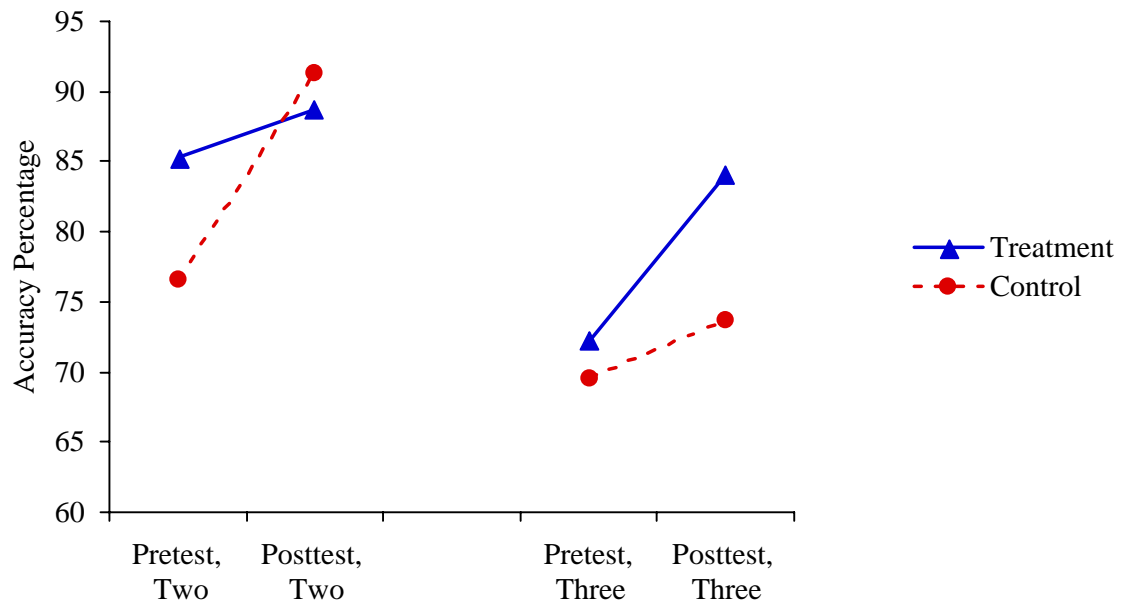


Figure 6. Rhythm Means for Test by Meter by Group Interaction

Due to the fact that all subjects played a left hand melody in one piece and a right hand melody in the other, but conditions alternated between pieces among subjects, the previous analysis could not compare hand and melodic function because of the empty cells that would have been contained in the analysis. To evaluate hand and function in



relation to rhythm, which was a major focus of this study, a separate analysis was conducted on the data.

A three-way repeated-measures ANOVA comparing pretest and posttest, right hand and left hand, and melody and accompaniment was used to determine differences in rhythm scores. Results of the analysis are presented in Table 9. As with the previous analysis, a significant difference due to the main effect of test [ $F(1, 38) = 19.88, p < .0001$ ] was detected, with posttest scores being higher than pretest scores. A second significant difference due to the main effect of hand [ $F(1, 38) = 5.03, p = .03$ ] was found, with right hand scores ( $M = 82.53\%$ ) being higher than left hand scores ( $M = 75.64\%$ ). A third significant difference due to the main effect of function [ $F(1, 38) = 9.50, p = .004$ ] was detected, with melody scores ( $M = 82.15\%$ ) being higher than accompaniment scores ( $M = 76.02\%$ ). No significant interactions were detected in this analysis.

A four-way repeated-measures ANOVA comparing treatment, pretest and posttest, metronome use, and meter was used to determine differences in beat scores between groups. Data were obtained from rendered MIDI performances that had been graded in comparison to the original score for beat accuracy. The total number of opportunities for beat errors in the piece with a meter of 2 was 61, and the total number of opportunities for beat errors in the piece with a meter of 3 was 64. These opportunities for beat errors occurred on half beats as well as beats and did not include the number of hesitations at barlines that could have occurred during performance. Raw scores were converted to percentages for comparison because the two pieces contained a different number of opportunities for beat errors. Results of the analysis are presented in Table 10.

Table 9

Hand by Function ANOVA Table for Rhythm

Source	DF	Sum of Squares	Mean Square	F-Value	P-Value
Subject	38	61848.83	1627.60		
Test	1	5635.50	5635.50	19.88	<.0001
Subject (Group)	38	10771.00	283.447		
Hand	1	3710.82	3710.82	5.03	.03
Subject (Group)	38	28041.68	737.94		
Function	1	2929.28	2929.28	9.50	.004
Subject (Group)	38	11723.72	308.52		
Test x Hand	1	37.39	37.39	.19	.66
Subject (Group)	38	7418.62	195.23		
Test x Function	1	62.82	62.82	.34	.56
Subject (Group)	38	6969.68	183.41		
Hand x Function	1	130.78	130.78	.19	.66
Subject (Group)	38	25686.72	675.97		
Test x Hand x Function	1	332.32	332.32	1.15	.29
Subject (Group)	38	10958.68	288.39		

Table 10

ANOVA Table for Beat

Source	DF	Sum of Squares	Mean Square	F-Value	P-Value
Metronome	1	1824.90	1824.90	3.82	.06
Group	1	467.29	467.29	.98	.33
Metronome x Group	1	2110.08	2110.08	4.42	.04
Subject (Group)	35	16718.10	1051.11		
Test	1	1051.11	1051.11	14.44	.0006
Test x Metronome	1	32.59	32.59	.45	.51
Test x Group	1	75.14	75.14	1.03	.32
Test x Metronome x Group	1	10.38	10.38	.14	.71
Subject (Group)	35	2548.35	72.81		
Meter	1	506.65	506.65	5.26	.03
Meter x Metronome	1	749.26	749.26	7.78	.01
Meter x Group	1	57.11	57.11	.59	.45
Meter x Metronome x Group	1	203.75	203.75	2.11	.16
Subject (Group)	35	3372.59	96.36		
Test x Meter	1	30.95	30.95	.44	.51
Test x Meter x Metronome	1	6.91	6.91	.10	.76
Test x Meter x Group	1	124.07	124.07	1.75	.19
Test x Meter x Metronome x Group	1	6.78	6.78	.10	.76
Subject (Group)	35	2481.05	70.89		

A significant difference due to the main effect of test was found [ $F(1, 35) = 14.36$ ,  $p = .0006$ ], with posttest scores ( $M = 92.64\%$ ) being higher than pretest scores ( $M = 87.49\%$ ). A second significant difference due to the main effect of meter [ $F(1, 35) = 5.26$ ,  $p = .03$ ], with meter of 2 ( $M = 91.95\%$ ) being more accurate than meter of 3 ( $M = 88.18\%$ ), was found. There were no significant main effects of group [ $F(1, 35) = .98$ ,  $p = .33$  (treatment,  $M = 91.78\%$ ; control,  $M = 87.84\%$ )] or metronome [ $F(1, 35) = 3.82$ ,  $p = .06$  (metronome,  $M = 93.25\%$ ; no metronome,  $M = 87.33\%$ )].

A significant interaction between meter and metronome use was detected [ $F(1, 35) = 7.78$ ,  $p = .0085$ ]. Means are presented in Table 11 and Figure 7. It is clear from the Figure that the metronome seemed to have a positive effect on beat accuracy scores of the piece with a meter of 3. When the metronome was used, beat scores for the piece with a meter of 3 were 10 percentage points higher than when the metronome was not used. Conversely, the metronome seemed to have a limited effect on beat accuracy scores of the piece with a meter of 2. When the metronome was used, beat scores for the piece with a meter of 2 were less than two percentage points higher than when the metronome was not used. Highest scores were earned by subjects who performed with the metronome in a meter of 3. Lowest scores were earned by subjects who performed without the metronome in a meter of 3.

Table 11

Beat Means for Meter by Metronome Interaction		
	Metronome	No Metronome
Two	92.92	91.12
Three	93.58	83.59

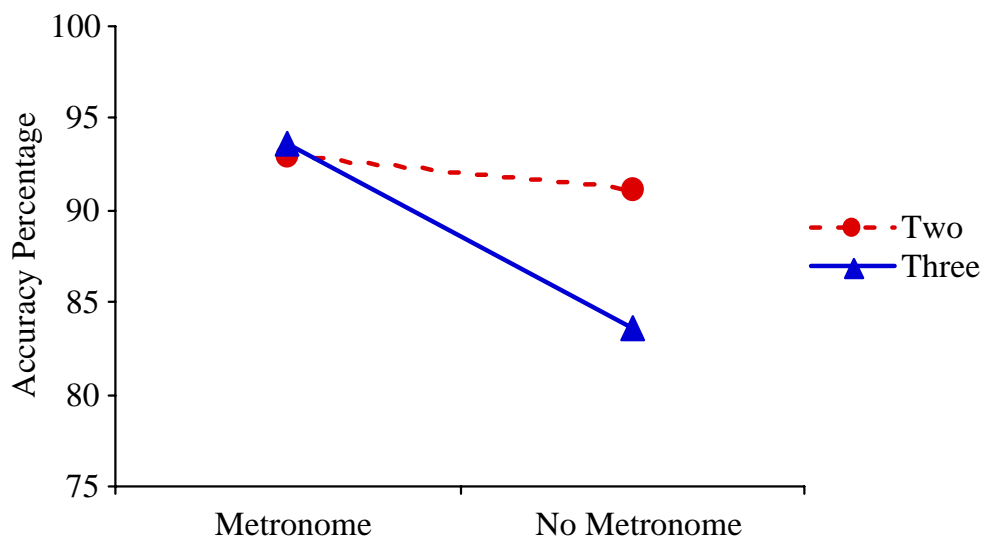


Figure 7. Beat Means for Meter by Metronome Interaction

A second significant interaction between metronome use and group [ $F(1, 35) = 4.42, p = .04$ ] was detected. Means are presented in Table 12 and Figure 8. It is clear from the Figure that the metronome did not seem to affect the treatment group, as subjects performed less than one percentage point better when they did not use the metronome than when they did. However, the control group seemed to benefit from its use. Subjects in the control group performed more than 14 percentage points higher when performing with the metronome than when performing without it. Highest scores were earned by control subjects who used the metronome; and lowest scores were earned by control subjects who did not use the metronome. No other interactions were detected. A separate analysis comparing hand, function, and test was not feasible because beat scores for both hands were the same. Therefore, all beat data are included in Tables 10-12 and Figures 7-8.

Table 12

Beat Means for Metronome by Group Interaction		
	Metronome	No Metronome
Treatment	91.50	92.02
Control	95.44	81.08

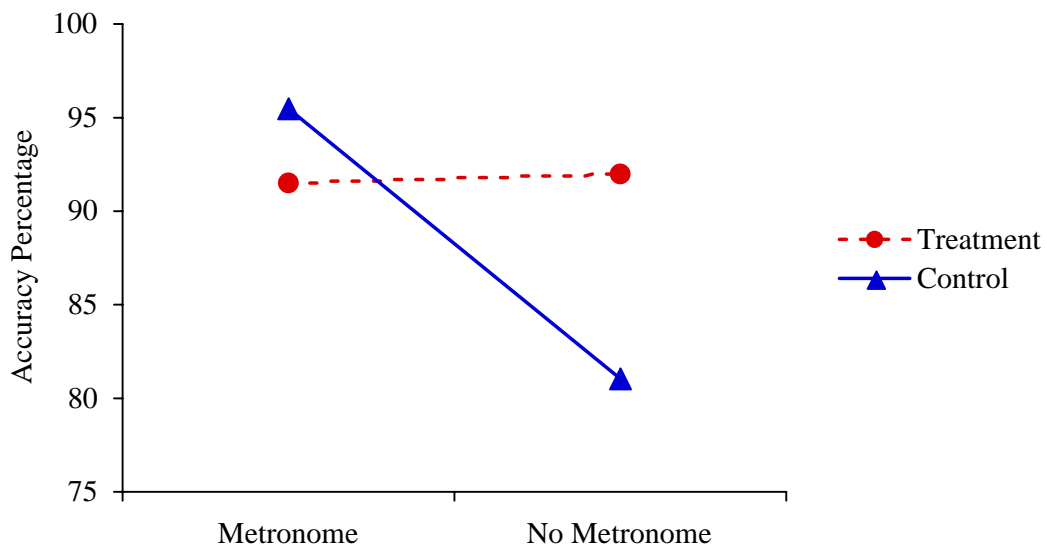


Figure 8. Beat Means for Metronome by Group Interaction

Approximately one-half of treatment and control subjects were randomly selected to perform the pretest and posttest pieces with the metronome set to 60 beats per minute, and the other half were allowed to choose their own performance tempos. Averages of the subjects' self-selected performance tempos were calculated and are presented in Table 13. Gains scores for tempos were also calculated and are presented in Table 13. It is clear from the Table that the average tempo for the piece in a meter of 2 on both the pretest and posttest was similar to the tempo marking on the score, which was 60 beats

per minute. The pretest and posttest averages for subjects who did not use the metronome were virtually the same as the tempos of subjects who were selected to use the metronome. However, the average tempos for the piece in 3/4 were considerably higher than 60 beats per minute and were not the same as the tempos of subjects who performed with the metronome. The piece in 3/4 averaged greater tempo gains from pretest to posttest than the piece in 2/4. Whereas the average tempo gain for the piece in 2/4 was 0.10 beats per minute, the average tempo gain for the piece in 3/4 was much greater at two beats per minute.

Table 13

Average Tempos of Pretest and Posttest Performance Selections and Tempo Gains Scores

	Pretest	Posttest	Gain
Piece in a meter of 2	60.00	60.10	0.10
Piece in a meter of 3	67.62	69.62	2.00

The lowest and highest tempos for each piece on both pretest and posttest are presented in Table 14. These eight tempos were the performance tempos of only four different subjects. The lowest tempo for the piece in a meter of 2 on the pretest was 40 beats per minute, and on the posttest was 40 beats per minute as well. The same subject selected this tempo for both tests. The highest pretest tempo for the piece in a meter of 2 was 88 beats per minute, selected by a different subject. A third subject performed the piece in a meter of 2 on the posttest at 92 beats per minute, and the piece in a meter of 3 on the pretest and posttest at 120 beats per minute. A fourth subject performed the piece in a meter of 3 at the slowest tempos on the pretest and posttest: 42 and 50 beats per minute, respectively. Only one control subject who did not use the metronome for

performance on pretest and posttest performed all selections at the assigned tempo, 60 beats per minute.

Table 14

Lowest and Highest Pretest and Posttest Performance Tempos		
	Lowest Tempo	Highest Tempo
Meter of 2, Pretest	40	88
Meter of 2, Posttest	40	92
Meter of 3, Pretest	42	120
Meter of 3, Posttest	50	120

### Practicing

At the beginning and end of the semester, subjects were given pretests and posttests consisting of two solo pieces to practice and perform. Subjects were allowed up to eight minutes per piece to study and practice in any fashion they chose. Pretest and posttest practice sessions were videotaped for further analysis. Following videotaping and analysis of pretest and posttest practice sessions, total practice time was divided into subsections, averaged, and converted to percentages for descriptive comparisons between groups and tests because all subjects did not use the entire allotted practicing time.

On the pretest, the treatment group practiced for an average of 15 minutes and 30 seconds of their total 16-minute practice time. On the pretest, the control group practiced for an average of 14 minutes and 31 seconds of their total 16-minute practice time. On the posttest, the treatment group practiced for an average of 13 minutes and 22 seconds of their total 16-minute practice time. On the posttest, the control group practiced for an average of 13 minutes and 42 seconds of their total 16-minute practice time. Results of



how time was spent during practice sessions are presented in Figure 9. It is clear from the Figures that behavior during practice sessions was similar for all groups and tests with the exception of the treatment group on the pretest, who spent more time practicing and less time analyzing the score. On the posttest, the treatment group spent approximately as much time analyzing the score as the control group, whose practicing behavior did not change greatly from pretest to posttest.

Besides time spent in performance and score study, subjects were engaged in activities that were not categorized when analyzed with the software program SCRIBE, and were included in the “other” category. Subjects in all groups spent more than 9% of their practice session engaged in activities that were included in this “other” category. On-task behaviors besides practicing or analyzing the score, such as turning the metronome on, setting a tempo, and turning it off, looking at the score without writing on it, or time spent thinking, which could not be observed and recorded, were considered to be “other” activities. Off-task activities such as time spent at the piano playing something other than the given solo pieces, dropping and retrieving the pencil, and looking around the room or out the window were also included in the “other” category.

Analysis of pretest practice sessions revealed that treatment subjects used 97% of the total 16 minutes allotted to them. Control subjects used 91% of the total 16 minutes allotted to them. Analysis of posttest practice sessions revealed that treatment subjects used 84% of the total 16 minutes allotted to them. Control subjects used 86% of the total 16 minutes allotted to them. The amount of practice time that subjects spent practicing with right hand, left hand, and both hands together was averaged and converted to percentages. Results are presented in Table 15 and Figure 10.

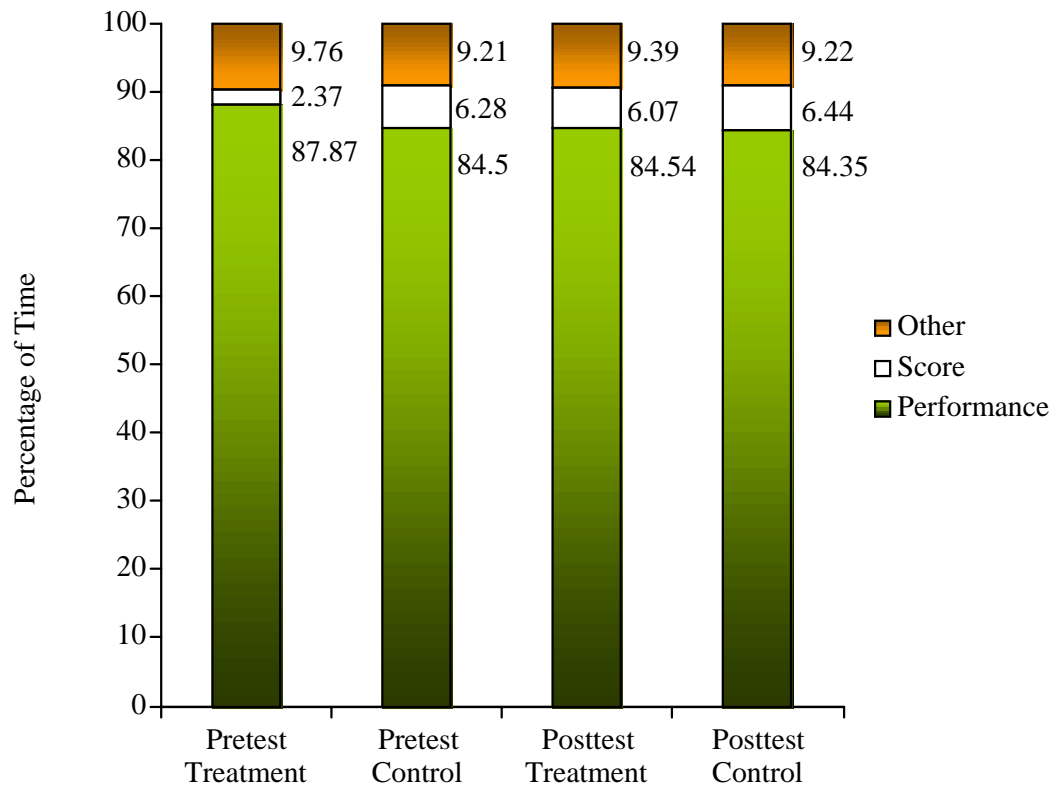


Figure 9. Practice Session Activities

From pretest to posttest, the average percentage of practice time used by treatment and control subjects decreased by 13 percentage points and 5 percentage points, respectively. Time spent practicing each hand separately diminished from pretest to posttest, and time spent practicing both hands together increased. Subjects in the treatment group practiced slightly more with their left hands than their right hands, and the opposite was true for control subjects, who practiced slightly more with their right hands than their left hands. Subjects in both groups spent the most time, 53 to 67 percent, practicing both hands together.

Table 15

Practice Session Percentages of Time by Hand

	Pretest Treatment	Posttest Treatment	Pretest Control	Posttest Control
% of Practice Time Used	97	84	91	86
Left Hand	23	18	23	19
Right Hand	22	15	24	20
Both Hands	55	67	53	61

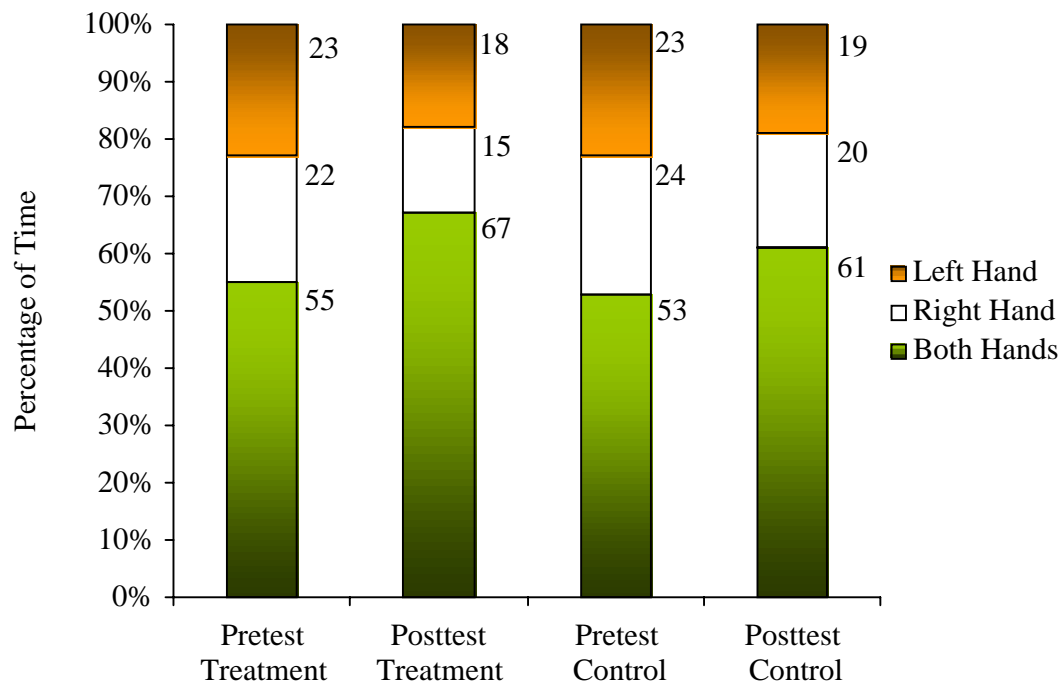


Figure 10. Practice Session Percentages of Time by Hand

The amount of practice time that subjects spent practicing the melody, accompaniment, and both functions together was averaged and converted to percentages.

Results are presented in Table 16 and Figure 11. Time spent practicing each function

separately diminished from pretest to posttest, and time spent practicing both functions together increased. Subjects in both groups practiced the melody slightly more than the accompaniment, with the exception of treatment subjects on the posttest, who practiced the accompaniment slightly more than the melody. Subjects in both groups spent the most time, 53 to 67 percent, practicing both functions together.

Table 16

Practice Session Percentages of Time by Function

	Pretest Treatment	Posttest Treatment	Pretest Control	Posttest Control
% of Practice Time Used	97	84	91	86
Accompaniment	22	17	23	19
Melody	23	16	24	20
Both Functions	55	67	53	61

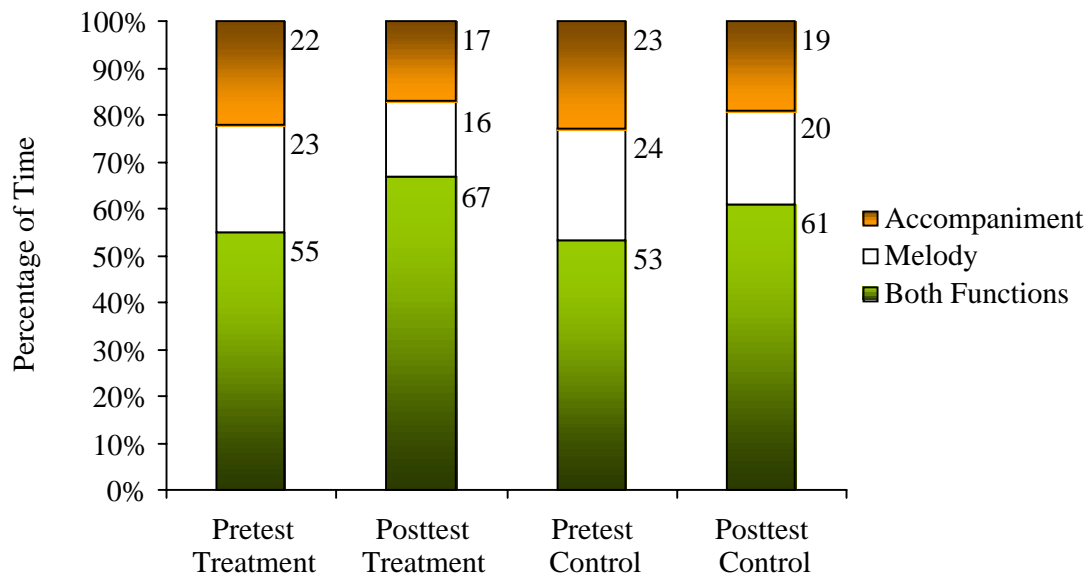


Figure 11. Practice Session Percentages of Time by Function

As the use of practicing strategies was a major focus of this study, subjects were asked to list on their Subject Information Sheets, before being given the pretest, various practice strategies that they used on a regular basis. Following analysis of pretest and posttest videotaped practice sessions, the investigator compared subjects' self-reported practice strategies to how subjects actually practiced. Their self-reported practice strategies and whether they seemed to employ them in practice sessions are included in Table 17. Although it appears in Table 17 that all 39 subjects in this study listed practice strategies, some did not. Several subjects listed multiple strategies and others listed none. There were a total of 39 separate listings of strategies, but only 20 subjects, 51%, used the strategies they listed. Many subjects listed acceptable practice techniques, but few chose to follow the strategies they listed. No subjects listed practice strategies for problems such as moving hands out of the starting position, learning unfamiliar chords, practicing accidentals, or slowly increasing from a rehearsal tempo to a performance tempo. These strategies were taught during treatment and were not expected to be used by subjects prior to treatment.

Much of the evidence of subjects' use of treatment practice strategies came from analysis of their posttest scores. All score analysis procedures included on pretest and posttest scores for all groups were labeled and categorized. Score analysis procedures were divided by percentage of subjects in each group utilizing each procedure, were calculated, and are included in Appendix J. Recurring pretest and posttest score analysis procedures of the treatment and control groups are included in Table 18.

Table 17

## Self-Reported Practice Strategies Listed and Used by Subjects

Strategy Listed	Frequency strategy was listed by subjects	Frequency strategy was used by same subjects
Hands separately/Hands together	5	5
Repetition	5	5
Scales	5	0
Slow down difficult passages, then speed up	5	3
Arpeggios	2	0
Look over a piece first	2	2
Bang out the notes, then sing it	1	0
Do it till it works	1	1
Find key	1	1
Play both lines with each hand to increase left hand proficiency	1	0
Record practice sessions	1	0
Repetition of problem spot	1	1
Repetition until perfection	1	0
Rhythm first, then melody	1	0
Sight-read on numbers rather than solfege	1	1
Sight-reading	1	0
Slow down tempo and isolate problem	1	0
Slower practice equals faster results	1	0
Slowing down the metronome	1	1
Slowly	1	0
Transposition	1	0
TOTALS	39	20

Table 18

## Percentages of Subjects Using Specific Score Analysis Procedures

Written Analysis	Treatment Pretest	Treatment Posttest	Control Pretest	Control Posttest
Adding Finger Numbers	9	9	18	29
Circling Accidentals	0	32	0	12
Circling Changing Pitches	0	14	12	0
Circling Finger Numbers	0	36	12	24
Circling Unfamiliar Chords	0	14	0	0
Drawing Arrows to Indicate Pitch Change	5	0	12	18
Drawing Stars to Indicate Hand Shifts	9	0	0	0
Identifying Key and Meter	0	24	0	12
Labeling Pitches	18	14	47	0
Marking Hand Position Changes	0	23	0	12
Marking Repeating Sections	0	32	0	0
Notating Accidentals	0	18	18	18
Roman Numeral Analysis	9	18	0	24

Subjects in the treatment group used the least score analysis procedures on the pretest, and the most on the posttest. Control subjects also used score analysis procedures, but used more than treatment subjects on the pretest, and less than treatment subjects on the posttest. The most frequently used procedure was labeling pitches, which was used by almost half of control subjects on the pretest. Score analysis procedures presented during

treatment, including identifying key and meter, marking hand position changes, marking repeating sections, circling accidentals, and circling unfamiliar chords, were used by a higher percentage of treatment than control subjects on the posttest.

An interesting finding regarding score analysis procedures was not necessarily what they wrote on the score, but what they noticed from the score and applied to their initial practicing on pretests and posttests. Results of this analysis are included in Table 19. On the pretest, as is presented in Table 18, no subject in either group circled the key signature of either piece. It was evident in their performances that this was not part of their daily practicing routine, as Table 19 shows that only 64% of treatment subjects and 41% of control subjects noticed and performed the correct key signature of the piece in a meter of 2, which was in G major, upon the first performance of the selection. However, on the posttest, as can be seen in Table 18, 24% of treatment subjects and 12% of control subjects circled the key signature to remind themselves of the F-sharp. During the initial performance on the posttest, as is presented in Table 19, treatment subjects improved by 22 percentage points in observing and applying the key signature when practicing the piece for the first time. Control subjects improved by only 6 percentage points from pretest to posttest in observing and applying the key signature when practicing the piece for the first time. Even though only 24% of treatment subjects and 12% of control subjects circled the G major key signature on the posttest, 86% of treatment subjects and 47% of control subjects observed the key signature when reading through the piece for the first time on the posttest.

Beyond evaluating subjects' score analysis procedures, the order in which they practiced with each hand was investigated as well. Results of the investigation of the



Table 19

## Percentages of Subjects Who Noticed Key Signatures

	Pretest	Posttest	Improvement
Treatment Group	64	86	22 percentage points
Control Group	41	47	6 percentage points

order in which subjects practiced with each hand are included in Table 20. It is clear from the Table that when practicing *Melody for Left Hand*, a piece with a meter of 2, most subjects in treatment and control groups who were assigned that piece chose to practice the accompaniment (right hand) first on both pretest and posttest. When practicing *Melody for Right Hand*, a piece with a meter of 2, subjects in 3 out of 4 groups chose to practice the accompaniment (left hand) first. None of the subjects chose to practice both hands of *Melody for Left Hand* or *Melody for Right Hand* first on the pretest. It is also clear from the Table that when practicing *Dance for Right Hand*, a piece with a meter of 3, most subjects in treatment and control groups who were assigned that piece chose to practice the melody (right hand) first on both pretest and posttest. When practicing *Dance for Left Hand*, a piece with a meter of 3, more subjects chose to practice the melody (left hand) than the accompaniment (right hand) first. When practicing *Dance for Left Hand* or *Dance for Right Hand*, a few subjects in each group chose to practice both hands first on the posttest. Whether subjects were right-handed or left-handed did not seem to make a difference in which hand they chose to practice first. Eighty-two percent of treatment subjects in this study, or 18 out of 22, were right-handed. Eighty-two percent of control subjects, or 14 out of 17, were right-handed.

Table 20

## Percentages of Hand and Function Practiced First by Piece and Group

	Melody for Left Hand (meter of 2)			Melody for Right Hand (meter of 2)			Dance for Left Hand (meter of 3)			Dance for Right Hand (meter of 3)		
	LH Mel	RH Acc	Both	RH Mel	LH Acc	Both	LH Mel	RH Acc	Both	RH Mel	LH Acc	Both
Treatment Pretest	23	77	0	56	44	0	44	44	11	54	46	0
Treatment Posttest	23	69	8	33	44	22	22	56	22	54	31	15
Control Pretest	29	71	0	40	60	0	70	20	10	71	14	14
Control Posttest	14	57	29	30	70	0	60	30	10	43	29	29

Another portion of practice time that was evaluated was the time subjects spent using the metronome as a practice aid.

Approximately one half of treatment and control subjects were randomly selected to perform pretest and posttest selections with the metronome set to 60 beats per minute. Subjects were informed of this before commencing practice and were given the option to practice with or without the metronome. Time spent using the metronome as a practice aid was averaged and converted to percentages, and is presented in Table 21.

Table 21

Average Percentage of Practice Time Spent Using the Metronome			
	Pretest	Posttest	Overall Average
Treatment	30	35	31
Control	13	28	22

Before commencing the pretest, subjects were instructed to list on their subject information form the amount of time they used the metronome during practice. Results of their self-reported metronome use are presented in Table 22. It is clear from Tables 21 and 22 that treatment and control subjects' self-reported percentages were lower than the actual time they spent using the metronome during pretest and posttest practice sessions.

Table 22

Self-Reported Percentage of Practice Time Spent Using the Metronome	
	% of Time
Treatment	22
Control	16

## CHAPTER 4

### DISCUSSION

The current study was undertaken partially to expand what is currently known about performance and practicing and to aid in determining empirically based practice strategies to be used in the group piano and private lesson settings. Performance and practicing are discussed daily by students and teachers, but little experimental data exists to support those discussions. Teachers desire to teach well. If teachers can be provided with information from empirical studies to help them as they train students, they may be more successful in helping students achieve a higher level of musicianship. If there is a better way to teach performance and practicing at the piano than was previously thought, then perhaps this study could serve to open a door for further research.

Helping students prepare for performance is sometimes a difficult process. Frequently, students in piano class and in private lessons are faced with performance situations for which they are graded in some way, and it would be helpful for teachers to know more about what research has to say about performing at the piano. Many issues are involved in teaching piano performance (e.g., maintaining a consistent tempo, continuing to play after a mistake occurs), and it would be useful to have data to confirm what pedagogues and researchers believe about performance.

Often, beginning private students and students in piano class seem to progress slowly. This could be linked to numerous reasons, one of which could be their inefficiency as they practice their weekly assignments. Though many pedagogues have dealt with practicing throughout their writings (Berr, 1995, Blickenstaff, 1993; Breth, 2001; Clark, 1992; Pearce, 1992), offering strategies that seem to work well, few have

endeavored to study them through empirical research methods. Some teachers may even have trouble giving their students specific practicing techniques to use throughout the week. It would be advantageous to determine specific steps leading to achievement during practice so that teachers could give appropriate practice instructions that move beyond “go home and practice harder this week.”

### Performance

A major focus of this study was to look more closely at issues believed (based on experience or data) to affect performance accuracy scores among undergraduate non-keyboard music majors. Previous research (Betts & Cassidy, 2000; Cassidy, Betts, & Hanberry, 2001) has consistently shown that right hand scores on piano performance tasks of undergraduate non-keyboard music majors are significantly higher than left hand scores on those same tasks. It was questioned whether the difference was due to right hand dominance or musical function. The present study isolated those variables in an attempt to discover the reason for those differences in scores between the right and left hands. In the two analyses that explored musical function (melody and accompaniment), melody scores were significantly higher than accompaniment scores with respect to pitch and rhythm, regardless of which hand performed the melody. Hand affected accuracy scores only in the case of rhythm, with right hand being more accurate than left hand. Therefore, musical function appears to have affected performance accuracy scores of subjects more so than did hand. These results indicate that accuracy is more closely related to musical function than it is to hand. Results also suggest that the accompaniment is the weaker of the two functions. Perhaps more attention should be given to the accompaniment in class, during lessons, and during practice sessions so that performance

accuracy will improve. Requiring students to spend more time practicing the accompaniment of dual-staved keyboard pieces, whether in the group piano class or private piano lesson, would be worth the effort involved to ensure greater accuracy of the accompaniment during performance. As suggested by Pace (1999a), immediate recognition of chords and their location on the keyboard (e.g., accompaniment) would help students with their music reading.

In performance situations, when professional accompanists are forced to omit pitches in order to maintain rhythmic integrity, they omit notes that do not detract from the harmonic structure of the piece. Conversely, in the present study when errors occurred, amateur pianists omitted notes in the accompaniment, allowing the harmonic structure to collapse. Perhaps teachers should instruct students to keep the accompaniment going during performance, no matter what happens to the melody. Future studies could compare the omitted note tendencies of performances of amateur pianists and professional accompanists when subjects are forced, perhaps by a page turn or other obstacle, to omit notes from the performance.

With regard to hand dominance, the right hand was significantly better than the left hand on rhythmic accuracy, but not on pitch accuracy. Perhaps there is reason to believe that, given most subjects were right-handed as is the general population, right hands are stronger and more coordinated than left hands. This coordination could affect rhythmic accuracy. These data do not indicate differences between right-handed and left-handed subjects because the sample size of left-handed subjects was very small. Larger and equally balanced samples would allow a closer look at the effect of handedness on music performance.

Many subjects had problems with specific measures in both performance pieces, regardless of which hand was playing the problematic measures. Figures 12 and 14 include musical examples of *Melody for Right Hand* and *Melody for Left Hand*, measures 13 through 16, as they appeared on the score. Figures 13 and 15 include the same examples as they frequently were performed.



Figure 12. *Melody for Right Hand*, Measures 13-16, Example from Score  
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Figure 13. *Melody for Right Hand*, Measures 13-16, Example as Performed  
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Figure 14. *Melody for Left Hand*, Measures 13-16, Example from Score  
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Figure 15. *Melody for Left Hand*, Measures 13-16, Example as Performed  
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The two measures that generated these pitch errors, measures 13 and 14 of *Melody for Right Hand* and *Melody for Left Hand*, were measures in which one hand moved out of the starting position. Often, subjects misread the descending interval in the melody, performing it as an octave rather than a sixth. Perhaps subjects did not take the time to identify the interval before practicing it. It is also possible that some subjects do not read bass clef well, and made a guess at what the pitch might have been. In future studies, identifying large intervals before beginning to practice could be added to the score analysis portion of the practice strategies to increase subjects' awareness of the span their hand will need to cover during practice.

It is also possible that using incorrect fingering could have contributed to pitch errors in these measures. Fingering suggestions were offered on the score, and no pitches were used that were unfamiliar to the subjects. However, it was apparent that subjects tended to use their own fingerings, to the detriment of pitch scores in some cases, when performing these measures. Using correct fingering as it was suggested on the score no doubt would have helped subjects earn more accuracy points in the pitch category. However, it is likely that there still would be no differences in pitch scores between hands, as the same pitches were included whether the melody was played by the left hand



or by the right hand. Because fingering on the piano has multiple options with varying levels of comfort and convenience, perhaps students in piano class should be taught more specifically the importance of piano fingering. It is plausible that increased emphasis on fingering could promote greater accuracy scores, as it would lead students to the most direct way of performing a given musical example. It is also possible that because these students were in their second semester of group piano, they had already formed ideas and ways of performing at the piano, which may not have included the importance of using suggested fingering. Perhaps future studies could examine piano performance habits, especially as they relate to fingering, of first-semester group piano students.

The measures that seemed to generate the most rhythm errors were in the accompaniment of *Dance for Right Hand* and *Dance for Left Hand*. These measures contained quarter note chords on the downbeat of each measure, followed by quarter rests on beats 2 and 3. Figures 16 and 18 contain measures 9 through 16 of *Dance for Right Hand* and *Dance for Left Hand* as notated on the score. Figures 17 and 19 contain measures 9 through 16 of *Dance for Right Hand* and *Dance for Left Hand* as subjects frequently performed them. Many subjects held the chords for all three beats of each measure and, as a result, were graded as committing errors due to the objective nature of the grading process.

Several subjects performed the rhythms of *Dance for Right Hand's* accompaniment and *Dance for Left Hand's* accompaniment as half notes or dotted half notes, regardless of which hand played them. This contributed to up to three rhythm errors per measure. Even though the sound of the performance was not as egregious to

the ear as incorrect pitches would have been, the incorrect rhythms were still counted as errors. Subjects were concentrating on performing both melody and accompaniment, but

The musical score for 'Dance for Right Hand' (Measures 9-16) is presented in two systems. Each system contains four measures. The first system (measures 9-12) shows a melody in the right hand and a bass line in the left hand. The second system (measures 13-16) continues the melody and bass line. Fingerings are indicated by numbers 1-5 above the notes. Rhythmic values are indicated by numbers 1, 2, 3, and 5 below the measures.

Figure 16. *Dance for Right Hand*, Measures 9-16, Example from Score  
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This musical score is identical to the one in Figure 16, showing the melody and bass line for measures 9-16. It includes fingerings and rhythmic values.

Figure 17. *Dance for Right Hand*, Measures 9-16, Example as Performed  
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Figure 18. *Dance for Left Hand*, Measures 9-16, Example from Score  
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Figure 19. *Dance for Left Hand*, Measures 9-16, Example as Performed  
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perhaps placed more of their attention on the melody. Pitches of the melody spanned the entire measure and pitches of the accompaniment occurred only on the downbeat, so it is possible that subjects simply forgot to release the notes of the accompaniment because of their focus on the melody. Twenty percent of treatment subjects who used the metronome, 25% of treatment subjects who did not use the metronome, 18% of control subjects who used the metronome, and 32% of control subjects who did not use the metronome committed these errors. Although holding through the rests counted as rhythm errors, the errors were more closely related to subjects' not paying attention to the rests than to actual rhythm errors. Perhaps if the grading had been more subjective, or if it had been more from a musical rather than accuracy standpoint, especially for subjects who had no errors besides the aforementioned rhythm errors, the results of rhythm accuracy would have been slightly different. Future studies could consider grading more heavily on beat continuity and excusing minor pitch and rhythm errors that do not diminish the overall effect of the piece.

It has been suggested that students maintain a beat more consistently when performing selections in meters of 2/4 or 4/4 than when performing in a meter of 3/4 (Cassidy, Betts, & Hanberry, 2001; Wood, 1995). This study isolated meter and imposed metronome use as a variable on one-half of subjects' pretest and posttest performances. It was thought that using the metronome during performances would contribute to increased beat continuity (Beeler, 1995; Lehmann & McArthur, 2002), especially regarding the piece in 3/4, and that using the metronome would have no significant effect on the piece in 2/4. Of the analyses containing the metronome as a variable, it was included in three interactions. One of these interactions indicated that when subjects were performing a

piece in 3/4, those who used the metronome maintained greater beat continuity than those who did not use the metronome. A metronome set to 60 beats per minute was imposed on half of the subjects' performances, while the other half were allowed to select their own tempos. The average of subjects' self-selected tempos for the piece in 2/4 was virtually identical to the tempo marking on the score on both the pretest and posttest. For the piece in 3/4, subjects' self-selected tempos were approximately 8 beats per minute higher on the pretest and 10 beats per minute higher on the posttest. In the selections in 2/4, when all subjects played at 60 beats per minute, there was no difference in beat continuity scores whether subjects used the metronome or not. In the selections in 3/4, tempos chosen by self-selection subjects were almost 10 beats per minute faster. These subjects had more problems maintaining the beat without pauses or hesitations. Perhaps 3/4 more naturally "feels faster" than 2/4, and students should be taught to slow down more than they believe they need to. It is also possible that students have had less practice in "feeling 3," and that lack of being able to feel the beat in 3 adversely affects coordination.

The other two interactions indicated that the control group benefited from using the metronome as a performance aid, as their pitch and beat scores when performing with the metronome were higher than when they performed without it. However, scores of the treatment group, whether or not they were using the metronome, were somewhat consistent. The only opportunity afforded to the control group to use the metronome, aside from those who were randomly selected to perform with it on pretests and posttests, was during daily performances of their practicing pieces. The treatment group practiced and performed while using the metronome set to the appropriate tempo during daily sessions. It is likely that because treatment subjects were accustomed to practicing and

performing with the metronome during daily treatment activities, using the metronome on posttest performances essentially had no effect on them, or had already had its effect during treatment classes. Conversely, control subjects performed daily selections with the metronome and did not practice with it during class throughout the semester as treatment subjects did. Requiring half of control subjects to use the metronome for posttest performances did contribute to their maintaining beat continuity much better than those who did not perform with the metronome on the posttest, and better than treatment subjects as well.

Although metronome made a difference in beat accuracy, it seemed that performing with the metronome did not make as great a difference in pitch and rhythm accuracy as was expected. One reason is that using the metronome did not force subjects to play correct rhythms. This was seen in Figures 17 and 19. It is also plausible that the metronome marking of 60 beats per minute was too high for the 8-minute practice session, and perhaps some subjects were forced to play faster than was feasible for them after such a limited rehearsal time. Additionally, many subjects began practicing at a tempo that was too fast, rather than slowing down to an appropriate practicing tempo. Previous research has indicated that practicing slowly and gradually increasing the tempo is more beneficial than rehearsing at the performance tempo (Henley, 2001).

The pretest and posttest practice session length and performance tempos were chosen based on data compiled from a pilot study (Hanberry, 2002a). Pilot study subjects (N=11) who had completed two semesters of group piano were asked to practice each of two selections, which included one of the pieces used in the current study and another of a similar level of difficulty, for as long as they wished before recording their

performances via the Yamaha *Clavinova*'s recording mechanism. Minutes spent in practice were averaged across both pieces and all subjects. This average resulted in the 8-minute practice sessions, which became the allotted practice time for pretest and posttest subjects in the current study.

Once each pilot study selection was performed and recorded, performance tempos of each selection were determined. Because there was a large range of tempos due to an outlier, the outlier was not included in the rest of the calculations. The remaining tempos of each piece were averaged, and the resulting numbers, ranging from 73 beats per minute for the selections with right hand melody to 84 beats per minute for selections with left hand melody, seemed too high for piano class students who had completed only one semester of piano. Thirteen and 24 beats per minute, respectively, were subtracted from the averages. The resulting 60 beats per minute was designated to be the performance tempo for the current study.

Approximately one half of treatment and control subjects were randomly selected to perform their pretest and posttest selections with the metronome set to 60 beats per minute. They were also given the option of practicing with the metronome at a self-selected tempo. It seemed that the performance tempo of 60 beats per minute would serve to prevent subjects from performing at a rate of speed that was too high for them to manage. However, following analysis of pretest and posttest accuracy scores, it appeared that the metronome could have served to inhibit performance success of some of the subjects. The pre-selected metronome marking of 60 beats per minute that was based on data gathered in a pilot study (Hanberry, 2002a) seemed to be too high for some subjects who had only one previous semester of piano study. The *average* self-selected tempo on

both pretest and posttest for *Melody* was 60 beats per minute and 60.10 beats per minute, respectively, which gives some support to the pre-assigned performance tempo of 60 beats per minute. However, for subjects who did not perform with the metronome, the lowest tempos on the pretest and posttest for both *Melody* and *Dance* ranged from 40 to 50 beats per minute, indicating that some subjects felt they needed a slower tempo.

The metronome was included as a variable in this study for two reasons: to impose a slow tempo on half of subjects' performances and to increase the beat continuity of those performances. Overall, the metronome did function to increase beat continuity, but it functioned to help subjects slow down on only one of the performance selections. Future studies could allow subjects to choose their own performance tempos, and then require them to perform with the metronome set to their self-selected tempos.

At the commencement of the current study, pretest and posttest performance selections of a seemingly similar level of difficulty were chosen from the same collection (Magrath, 1997) after being agreed upon by a panel of experts. However, following analysis of the results of the study, it is possible that the piece with a meter of 2 was the easier selection. There are several possible explanations for why the piece with a meter of 3 seemed slightly more difficult to subjects than the piece with a meter of 2. The piece with a meter of 2 contained primary triads in the key of G major, plus one suspension, and the piece with a meter of 3 contained primary and secondary chords in the key of C major. Though the piece with a meter of 3 contained more quarter rests than the piece with a meter of 2, allowing more time for hand position shifts, it also contained more changes in harmony, and thus changes in chords, than the piece with a meter of 2. It is possible that these frequent chord changes caused the hand to move out of position more



than subjects expected. This, among other factors, resulted in the many interruptions in beat continuity as indicated by Cassidy, Betts, and Hanberry (2001) and Wood (1995), when subjects perform in a meter of 3. Or perhaps the piece with a meter of 3 contained a melody with trickier fingerings, and subjects had difficulty with the fingerings in the melody combined with the chord changes in the accompaniment. It is also possible that performing the piece with a meter of 3 at the same tempo as the piece with a meter of 2 made the piece with a meter of 3 seem slower, so subjects may have unconsciously increased their performance tempos, as in the Mito and Murao study (2001). Thus, the piece with a meter of 3 may have seemed more difficult because subjects were playing it faster than they were playing the piece with a meter of 2. It is also possible that the subjects could not detect changes in their tempos because they were inhibited by the reading and performing. That would in part support Ellis (1989), who found that subjects had difficulty detecting tempo changes while reading and performing along with a pre-recorded metronome with a fluctuating tempo. It is also possible that playing in a meter of 3 is more difficult than playing in a meter of 2. However, further research is needed to make such a determination. This possible difference in level of difficulty could have affected performance scores in all analyses and could have contributed to the differences in performance scores, especially in regards to rhythm and beat, that were noted. Future researchers could compose selections with virtually identical melodic and harmonic material but with different meters to further examine the issue of meter as it relates to piano performance.

Though many instances of significance were revealed, it was surprising that certain findings were not statistically significant. It seemed that there would have been a

difference in right hand and left hand pitch and rhythm scores, as has been documented in previous research (Betts & Cassidy, 2000; Cassidy, Betts, & Hanberry, 2001). There was a difference in rhythm accuracy scores, but not in pitch accuracy scores, between the hands. This lack of significance in pitch accuracy scores, however, was a pleasing finding, as it seemed to answer the problem regarding whether the right hand was dominant when performing at the piano, or whether the melody was the dominant function. Results of the current study indicate that the melody is the dominant function.

Many subjects performed their pretest and posttest selections at a faster tempo than their practicing tempo and they did not seem to play as well during performances as they had during practice. Additionally, a few subjects gave the impression that if they could get a “running start,” then surely they could “plow through” the performance without any problems. Obviously, this was not the case. One subject even approached the investigator and asked whether the investigator would take into consideration that recorded performances of the selections seemed worse than performances during practice sessions, and whether rehearsal performances that seemed more accurate than actual recorded performances would help subjects earn credit for accuracy. This parallels the common phrase said to teachers of piano students at many lessons, “I played it better at home.” If students could be taught to practice performing, in addition to working out trouble spots in their pieces, then perhaps they would be more likely to view portions of rehearsals and practice sessions as performances between the weekly performances they give at lessons. Students who play for family and friends on a regular basis could become desensitized to performing with others around. These frequent performances would most

likely contribute to students making greater efforts to focus keeping the performance going, even after a mistake.

While using technology proved to be a convenient and objective means of gathering data for the current study, there were problems to be dealt with as a result of its use. When recording pretest and posttest performances via the MIDI recording mechanism of the Yamaha *Disklavier*, some subjects did not press the piano keys with enough force for the data of the pressed key to be recorded. Therefore, pitches that subjects pressed lightly did not register as pitches on their performances. This contributed to errors that perhaps subjects did not make, as it seemed that they had omitted pitches from their performances, when in reality, there were no data for the keys that had been pressed. This finding, following grading of pretest and posttest performances, could have contributed to lower pitch and rhythm scores on some subjects' performances.

Another issue worthy of discussion with regards to technology used in this study dealt with subjects who did use the metronome during performances versus those who did not, and the resulting grading issues. For subjects who used the metronome during performances of pretest and posttest selections, grading was not as difficult as it was for subjects who did not use the metronome during pretest and posttest performances. For subjects who did use the *Disklavier*'s metronome, the resulting musical score was cleaner, easier to read, and had correct note values and correctly placed barlines. For subjects who did not use the *Disklavier*'s metronome, it was impossible to use the resulting musical score to grade their performances. As long as the metronome was on, the software notation program *Finale*<sup>TM</sup> could use the *Disklavier*'s recording of its internal metronome to print the score reasonably accurately. When the metronome was

not in use, *Finale*<sup>TM</sup> had no way of generating a score with correct measures and rhythms because it was impossible for the program to “know” where the barlines should have been, due to the time-based versus space-based issue. As a result, the investigator notated manually the performances of subjects who did not use the metronome.

### Practicing

It was thought that teaching practicing strategies specific to keyboard would increase piano performance scores of the treatment group because of the structured practice they would provide. However, none of the analyses showed a difference in scores between the treatment and control groups. After analysis of time spent practicing, this was not a surprise because treatment subjects did not use the strategies they were taught during treatment as they practiced for their posttest performance. The only real difference between the practicing habits of treatment and control subjects was that treatment subjects analyzed their scores differently than control subjects. Treatment subjects used score analysis techniques presented during treatment, but their practice did not reflect the strategies they listed on their scores, nor did they appear to follow a routine for practicing the pretest and posttest pieces. This finding is not surprising, as it supports Kostka (2001), who found that 55% of college music students do not follow a set practice routine. These results also are consistent with data from younger subjects with similar piano experience. Duke, Flowers, and Wolfe (1997), found that 75% of pre-college piano students do not follow a regular practice routine. Additionally, 62% of students in the same survey reported that they do not practice the same way all of the time.

Essentially, subjects in both treatment and control groups practiced the same for the posttest as they had for the pretest. Perhaps the practice strategies were too

cumbersome for these amateur pianists, and they felt that they practiced more efficiently without using them. One treatment subject admitted to the investigator that the strategies took too long, so she used her own strategies. For example, practicing in small segments was recommended during treatment as an efficient means of preventing errors via drilling those segments that seemed troublesome (Breth, 2001; Byo, in press; Sitton, 1992). However, few subjects adhered to this suggestion. During posttest practicing sessions, many treatment subjects did not use the practice strategies taught to them during treatment. As a result, there was little opportunity for the strategies to affect piano performance accuracy of treatment subjects. Perhaps if strategy use had been mandatory for treatment subjects and had been enforced by the investigator, there would have been a difference in their scores. An encouraging finding was that many more treatment subjects marked their scores during the posttest than the pretest. This was not surprising given that this was a strategy they learned during treatment. Future studies could involve instructor-guided practice time for these group piano students or parent-guided practice time for beginners in the private studio to ensure the use of practice strategies.

Although subjects showed improvement from pretest to posttest, treatment did not seem to make a difference, as subjects in both groups improved significantly. Subjects in both groups were given the same practicing pieces each day, aside from the specific practice strategies that treatment subjects were given and control subjects were not. Perhaps it was not the strategies themselves that caused an increase in performance scores, but that all subjects were spending time each day in focused practice.

In this setting, subjects did not use the practice strategies presented to them during treatment. Perhaps similar occurrences are happening in the private studio as well. It is

likely that these amateur pianists need more structure in their practice because left to their own devices they do not use strategies that could result in efficient practice. It is important to note that average accuracy scores for all subjects were quite high. It seems that helping students practice more efficiently is one key to faster progress and success. Certainly a feeling of success would motivate students to continue playing and practicing the piano. Future research could explore specific structuring of practicing outside of class and private lessons in an attempt to discover whether more specific practicing assignments would result in faster progress toward performance accuracy. Additionally, subjects could be graded on practice effectiveness rather than performance accuracy.

An important aspect of learning is the ability of students to transfer information they learn in one situation to another situation. This occurs frequently as musicians sight-read unfamiliar material, practice new pieces, and perform in new settings. Throughout the semester as subjects were receiving treatment, they also were required to take examinations as listed in the course syllabus. One element included in these exams was a short musical example for which students had approximately five minutes to practice before performing it for the instructor of the course. Subjects in the treatment group applied the strategies of score analysis and setting a slow tempo to the rehearsal of these pieces on examinations throughout the semester. Transfer of learning within the piano course itself did seem to take place with the treatment subjects, as they were using strategies they had learned during treatment and applying them to a specific area of the piano course. However, they did not use those same strategies on the posttest at the end of the semester. Perhaps the subjects did not make the transfer from course material to the posttest because they viewed the posttest as being separate from the course. It is also

possible that subjects simply chose not to use the strategies. Music students seem to know how to practice their own instruments, but it is plausible that when these subjects practiced on an instrument with which they were less familiar than a primary instrument, they did not know how to transfer what they knew from a familiar setting to a less familiar one.

Though transfer of learning took place from daily treatment sessions to the musical example included on semester examinations, the information that subjects learned during treatment may not have transferred beyond the boundaries of the group piano classroom to their major instruments. If instructors expect students to remember and apply the things they learn in their lessons to other areas of music study, then instructors must teach for transfer from the beginning of these students' music study. In order to help advancing students make problem solving through practice strategies a part of their daily practice routine (Berr, 1995), regardless of the instrumental or rehearsal setting, these strategies must be incorporated into and transferred among the daily lessons and classes of students from the beginning of their music study. If instructors can provide students with ample tools for solving musical problems efficiently, then students will learn to become self-sufficient and independent music makers. It is likely that subjects in this study did not seem to fully understand problem solving, a type of higher-level learning advocated by Gagné (1965). Subjects had difficulty transferring to the piano what they most likely knew about problem solving and practicing on a major instrument.

Once more teachers and students become aware of teaching for transfer and learning to transfer information from one setting to another, students' practice routines could change dramatically. Perhaps teachers should devote a great amount of lesson time

during the early years of piano study to teaching students how to practice. This could involve time spent in supervised practice, with the teacher guiding students to accomplish practicing as it should be done at home or in the practice room. Students should easily transfer the practicing techniques used in the lesson to their home practice because they have been taught its importance and experienced its results from the beginning. The more explicitly that instructors can provide students with the necessary means for productive and proactive practicing, the greater the opportunity for student success during practice sessions. Students will know what “practicing” means and what is included in an effective practice session. Future research could consider practicing as it relates to specific instruments, including techniques that are used frequently, and whether those techniques are transferable among instruments.

Subjects in this study were offered many opportunities for practicing: 16 minutes each on pretest and posttest, and approximately five minutes during daily in-class sessions. Choosing an appropriate practicing tempo was one of the strategies presented during treatment. Treatment subjects were required to practice with the metronome set to an appropriate practicing tempo each day during treatment activities, and control subjects were allowed to self-select practice tempos. On the pretest, most subjects set the metronome to the performance tempo listed on the score, 60 beats per minute, and commenced practicing at that tempo, whether or not it was feasible for them to do so. Only 2 of the 39 subjects in this study set the metronome to a slow practicing tempo during the pretest practicing session, both of which happened to be treatment subjects. Seven out of the 39 subjects set a slow practicing tempo during the posttest practicing session, five of which were treatment subjects, and none of whom were the same as those



who elected to practice slowly on the pretest. Many subjects listed on their subject information sheets that they used the metronome during daily practice. For some of these subjects, using the metronome as a practice aid during the pretest and posttest simply meant that it was set to 60 beats per minute and turned on for the duration of the 8-minute practice time. Perhaps they did not know how to use the metronome most optimally as a practice aid, but would have benefited from its use if they knew how to use it appropriately during pretest and posttest practice sessions.

The 8-minute pretest and posttest practice sessions were sometimes too long for subjects who were strong readers, but not long enough for subjects who were weaker readers, especially with regard to the ones who were randomly selected to perform with the metronome set to 60 beats per minute. Given that real life situations normally guarantee adequate rehearsal and preparation time, subjects in subsequent studies could be allowed to practice for as long as they wished during in-house pretests and posttests, or they could be given the pretest and posttest selections to rehearse independently prior to the test (Mito & Murao, 2001). Nonetheless, if students were good sight-readers and had efficient practice routines, eight minutes should have been ample time to learn the piece adequately. This indicates even more reason to devote time and effort to sight-reading skills and practice strategies, as ability in these two areas would minimize the rehearsal time needed for an acceptable performance.

When practicing *Melody for Left Hand* or *Melody for Right Hand* on both pretest and posttest, a higher percentage of subjects chose to practice the accompaniment first in all but one group. Perhaps this can be attributed to the number of pitches that were included in the accompaniment (183) as compared to the melody (32), and subjects

practiced the part with the most pitches first. The accompaniment could have appeared to be more challenging simply because of the number of pitches contained therein, coupled with the presentation of the pitches, which consisted of four blocked triads per measure. Another observation was that a higher percentage of subjects chose to practice the melody first when practicing *Dance for Left Hand* or *Dance for Right Hand*. Perhaps this too can be attributed to the fact that the melody had a greater number of pitches (64) than the accompaniment (41), and seemed visually to present itself as a greater challenge than the accompaniment, which contained only one chord per measure.

Many subjects practiced the pretest and posttest selections from beginning to end without stopping to drill the measures or beats in which errors were occurring. They would simply correct the mistake and continue. Thus, the error never was truly corrected, and in subsequent performances of the selection, the mistake returned. Many times it was a trial and error process of deciding which note sounded the best, whether it was correct or not. Though this means of error detection and correction was not the most optimal practice technique, subjects did show improvement from pretest to posttest. Perhaps it was not necessarily that subjects were practicing efficiently, but that they were in fact, practicing that mattered. It was encouraging that both treatment and control groups improved on pitch, rhythm, and beat continuity scores from pretest to posttest. However, such improvements were expected, given that all subjects were required to practice challenging selections during daily class meetings throughout the semester. Surprisingly, when treatment subjects practiced during the posttest, they opted not to use practice strategies even though approximately 10 to 15 percent of class time was devoted

specifically to instruction in practice strategies, and approximately 10 percent of class time was devoted to rehearsal of pieces and application of strategies.

While most subjects practiced the pretest and posttest selections in the correct register of the piano, many did not. All subjects, on pretest and posttest, performed *Melody for Right Hand* or *Melody for Left Hand* in the correct register. On the pretest, two subjects performed *Dance for Left Hand* or *Dance for Right Hand* in the incorrect register. On the posttest, 8 subjects performed *Dance for Left Hand* or *Dance for Right Hand* in the incorrect register. In all instances, subjects performed one or both hands one octave too low. However, they did not receive pitch deductions for the octave shift because the results of the study would have been skewed. A remarkable anomaly that recurred many times during pretest and posttest practice sessions of *Melody for Right Hand* and *Melody for Left Hand* was the tendency of subjects to misread the chord in the accompaniment of measure 7. Figures 20 and 22 contain the measures as they were notated. Figures 21 and 23 contain the measures as subjects frequently performed them.



Figure 20. Suspension from *Melody for Right Hand*, Example from Score  
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Figure 21. Suspension from *Melody for Right Hand*, Example as Performed  
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Figure 22. Suspension from *Melody for Left Hand*, Example from Score  
Copyright 1997 by Alfred Publishing Co., Inc. Used with Expressed Written Consent of the Publisher.

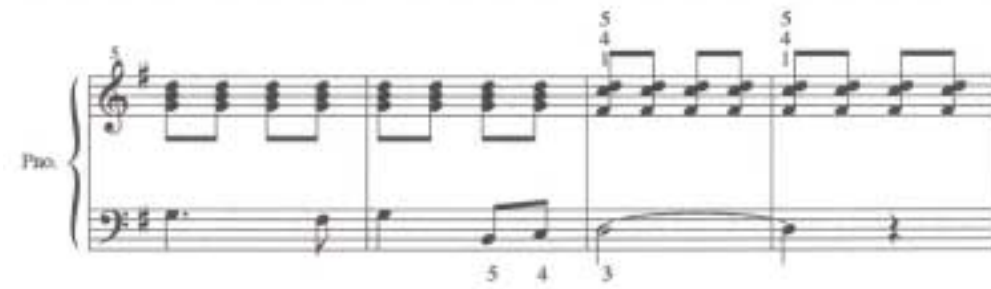


Figure 23. Suspension from *Melody for Left Hand*, Example as Performed  
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Rather than initially practicing the suspension in measure 7 as it was written, subjects played the chord as a seventh chord, which was actually the suspension's resolution in the following measure. This was documented in 54% of pretest practice

sessions and 41% of posttest practice sessions. Consequently, 49% of subjects on pretests and 38% of subjects on posttests performed the measure containing the suspension incorrectly. These incorrect performances of the suspension contributed to many pitch errors because subjects misread the chord and performed it incorrectly four times.

Another prominent occurrence was the tendency of subjects to consistently misread the melody in the third measure of *Dance for Left Hand* or *Dance for Right Hand*. Thirty-three percent of subjects on the pretest and only 5% of subjects on the posttest misread the pitches and practiced them incorrectly. The actual pitches of the melody consisted of the pattern included in Figure 24.



Figure 24. *Dance for Right Hand*, Example from Score  
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Subjects tended to play the pitches correctly in measure 1, and alter them in measures 2 through 4, practicing a sequence rather than an exact repetition. The sequence is included in Figure 25. Though 31% of subjects initially practiced these measures incorrectly on the pretest, 18% performed the measures incorrectly on the pretest. Five percent of subjects initially practiced these measures incorrectly on the posttest, and 8% performed measures two through four incorrectly on the posttest.



Figure 25. *Dance for Right Hand*, Example as Performed  
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### Summary

In an attempt to further increase the knowledge that is available concerning piano performance and practicing, this study sought to isolate those two areas in conjunction with clarifying the relationship between the two. Conclusions regarding the connection of practicing and performing can also be drawn. However, generalization should be approached with caution due to the small number of subjects in each subgroup.

This study offers evidence to support the use of the metronome when practicing early-level keyboard music. The metronome did increase subjects' beat continuity when used while practicing and performing in a meter of 3. Perhaps this finding will encourage instructors to use the metronome or the rhythm accompaniment settings of a digital piano as aids for beginning piano students who encounter difficulty when attempting to maintain the pulse in a meter of 3. Subjects in this study sustained the beat more consistently when performing in a meter of 2 than in a meter of 3. Instructors may choose to incorporate more pieces with a meter of 3 into daily lessons so that students learn to feel the meter of 3 as easily and naturally as they feel meters of 2 and 4.

Previous research (Betts & Cassidy, 2000; Cassidy, Betts, & Hanberry, 2001) has determined that the right hand, when playing the melody, earned higher accuracy scores than the left hand, which played the accompaniment, on piano performance tasks. The current study, however, found that the melody, regardless of which hand performed it, earned higher accuracy scores than the accompaniment. Instructors could provide more opportunities for students to read and perform accompaniments in an attempt to increase performance accuracy of the accompaniment, or simply to help students keep the accompaniment going when they begin to encounter difficulty.

It seemed that whether subjects were involved in the treatment or control groups did not matter. What did seem to matter was that they were spending time in focused, uninterrupted practice. Granted that the circumstances in which subjects found themselves during pretest and posttest sessions were not indicative of life situations, subjects nevertheless approached their assigned tasks with diligence. Though practicing strategies were not given opportunity to aid subjects in their practice, as subjects chose not to use the strategies, the fact that many subjects were involved in a deeper level of score study at the end of the semester than at the beginning is encouraging.

It is also encouraging that subjects in the treatment group transferred some of the strategies presented to them during treatment to the exams included within the piano course. However, it is troubling that they did not transfer the information to posttest practice sessions, which they might have viewed as being separate from the course.

#### Recommendations for Future Research

The group piano classroom and private studio are important parts of the music student's academic and musical career. Studies that can guide the piano pedagogue in

these areas are being conducted and published, but many questions remain. Practicing strategies taught to second-semester non-keyboard music students did not seem to make a difference in piano performance accuracy scores of the selections chosen for this study. Factors such as ascertaining whether group piano students believe they use strategies during practice, determining whether they are accustomed to using the metronome when practicing the piano, allowing them to choose their own practicing and performance tempos, providing selections of equal difficulty, and offering longer practice sessions during class and before performances could be considered in future research. Additionally, subjects could be assigned a piece to rehearse for a set length of time before arriving for the pretest and posttest. Other aspects to consider include subjective means of grading performances in addition to the objective means employed in this study. Beyond having subjects memorize the practicing strategies that were presented to them during treatment, it would be helpful to provide more guidance via a list of step-by-step processes to use when working out common problems that they certainly would encounter in the practice room. Requiring subjects, whether group piano students or private beginning piano students, to use the strategies could contribute to greater efficiency during practice. Additionally, teaching for transfer and helping students learn to transfer should be examined more specifically as they relate to music study in the group piano and private piano lesson settings.



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## APPENDIX A

### IRB EXEMPTION FORM AND CONSENT FORM

IRB #: 2129 LSU Proposal #: \_\_\_\_\_

LSU INSTITUTIONAL REVIEW BOARD (IRB) for  
HUMAN RESEARCH SUBJECT PROTECTION  
Office: 203 B-1 David Boyd Hall

578-8692  
FAX 6792

#### APPLICATION FOR EXEMPTION FROM INSTITUTIONAL OVERSIGHT

Unless they are qualified as meeting the specific criteria for exemption from Institutional Review Board (IRB) oversight, ALL LSU research/projects using living humans as subjects, or samples or data obtained from humans, directly or indirectly, with or without their consent, must be approved in advance by the LSU IRB. This Form helps the PI determine if a project may be exempted, and is used to request an exemption.

**Instructions:** Complete this form. If exemption seems likely, submit it. If not, submit regular IRB application. Help is available from Dr. Robert Mathews, 578-8692, [irb@lsu.edu](mailto:irb@lsu.edu) or any screening committee member.

**Principal Investigator** Melody A. Hanberry  
**Student?** Y

**Ph:** 293-8064 **E-mail:** melhanberry@hotmail.com **Dept/Unit:** Music Education

**If Student, name supervising professor:** Jane W. Cassidy **Ph:** 578-3258

**Mailing Address:** School of Music, 273 M&DA

**Project Title:** Effects of Practice Strategies, Hand, Metronome Use and Musical Function on Dual-Staved Piano Performance Accuracy and Practice Time Usage of Undergraduate Non-Keyboard Music Majors

**Agency expected to fund project:** N/A

**Subject pool (e.g. Psychology Students):** Undergraduate non-keyboard music majors

**"Vulnerable populations" to be used:** None

I certify my responses are accurate and complete. If the project scope or design is later changed I will resubmit for review. I will obtain written approval from the Authorized Representative of all non-LSU institutions in which the study is conducted.

**PI Signature** Melody Hanberry **Date** 11/7/02 (no per signatures)

**Screening Committee Action:** Exempted ☒ Not Exempted ☐  
**Reviewer** S. Kim MacGregor **Signature** S. Kim MacGregor **Date** 11/8/02  
Ran

## **Part A: DETERMINATION OF "RESEARCH" and POTENTIAL FOR RISK**

This section determines whether the project meets the Department of Health and Human Services definition of "research" and if not, whether it nevertheless presents more than "minimal risk" to humans that makes IRB review prudent and necessary.

**1. Is the project a systematic investigation designed to develop or contribute to generalizeable knowledge?**

(Note "systematic investigation" includes "research development, testing and evaluation"; therefore some instructional development and service programs will include a "research" component).

☒ **YES**

☐ **NO**

**2. Does the project present physical, psychological, social or legal risks to the participants reasonably expected to exceed those risks normally experienced in daily life or in routine diagnostic physical or psychological examination or testing? You must consider the consequences if individual data inadvertently become public.**

☐ **YES Stop.** This research cannot be exempted--**submit application for IRB review.**

☒ **NO Continue** to see if research can be exempted from IRB oversight

**3. Are any of your participants incarcerated?**

☐ **YES Stop.** This research cannot be exempted--**submit application for IRB review.**

☒ **NO Continue** to see if research can be exempted from IRB oversight.

## Part B: EXEMPTION CRITERIA FOR RESEARCH PROJECTS

Research is exemptible when all research methods are one or more of the following five methods. Check statements that apply to your study:

- ☐ 1. Uses only existing data, documents, records, or specimens properly obtained.

*The research must also comply with one of the following:  
either that:*

- ☐ a) **subjects cannot be identified** in the research data directly or statistically, and no-one can trace back from research data to identify a participant;

- ☐ *or that*  
b) **the sources are publicly available**

- ☐ 2. **Research or demonstration service/care programs, e.g. health care delivery.**

- ☐ *The research must also comply with all of the following:*  
a) It is directly conducted or approved by the head of a US Govt. department or agency.

- ☐ *and that*  
b) **it concerns only issues under usual administrative control** (48 Fed Reg 9268-9), e.g., regulations, eligibility, services, or delivery systems;

- ☐ *and that*  
c) **its research/evaluation methods are also exempt from IRB review.**



- ☐ 3. For research not involving vulnerable people [prisoner, fetus, pregnancy, children, or mentally impaired]: observe public behavior (including participatory observation), or do interviews or surveys or educational tests:

The research must also comply with one of the following:  
either that

- ☐ a) the participants cannot be identified, directly or statistically;

or that

- ☐ b) the responses/observations could not harm participants if made public;

or that

- ☐ c) federal statute(s) completely protect all participants' confidentiality;

or that

- ☐ d) all respondents are elected, appointed, or candidates for public officials.

- 
- ☒ 4. In education setting, research to evaluate normal educational practices.

- 
- ☐ 5. For research not involving vulnerable volunteers [see "3" above], do food research to evaluate quality, taste, or consumer acceptance.

The research must also comply with one of the following:

either that

- ☐ a) the food has no additives;

or that

- ☐ b) the food is certified safe by the USDA, FDA, or EPA.

**Exemption Applicant:** If it appears that your study qualifies for exemption, send:

- (A) Two copies of this completed form,
- (B) a brief project description (adequate to evaluate risks to subjects and to explain your responses to Parts A & B),
- (C) copies of all instruments to be used
- (D) the consent form that you will use in the study

**to:** ONE screening committee member (listed below) in the most closely related department/discipline or to IRB office.

**NOTE:** Even when exempted, the researcher is required to exercise prudence in protecting the interests of research subjects, obtain informed consent if appropriate, and must conform to the **Ethical Principles and Guidelines for the Protection of Human Subjects (Belmont Report), 45 CFR 46, and LSU Guide to Informed Consent;** (Available from OSP or <http://www.fas.lsu.edu/osp/irb>)  
**HUMAN SUBJECTS SCREENING COMMITTEE MEMBERS can assist & review:**

**COLLEGE OF ARTS AND SCIENCES: MASS COMMUN/SOC WK/AG:**

Dr. Northup *	(Psych)	578-4112
Dr. Nelson	(Mass C)	578-6686
Dr. Geiselman *	(Psych)	763-2695
Dr. Archambeault	(Soc Wk)	8-1374
Dr. Deseran	(Socio)	578-1113
Dr. Rose	(Soc Wk)	578-1015
Dr. Honeycutt	(Speech)	578-6676
Dr. Keenan*	(Hum Ecol)	578-1708
Dr. Dixit	(Comm Sc./Dis)	578-3938
Dr. Belleau	(Hum Ecol)	578-1535

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**ED/LIBRARIES/INFO SCI BUSINESS**

Dr. Kleiner	(Middleton)	578-2217
Dr. Biswas	(Marketing)	578-8818
Dr. Culross	(Education)	578-5227
Dr. Landin*	(Kinesiol)	578-2916
Dr. MacGregor	(ELRC)	578-2150
Dr. Munro*	(Curric & I)	578-2352
Dr. Barry	(Lib/Sci)	578-3158

(\* = IRB member)

## DESCRIPTION OF STUDY

<b>Title</b>	Effects of Practice Strategies, Metronome Use, Meter, Hand, and Musical Function on Dual-Staved Piano Performance Accuracy and Practice Time Usage of Undergraduate Non-Keyboard Music Majors
<b>Site</b>	LSU School of Music
<b>Contact</b>	Melody A. Hanberry (principal investigator) 11850 Wentling Avenue, Apartment B-11 Baton Rouge, LA 70816 (225) 293-8064 melhanberry@hotmail.com
<b>Purpose of Study</b>	The purposes of this study are twofold. The first will be to investigate the effects of practicing strategies on time usage during two eight-minute practice intervals of unfamiliar music. The second purpose of this study will be to assess the effects of practicing strategies, right hand and left hand, metronome use, meter, and musical function on piano performance accuracy of undergraduate non-keyboard music majors.
<b>Inclusion Criteria</b>	Undergraduate non-keyboard music majors enrolled in second-semester group piano at LSU.
<b>Number of Subjects</b>	Approximately 48.
<b>Study Procedures</b>	Throughout a ten-week, 20-class training session in practice strategies, subjects in the treatment group will be given guidelines for practicing an unfamiliar piece of keyboard music. During pretest and posttest sessions, subjects will be videotaped while practicing and performing two pieces of keyboard music. Pretest and posttest sessions will last approximately 20 minutes.
<b>Benefits</b>	Findings of this study could benefit collegiate-level piano class instructors, and could identify variables that might be used as the basis for further research efforts in this area.
<b>Risks</b>	There are no known potential risks.
<b>Right to Refuse</b>	Participation in the study is voluntary. Subjects may change their mind and withdraw from the study at any time without penalty or loss of any benefit to which they may otherwise be entitled. Refusal to participate in the study will not exempt students from instructional activities associated with this course.
<b>Privacy</b>	Subjects will participate in this study anonymously. Data will not be able to be linked to the identity of the subject. In all write-ups, names will be changed in order to ensure subject privacy.
<b>Financial Information</b>	Subject participation in this project is on a voluntary basis.

## SAMPLE CONSENT FORM

<b>Title</b>	Effects of Practice Strategies, Metronome Use, Meter, Hand, and Musical Function on Dual-Staved Piano Performance Accuracy and Practice Time Usage of Undergraduate Non-Keyboard Music Majors
<b>Site</b>	LSU School of Music
<b>Contact</b>	Melody A. Hanberry (principal investigator) 11850 Wentling Avenue, Apartment B-11 Baton Rouge, LA 70816 (225) 293-8064 melhanberry@hotmail.com
<b>Purpose of Study</b>	The purposes of this study are twofold. The first will be to investigate the effects of practicing strategies on time usage during two eight-minute practice intervals of unfamiliar music. The second purpose of this study will be to assess the effects of practicing strategies, right hand and left hand, metronome use, meter, and musical function on piano performance accuracy of undergraduate non-keyboard music majors.
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<b>Number of Subjects</b>	Approximately 48.
<b>Study Procedures</b>	Throughout a ten-week, 20-class training session in practice strategies, subjects in the treatment group will be given guidelines for practicing an unfamiliar piece of keyboard music. During pretest and posttest sessions, subjects will be videotaped while practicing and performing two pieces of keyboard music.
<b>Benefits</b>	Findings of this study could benefit collegiate-level piano class instructors, and could identify variables that might be used as the basis for further research efforts in this area.
<b>Risks</b>	There are no known potential risks.
<b>Right to Refuse</b>	Participation in the study is voluntary. Subjects may change their mind and withdraw from the study at any time without penalty or loss of any benefit to which they may otherwise be entitled. Refusal to participate in the study will not exempt students from instructional activities associated with this course.
<b>Privacy</b>	Subjects will participate in this study anonymously. It will not be possible to link data to the identity of the subject. In all write-ups, names will be changed in order to ensure subject privacy.
<b>Financial Information</b>	Subject participation in this project is on a voluntary basis.

**Signature**      The study has been discussed with me and all my questions have been answered. I may direct additional questions regarding study specifics to the investigators. If I have questions about subjects' rights or other concerns, I can contact Robert C. Mathews, Chairman, LSU Institutional Review Board, (225) 578-8692. I agree to participate in the study described above and acknowledge the investigators' obligation to provide me with a copy of this consent form signed by me.

**Printed Name** \_\_\_\_\_

**Signature** \_\_\_\_\_

**Date** \_\_\_\_\_

## APPENDIX B

### DAILY LESSON PLANS FOR TREATMENT AND CONTROL GROUPS

**03 Feb 03**

**Treatment Plan**

**MUS 1131**

7 minutes to present information and piece

5 minutes to practice piece

- Hand out *Dance*, Op. 823, No. 11 (Czerny, 2002).
- Put KMTS overhead up.
- Explain that they can learn new pieces more efficiently if they follow this acronym: Key, Meter, Tempo, Score.
- Discuss each as it relates to *Dance*, Op. 823, No. 11 (Czerny, 2002)

#### **Key: Overhead**

- Key Signature: Ask KS and have them say sharps/flats in correct order
- Scale: Play scale in the key with RH
- Chord Progression: LH
- 1<sup>st</sup> Altered Pitch: Circle 1<sup>st</sup> instance of each F# & C#

#### **Meter: Overhead**

- Time Signature: What is it?
- Beats/Measure: How many?

#### **Tempo: Overhead**

- Smallest Note Value: Find it.
- Count Aloud: Count aloud 2 measures with the smallest note value (eighth note) receiving MM = 60.
- Set Metronome: set metronome on Clavinova (so they can hear it while wearing headphones)

#### **Score: Overhead**

- Mel/Harm Function: Which hand has melody? Which has acc?
- Accompaniment: What type of acc?
- Form: What is it?
- Repeating Sections: Mark them (mm. 1-2, 5-6, 13-14; mm. 3&15; mm. 9-10, 11-12). There are only 8 measures to practice! 1, 3, 4, 7, 8, 9, 10, 16! Practice them, then the entire piece.

Put up **overview KMTS overhead** and give like **handout**.

- Set metronome to eighth note = 60.
- Start stopwatch.
- Stop stopwatch after 5 minutes.
- Play through entire piece without headphones and with metronome.
- Review acronym – KMTS: Key, Meter, Tempo, Score

# K M T S

## **Key      Meter      Tempo      Score**

### *Key*

Key Signature  
Scale  
Chord Progression  
1st Altered Pitch

### *Meter*

Time Signature  
Beats Per Measure

### *Tempo*

Smallest Note Value  
Count Aloud  
Set Metronome

### *Score*

Melodic/Harmonic Function  
Accompaniment  
Form  
Repeating Sections

For Control Classes (MW 12:30 & TTH 2:30), give them *Dance*, Op. 823, No. 11 (Czerny, 2002) to practice for 5 minutes in any way they choose, then have them play aloud, together, at eighth note = 60. Take up *Dance*, Op. 823, No. 11 (Czerny, 2002), paperclip together, and put in binder.



7 minutes to present information and piece

5 minutes to practice piece

- Hand out *Quadrille* (Haydn, 1996)
- Put KMTS “handout” overhead up.
- Ask them to get out their KMTS handouts.
- Quickly review that KMTS means: Key, Meter, Tempo, Score.

Give them 2 minutes to work from the overhead/handouts and apply it to their scores. Ask them to think of the answers to each question in their head this time, and write appropriate responses on the score, just like Monday.

Give them 5 minutes to practice with headphones on. Set metronome to eighth note = 68.

Play out loud together as a class, with metronome set to eighth note = 68.

Have them write their names on *Quadrille* (Haydn, 1996) and turn it in to you. Paperclip them together and put in blue binder.

Hand out *Quadrille* (Haydn, 1996)

Give them 5 minutes to practice with headphones on.

Play out loud together as a class, with metronome set to eighth note = 68.

Have them write their names on *Quadrille* (Haydn, 1996) and turn it in to you. Paperclip them together and put in blue binder.

Give out *Morning Classic* (Lancaster, 1999): have them write name on it  
Review KMTS & apply to *Morning Classic* (Lancaster, 1999): Handouts & overhead  
(Quickly)

**New topic: Hands move out of position (do this together, out loud)**

- Identify place where one or both hands move out of position. (Ex: RH mm. 2, LH mm. 3)
- Practice the segment by playing the measure (HS) for 3 consecutive trials without error, with correct dynamics and articulation, at the practice tempo, always stopping on the downbeat of the next measure.
- Find segment in next measure and play the measure (HS) for 3 consecutive trials without error, with correct dynamics and articulation, at the practice tempo, always stopping on the downbeat of the next measure.
- Add the 2 measures together and play (HS) 3 consecutive trials without error, with correct dynamics and articulation, at the practice tempo, always stopping on the downbeat of the next measure.
- Play the 2 measures HT for 3 consecutive trials without error, with correct dynamics and articulation, at the practice tempo, always stopping on the downbeat of the next measure.
- Put the segment back into context by playing one measure before the segment, stopping on the first note of the segment 3 times, at the practice tempo.
- Play one measure before the segment + the entire segment in which the hands move out of position, with correct dynamics and articulation, at the practice tempo, always stopping on the downbeat of the next measure.
- Repeat process for other segments in which the hands move out of the 5-finger starting position.

Allow the treatment groups 5 minutes to practice the rest of the piece in the above fashion.

Play together as a group at M.M. (eighth note) = 76.

Take up *Morning Classic* (Lancaster, 1999), paperclip together, and put in blue binder.

# K M T S

<i>Key</i>	<i>Meter</i>	<i>Tempo</i>	<i>Score</i>
Key Sign.	Time Signature	Smallest Value	Melody/Harmony
Scale	Beats/measures	Count Aloud	Accompaniment
Chord Progression		Set Metronome	Form
1 <sup>st</sup> Altered Pitch			Repeating Sections

# H O O P

## *Hands Out Of Position*

Where? Mark it!  
Small segment HS 3 times  
Small segment HT 3 times  
In context 3 times: mm + segment + downbeat

Give out *Morning Classic* (Lancaster, 1999): have them write name on it

Allow them 5 minutes to practice Morning Classic.

Perform out loud together as a class at M.M. (eighth note) = 76

Take up *Morning Classic* (Lancaster, 1999), paperclip together, and put in blue binder.

Give out *A Classic Tale* (Lancaster, 1999): have them write name on it

Review KMTS & HOOP - overhead (**Quickly**)

Allow the treatment groups 2 minutes to apply KMTS & HOOP and 5 minutes to practice the piece in the above fashion

Play together as a group at M.M. (eighth note) = 76

Take up *A Classic Tale* (Lancaster, 1999), paperclip together, and put in blue folder

**19, 20 Feb 03**

**Control Plan**

**MUS 1131**

Give out *A Classic Tale* (Lancaster, 1999): have them write name on it

Allow them 5 minutes to practice A Classic Tale

Perform out loud together as a class at M.M. (eighth note) = 76

Take up *A Classic Tale* (Lancaster, 1999), paperclip together, and put in blue folder

Give out *Morning Song*, Op. 140, No. 2 (Gurlitt, 1997): have them write name on it

Review KMTS & HOOP and apply to *Morning Song*, Op. 140, No. 2 (Gurlitt, 1997):  
Handouts & overhead (QUICKLY!)

**New topic: Unfamiliar Chords (do this together, out loud)**

- Identify a chord that is unfamiliar and circle it.
- Check to see if it is the same as or different from other chords in the piece.
- Identify each note of the chord by letter name.
- Play chord one note at a time from bottom to top (broken), and 3 times blocked.
- Compare chord to previous chord, noting common and uncommon notes as well as the shape of the hand when moving from chord to chord.
- Play the 2 chords, alternating between them, 3 times.
- Compare chord to following chord, again noting common and uncommon notes as well as the shape of the hand when moving from chord to chord.
- Play the 2 chords, alternating between them, 3 times.
- Play all 3 chords 3 times.
- Play passage with correct rhythm, articulation, and dynamics 3 times.
- Add other hand and play passage 3 times with no mistakes.
- Repeat process for other unfamiliar chords.

Allow the treatment groups 5 minutes to practice the rest of the piece in the above fashion.

Play together as a group at M.M. (eighth note) = 76.

Take up *Morning Song*, Op. 140, No. 2 (Gurlitt, 1997), paperclip together, and put in blue binder.



# K M T S

<i>Key</i>	<i>Meter</i>	<i>Tempo</i>	<i>Score</i>
Key Sign.	Time Signature	Smallest Value	Melody/Harmony
Scale	Beats/measures	Count Aloud	Accompaniment
Chord Progression		Set Metronome	Form
1 <sup>st</sup> Altered Pitch			Repeating Sections

# H O O P

## *Hands Out Of Position*

Where? Mark it!  
 Small segment HS 3 times  
 Small segment HT 3 times  
 In context 3 times: mm + segment + downbeat

# ICE<sup>3</sup>

## *Unfamiliar Chords*

Identify unfamiliar chord  
 Circle it  
 Execute practice steps 3 times each

**24, 25 Feb 03**

**Control Plan**

**MUS 1131**

Give out *Morning Song*, Op. 140, No. 2 (Gurlitt, 1997): have them write name on it

Allow them 5 minutes to practice Morning Song.

Perform out loud together as a class at M.M. (eighth note) = 76

Take up *Morning Song*, Op. 140, No. 2 (Gurlitt, 1997), paperclip together, and put in blue binder.

**26 Feb 03**

**Treatment Plan  
Strategy 2, Unfamiliar Chords, Day 2**

**MUS 1131**

Give Quiz #1: students will write as many strategies as they can, in the order in which they were presented, and turn in.

Give out *Scherzo*, Op. 140, No. 17 (Gurlitt, 1997): have them write name on it

Review KMTS, HOOP, & I CE<sup>3</sup>: Handouts and overhead (QUICKLY!)

Allow treatment group 7 minutes to apply KMTS, HOOP, & I CE<sup>3</sup> and practice the piece accordingly.

Play together as a group at M.M. (eighth note) = 76.

Take up *Scherzo*, Op. 140, No. 17 (Gurlitt, 1997), paperclip, and put in blue binder in Week 3 tab.

Give out *Scherzo*, Op. 140, No. 17 (Gurlitt, 1997): have them write name on it

Allow them 5 minutes to practice *Scherzo*.

Perform out loud together as a class at M.M. (eighth note) = 76

Take up *Scherzo*, Op. 140, No. 17 (Gurlitt, 1997), paperclip together, and put in blue binder.

Give out *Folk Dance* (Taranta, 1997): have them write name on it

**New topic: Accidentals: SSE-TSE  
(do this together, out loud)**

- Locate the first accidental and circle it
- With the hand containing the accidental (HS=S), begin playing on the note(s)/chord before the accidental, and Stop on the accidental. Do this 3 times with no mistakes.
- With the same hand, play the Entire measure containing the accidental 3 times with no mistakes.
- Now add the other hand (HT=T) and Stop on the accidental 3 times with no mistakes.
- Finally, still HT, play the Entire measure containing the accidental 3 times with no mistakes.

Put up new overhead so students can review KMTS, HOOP, & ICE<sup>3</sup>, as well as **SSE-TSE** and apply to *Folk Dance* (Taranta, 1997).

Allow them a total of 7 minutes to apply the above and practice the piece at M.M. (eighth note) = 76.

Play together as a group at M.M. (eighth note) = 76.

Take up *Folk Dance* (Taranta, 1997), paperclip together, and put in green binder.

# K M T S

<i>Key</i>	<i>Meter</i>	<i>Tempo</i>	<i>Score</i>
Key Sign.	Time Signature	Smallest Value	Melody/Harmony
Scale	Beats/measures	Count Aloud	Accompaniment
Chord Progression		Set Metronome	Form
1 <sup>st</sup> Altered Pitch			Repeating Sections

# H O O P

## *Hands Out Of Position*

Where? Mark it!  
 Small segment HS 3 times  
 Small segment HT 3 times  
 In context 3 times: mm + segment + downbeat

# I C E<sup>3</sup>

## *Unfamiliar Chords*

Identify unfamiliar chord  
 Circle it  
 Execute practice steps 3 times each

# S S E - T S E

## *Accidentals*

HS, Stop on accidental 3 times  
 HS, Entire measure 3 times  
 HT, Stop on accidental 3 times  
 HT, Entire measure 3 times

**10, 11 Mar 03**

**Control Plan**

**MUS 1131**

Give out *Folk Dance* (Taranta, 1997): have them write name on it

Allow them 5 minutes to practice Folk Dance.

Perform out loud together as a class at M.M. (eighth note) = 76

Take up *Folk Dance* (Taranta, 1997), paperclip together, and put in green binder.

Give out *Romance*, Op. 149, No. 11 (Diabelli, 1996); have them write name on it.

Put up overhead of practicing strategies.

Allow treatment group 2 minutes to apply previous strategies.

Allow treatment group 5 minutes to practice *Romance* at M.M.=60 (quarter note)  
[M.M.=120 (eighth note) is too cumbersome].

Perform together as a group at M.M.=60 (quarter note).

Take up *Romance*, Op. 149, No. 11 (Diabelli, 1996), paperclip together, and put in green binder.



**12, 13 Mar 03**

**Control Plan  
Accidentals, Day 2**

**MUS 1131**

Give out *Romance*, Op. 149, No. 11 (Diabelli, 1996); have them write name on it.

Allow control group 5 minutes to practice *Romance*.

Perform together as a group at M.M.=60 (quarter note).

Take up *Romance*, Op. 149, No. 11 (Diabelli, 1996), paperclip together, and put in green binder.

Give out *A Winter Tale* (Bartók, n.d.); have them write name on it.

Put up practicing strategies overhead.

**New strategy: Increasing tempo.**

- “What will be your practice tempo for *A Winter Tale* (Bartók, n.d.)? Quarter note = 80? Eighth note = 160? No, that’s too fast. We’ll slow it down using the smallest note value as a guide. How about eighth note = 76?”
- “As you practice *A Winter Tale* (Bartók, n.d.), I am going to increase the tempo by 8 beats per measure. I will begin to increase it after you have had 2 minutes to practice it at eighth note = 76. Our tempo goal for today is eighth note = 100.”

Allow treatment group 2 minutes to apply previous strategies.

Allow treatment group 2 minutes to practice *A Winter Tale* (Bartók, n.d.) at M.M.=76 (eighth note), 1 minute to practice at M.M.=84, 1 minute to practice at M.M.=92, and 1 minute to practice at M.M.=100.

Perform together as a group at M.M.=100 (eighth note).

Take up *A Winter Tale* (Bartók, n.d.), paperclip together, and put in green binder.

**17, 25 Mar 03**

**Control Plan**

**MUS 1131**

Give out *A Winter Tale* (Bartók, n.d.); have them write name on it.

Allow control group 5 minutes to practice *A Winter Tale*.

Perform together as a group at M.M.=100 (eighth note).

Take up *A Winter Tale* (Bartók, n.d.), paperclip together, and put in green binder.

Put up overhead of practicing strategies.

Give out *A Winter Tale* (Bartók, n.d.) (from Green Binder).

**New Strategy, Day 2: Increasing tempo.**

- Remind them that last week's beginning practice tempo was **much slower** than the performance tempo, and that today's practice tempo will also be slower than the final performance tempo.
- "Last time, you performed *A Winter Tale* (Bartók, n.d.) at eighth note = 100. As you practice *A Winter Tale* (Bartók, n.d.) today, I am going to increase the tempo by 8 beats per minute. I will begin to increase it after you have had 2 minutes to practice it at eighth note = 100. Our tempo goal for today is eighth note = 124/quarter note = 62."

Allow treatment group 2 minutes to practice *A Winter Tale* (Bartók, n.d.) at M.M. = 100 (eighth note), 1 minute to practice at M.M. = 108, 1 minute to practice at M.M. = 116, and 1 minute to practice at M.M. = 124.

Perform together as a group at M.M. = 124 (eighth note).

Take up *A Winter Tale* (Bartók, n.d.), paperclip together, and put in green binder.

**26, 27 Mar 03**

**Control Plan**

**MUS 1131**

Give out *A Winter Tale* (Bartók, n.d.); have them write name on it.

Allow control group 5 minutes to practice *A Winter Tale* (Bartók, n.d.).

Perform together as a group at M.M. = 124 (eighth note).

Take up *A Winter Tale* (Bartók, n.d.), paperclip together, and put in green binder.

Review practicing strategies and put up practicing strategies overhead.

Give out *Northern Ode* (Berr, 1997); have them write name on it and add tempo marking of quarter note = 60.

### Increasing tempo, Day 3

“What will be your practice tempo for *Northern Ode* (Berr, 1997)? Quarter note = 60?/Eighth note = 120? No, that’s too fast. We’ll slow it down using the smallest note value as a guide. How about eighth note = 76?”

“As you practice *Northern Ode* (Berr, 1997), I am going to increase the tempo by 8 beats per minute. I will begin to increase it after you have had 2 minutes to practice it at eighth note = 76. Our tempo goal for today is eighth note = 100.”

Allow treatment group 2 minutes to apply previous strategies.

Allow treatment group 2 minutes to practice *Northern Ode* (Berr, 1997) at M.M.=76 (eighth note), 1 minute to practice at M.M.=84, 1 minute to practice at M.M.=92, and 1 minute to practice at M.M.=100.

Perform together as a group at M.M.=100 (eighth note).

Take up *Northern Ode* (Berr, 1997), paperclip together, and put in green binder.

Give out *Northern Ode* (Berr, 1997); have them write name on it.

Allow control group 5 minutes to practice *Northern Ode* (Berr, 1997).

Perform together as a group at M.M.=100 (eighth note).

Take up *Northern Ode* (Berr, 1997), paperclip together, and put in green binder.

Put up overhead of practicing strategies.  
Review strategies and give new handout.  
Give out *Northern Ode* (Berr, 1997) (from Green Binder).

### Increasing tempo, Day 4

*Remind them that last week's beginning practice tempo was **much slower** than the performance tempo, and that today's practice tempo will also be slower than the final performance tempo.*

- “Last time, you performed *Northern Ode* (Berr, 1997) at eighth note = 100. As you practice *Northern Ode* (Berr, 1997) today, I am going to gradually increase the tempo by 8 beats per minute. I will begin to increase it after you have had 2 minutes to practice it at eighth note = 100. Our tempo goal for today is eighth note = 120/quarter note = 60.”

Allow treatment group 2 minutes to practice *Northern Ode* (Berr, 1997) at M.M. = 100 (eighth note), 1 minute to practice at M.M. = 108, 1 minute to practice at M.M. = 116, and 1 minute to practice at M.M. = 120.

Perform together as a group at M.M. = 120 (eighth note).

Take up *Northern Ode* (Berr, 1997), paperclip together, and put in green binder.



Give out *Northern Ode* (Berr, 1997); have them write name on it.

Allow control group 5 minutes to practice *Northern Ode* (Berr, 1997).

Perform together as a group at M.M. = 120 (eighth note).

Take up *Northern Ode* (Berr, 1997), paperclip together, and put in green binder.

*Give Strategies Quiz #2 to each subject:*

- 4 segments, each with practicing problems
- Identify strategy(ies) that would be helpful in practicing each segment (there may be more than one correct answer)
- Write them on the lines below each segment
- Practice each segment on your own, without the classroom metronome
- Play segments together as a class after 10 minutes (with metronome)
- Discuss possible strategies for each segment

*Explain that they will have 10 minutes to complete the quiz and practice all segments.*

Segments included on Strategies Quiz #2 consist of the following:

*Melodic Tune*, Op. 218, No. 20 (Köhler, 1997), mm. 13-16, melody moved to bass staff and accompaniment moved to treble staff

*A Little Dance*, Op. 39, No. 9 (Kabalevsky, 1997), mm. 5-8, original placement of melody and accompaniment

*Arabesque*, Op. 100, No. 2 (Burgmüller, 1995), mm. 26-31, original placement of melody and accompaniment

*Play Song* (Bartók, 1995), mm. 27-32, original placement of melody and accompaniment

*Give Strategies Quiz #2 to each subject:*

- 4 segments, each with practicing problems
- Identify strategy(ies) that would be helpful in practicing each
- segment (there may be more than one correct answer)
- Write them on the lines below each segment
- Practice each segment on your own, without the classroom metronome
- Play segments together as a class after 10 minutes (with metronome)

*Explain that they will have 10 minutes to complete the quiz and practice all segments.*

Segments included on Strategies Quiz #2 consist of the following:

*Melodic Tune*, Op. 218, No. 20 (Köhler, 1997), mm. 13-16, melody moved to bass staff and accompaniment moved to treble staff

*A Little Dance*, Op. 39, No. 9 (Kabalevsky, 1997), mm. 5-8, original placement of melody and accompaniment

*Arabesque*, Op. 100, No. 2 (Burgmüller, 1995), mm. 26-31, original placement of melody and accompaniment

*Play Song* (Bartók, 1995), mm. 27-32, original placement of melody and accompaniment

*Give practicing segments to each student.*

*Put up overhead.*

- 4 segments, each with practicing problems
- Identify strategy(ies) that would be helpful in practicing each segment (there may be more than one correct answer)
- Practice each segment on your own, without the classroom metronome
- Play segments together as a class after 5 minutes (with metronome)
- Discuss possible strategies for each segment

*Explain that they will have 5 minutes to practice all segments.*

Segments consist of the following:

*The Trumpet and the Drum*, Op. 89, No. 20 (Kabalevsky, 1997), mm. 17-20,  
melody moved to bass staff and accompaniment moved to treble staff

*Trumpet Tune* (Duncombe, 1997), mm. 1-4, original placement of melody and  
accompaniment

*Etude* (Gurlitt, 1995), mm. 1-5, original placement of melody and accompaniment

*In Church* (Tchaikovsky, 1995), mm. 1-5, original placement of melody and  
accompaniment

*Give practicing segments to each student.*

- 4 segments, each with practicing problems
- Practice each segment on your own, without the classroom metronome
- Play segments together as a class after 5 minutes (with metronome)

*Explain that they will have 5 minutes to practice all segments.*

Segments consist of the following:

*The Trumpet and the Drum*, Op. 89, No. 20 (Kabalevsky, 1997), mm. 17-20,  
melody moved to bass staff and accompaniment moved to treble staff

*Trumpet Tune* (Duncombe, 1997), mm. 1-4, original placement of melody and  
accompaniment

*Etude* (Gurlitt, 1995), mm. 1-5, original placement of melody and accompaniment

*In Church* (Tchaikovsky, 1995), mm. 1-5, original placement of melody and  
accompaniment

**21 Apr 03**

**Treatment Plan  
My Country 'Tis of Thee**

**MUS 1131**

Put up overhead and review all practicing strategies.

Give out *My Country 'Tis of Thee* (Thesaurus Musicus, 1991) and have them write their names on it.

Allow them 8 minutes to apply the strategies and practice the selection.

Play the piece together as a class at M.M. = 76 (eighth note)

Take up scores and put them in binder.

Sign up for posttests.

**21-22 Apr 03**

**Control Plan  
My Country 'Tis of Thee**

**MUS 1131**

Give out *My Country 'Tis of Thee* (Thesaurus Musicus, 1991) and have them write their names on it.

Allow them 8 minutes to apply the strategies and practice the selection.

Play the piece together as a class at M.M. = 76 (eighth note)

Take up scores and put them in binder.

Sign up for posttests.

*Because this is the last day of treatment, subjects will be allowed to practice without the overhead.*

Give out *Waltz*, Op. 39, No. 13 (Kabalevsky, 1995) and have them write their names on it.

Tell them to try to recall and use as many of the practicing strategies as they can.

Give them 8 minutes to practice *Waltz*, Op. 39, No. 13 (Kabalevsky, 1995).

Have them perform as a group at M.M. = 60 (quarter note).

Take up *Waltz*, Op. 39, No. 13 (Kabalevsky, 1995), paperclip, and put in binder.

Thank subjects and remind them of their posttest times, which begin this Friday.



Give out *Waltz*, Op. 39, No. 13 (Kabalevsky, 1995) and have them write their names on it.

Give them 8 minutes to practice *Waltz*, Op. 39, No. 13 (Kabalevsky, 1995).

Have them perform as a group at M.M. = 60 (quarter note).

Take up *Waltz*, Op. 39, No. 13 (Kabalevsky, 1995), paperclip, and put in binder.

Thank subjects and remind them of their posttest times, which begin this Friday.

## QUIZZES FOR TREATMENT AND CONTROL GROUPS

List the practice strategies that we have discussed this semester. Be as specific as possible, and list them in the order in which we studied them. List each acronym, then list or briefly describe each component.

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

Practice Strategies Quiz #1 - C  
Name \_\_\_\_\_  
26 February 2003

List and describe the practice strategies that you use  
when working out a new piece of music at the piano.

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## APPENDIX D

### DESCRIPTIONS OF DAILY PRACTICE PIECES

Treatment Week	Day	Title	Original Key	Edited Key	Original Melody	Edited Melody	Measures Practiced	Tempo
1	1	Dance	C	D	RH	RH	16	Eighth = 60
1	2	Quadrille	C	F	RH	LH	16	Eighth = 68
2	1	Morning Classic	C	G	RH & LH	RH & LH	16	Eighth = 76
2	2	A Classic Tale	F	F	RH	RH & LH	24	Eighth = 76
3	1	Morning Song	F	F	RH	RH	24	Eighth = 76
3	2	Scherzo	F	D	RH	RH	28	Eighth = 76
4	1	Folk Dance	Am	Am	RH & LH	RH & LH	20	Eighth = 76
4	2	Romance	Am	Gm	RH & LH	RH & LH	32	Quarter = 60
5	1	A Winter Tale	A Dorian	A Dorian	RH	LH	25	Eighth = 76-100
5	2	A Winter Tale	A Dorian	A Dorian	RH	LH	25	Eighth = 100-124
6	1	Northern Ode	Am	Am	RH & LH	RH & LH	31	Eighth = 76-100
6	2	Northern Ode	Am	Am	RH & LH	RH & LH	31	Eighth = 100-120
7-8	1-2	<i>Subjects were given various selections and were instructed to practice them using the most appropriate strategies.</i>						

## APPENDIX E

### PUBLISHER PERMISSION LETTERS

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17 December 2002

Alfred Publishing Co., Inc.  
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Van Nuys, CA 91410-0003  
Attn: Permissions

To Whom it May Concern:

I am completing a doctoral dissertation at Louisiana State University entitled "Effects of Practice Strategies, Metronome Use, Meter, Hand, and Musical Function on Dual-Staved Piano Performance Accuracy and Practice Time Usage of Undergraduate Non-Keyboard Music Majors." I would like your permission to reprint in my dissertation the following:

Schytte, L. (1997). Dance, Op. 108, No. 1. In J. Magrath (Ed.), "Masterwork Classics, Levels 1-2." Alfred Publishing Co., Inc.

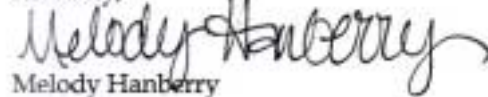
Schytte, L. (1997). Melody for Left Hand, Op. 108, No. 12. In J. Magrath (Ed.), "Masterwork Classics, Levels 1-2." Alfred Publishing Co., Inc.

I would also request your permission to distribute copies of the above selections to the 48 members of the class who will serve as subjects of the study as well as exchanging the treble and bass parts of the pieces for experimental research purposes. Copies of my proposed arrangements are attached.

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## APPENDIX F

### SUBJECT INFORMATION FORM

#### SUBJECT INFORMATION

---

Subject Condition/Number

---

Pretest/Posttest Metronome Used

---

Name

---

Date

---

Section Number/Class Day & Time

---

Teacher

---

Primary Instrument

---

Clef of Primary Instrument

---

Hand Preference (Right or Left)

---

Years of Piano Study (Total)

---

Years of Primary Instrument Study (Total)

---

% of Practice Time Metronome is Used

---

Specific Practice Strategies Used

---

---

---

---

## APPENDIX G

### VIDEOTAPING CHECKLISTS

#### *Pretest Videotaping Checklist*

- Turn on video camera and insert blank videotape.
- Make sure the videotape number is written on the tape and tape case.
- Make sure that the date and counter displays are showing in the camera window.
- Make sure that hands and fingers will be clearly recorded on videotape.
- Press RECORD when first subject enters.
- Give Subject Information Form and pencil to subject and ask subject to complete the bottom section.
- Once the information form is complete, collect the form and write the subject number and videotape number in the table at the top of the form.
- Ask the subject to state his/her name, class day and time, and section number.
- Ask subject to sit down at the piano and listen to instructions.

*Following each of two 8-minute practice intervals, you will perform a musical example.*

*You may use the 8 minutes to practice each example in any way you choose.*

- Record performance order on Subject Information Form.
- Circle M [metronome] or NM [no metronome] on Subject Information Form

*Begin practicing the first example now.*

- Start timer.

(After eight minutes) *Let's record the first example.* (Record first example)

(After performance of first example) *Begin practicing the second example now.*

- Reset and start timer.

(After eight minutes) *Let's record the second example.* (Record second example)

(When student finishes) *Thank you. Please send the next person in.*



### *Posttest Videotaping Checklist*

- Turn on video camera and insert blank videotape.
- Make sure the videotape number is written on the tape and tape case.
- Make sure that the date and counter displays are showing in the camera window.
- Make sure that hands and fingers will be clearly recorded on videotape.
- Press RECORD when first subject enters.
- Write the subject number and videotape number in the table at the top of the Subject Information Form.
- Ask the subject to state his/her name, class day and time, and section number.
- Ask subject to sit down at the piano and listen to instructions.

*Following each of two 8-minute practice intervals, you will perform a musical example.*

*You may use the 8 minutes to practice each example in any way you choose.*

*Begin practicing the first example now.*

- Refer to Pretest Subject Information Sheet for performance order and metronome use.
- Start timer.

(After eight minutes) *Let's record the first example.* (Record first example)

(After performance of first example) *Begin practicing the second example now.*

- Reset and start timer.

(After eight minutes) *Let's record the second example.* (Record second example)

(When student finishes) Thank you. Please send the next person in.

## APPENDIX H

### *FINALE*<sup>TM</sup>-RENDERED AND INVESTIGATOR-REPRODUCED SCORE

Track 0

7

13

20

$\text{♩} = 60$

Piano

Measures 1-4: Treble clef, key of D major (F#), 3/4 time. Bass clef has block chords. Treble has eighth notes and quarter notes.

Pno.

Measures 5-8: Treble clef, key of D major (F#), 3/4 time. Bass clef has block chords and eighth notes. Treble has eighth notes and quarter notes.

Pno.

Measures 9-12: Treble clef, key of D major (F#), 3/4 time. Bass clef has block chords and eighth notes. Treble has eighth notes and quarter notes.

Pno.

Measures 13-16: Treble clef, key of D major (F#), 3/4 time. Bass clef has block chords and eighth notes. Treble has eighth notes and quarter notes.

# APPENDIX I

## SUBJECT SCORING SHEETS

### T.01.M.MLH.DRH

#### *Melody for Left Hand*

Pretest			Posttest		
Hand Practiced First	RH		Hand Practiced First	RH	
Function Practiced First	Accompaniment		Function Practiced First	Accompaniment	
Performance Tempo	70		Performance Tempo	68	
RH Pitches Correct	143/183	78%	RH Pitches Correct	126/183	69%
RH Rhythms Correct	49/62	79%	RH Rhythms Correct	45/62	73%
RH Beats Correct	40/61	66%	RH Beats Correct	41/61	67%
LH Pitches Correct	20/32	63%	LH Pitches Correct	22/32	69%
LH Rhythms Correct	16/34	47%	LH Rhythms Correct	19/34	56%
LH Beats Correct	40/61	66%	LH Beats Correct	41/61	67%
RH % Correct	232/306	76%	RH % Correct	212/306	69%
LH % Correct	76/127	60%	LH % Correct	82/127	65%
Pitch % Correct	163/215	76%	Pitch % Correct	148/215	69%
Rhythm % Correct	65/96	68%	Rhythm % Correct	64/96	67%
Beat % Correct	40/61	66%	Beat % Correct	41/61	67%

#### *Dance for Right Hand*

Pretest			Posttest		
Hand Practiced First	LH		Hand Practiced First	RH	
Function Practiced First	Accompaniment		Function Practiced First	Melody	
Performance Tempo	60		Performance Tempo	66	
RH Pitches Correct	42/64	66%	RH Pitches Correct	54/64	84%
RH Rhythms Correct	57/66	86%	RH Rhythms Correct	55/66	83%
RH Beats Correct	41/64	64%	RH Beats Correct	53/64	83%
LH Pitches Correct	21/41	51%	LH Pitches Correct	28/41	68%
LH Rhythms Correct	8/48	17%	LH Rhythms Correct	47/48	98%
LH Beats Correct	41/64	64%	LH Beats Correct	53/64	83%
RH % Correct	140/194	72%	RH % Correct	162/194	84%
LH % Correct	70/153	46%	LH % Correct	128/153	84%
Pitch % Correct	63/105	60%	Pitch % Correct	82/105	78%
Rhythm % Correct	65/114	57%	Rhythm % Correct	102/114	89%
Beat % Correct	41/64	64%	Beat % Correct	53/64	83%

*Note.* For the documents included in Appendix I, T designates Treatment group, C designates Control group, M designates Metronome, NM designates No Metronome, MLH designates *Melody for Left Hand*, MRH designates *Melody for Right Hand*, DLH designates *Dance for Left Hand*, and DRH designates *Dance for Right Hand*.

## T.02.M.DRH.MLH

*Dance for Right Hand*

Pretest			Posttest		
Hand Practiced First	LH		Hand Practiced First	LH	
Function Practiced First	Accompaniment		Function Practiced First	Accompaniment	
Performance Tempo	60		Performance Tempo	60	
RH Pitches Correct	49/64	77%	RH Pitches Correct	37/64	58%
RH Rhythms Correct	55/66	83%	RH Rhythms Correct	47/66	71%
RH Beats Correct	52/64	81%	RH Beats Correct	50/64	78%
LH Pitches Correct	8/41	20%	LH Pitches Correct	12/41	29%
LH Rhythms Correct	19/48	40%	LH Rhythms Correct	41/48	85%
LH Beats Correct	52/64	81%	LH Beats Correct	50/64	78%
RH % Correct	156/194	80%	RH % Correct	134/194	69%
LH % Correct	79/153	52%	LH % Correct	103/153	67%
Pitch % Correct	57/105	54%	Pitch % Correct	49/105	47%
Rhythm % Correct	74/114	65%	Rhythm % Correct	88/114	77%
Beat % Correct	52/64	81%	Beat % Correct	50/64	78%

*Melody for Left Hand*

Pretest			Posttest		
Hand Practiced First	LH		Hand Practiced First	RH	
Function Practiced First	Melody		Function Practiced First	Accompaniment	
Performance Tempo	60		Performance Tempo	60	
RH Pitches Correct	0/183	0%	RH Pitches Correct	129/183	70%
RH Rhythms Correct	49/62	79%	RH Rhythms Correct	51/62	82%
RH Beats Correct	55/61	90%	RH Beats Correct	53/61	87%
LH Pitches Correct	26/32	81%	LH Pitches Correct	26/32	81%
LH Rhythms Correct	21/34	62%	LH Rhythms Correct	26/34	76%
LH Beats Correct	55/61	90%	LH Beats Correct	53/61	87%
RH % Correct	104/306	34%	RH % Correct	233/306	76%
LH % Correct	102/127	80%	LH % Correct	105/127	83%
Pitch % Correct	26/215	12%	Pitch % Correct	155/215	72%
Rhythm % Correct	70/96	73%	Rhythm % Correct	77/96	80%
Beat % Correct	55/61	90%	Beat % Correct	53/61	87%

*Dance for Right Hand*

Pretest			Posttest		
Hand Practiced First	RH		Hand Practiced First	RH	
Function Practiced First	Melody		Function Practiced First	Melody	
Performance Tempo	120		Performance Tempo	120	
RH Pitches Correct	59/64	92%	RH Pitches Correct	62/64	97%
RH Rhythms Correct	57/66	86%	RH Rhythms Correct	61/66	92%
RH Beats Correct	58/64	91%	RH Beats Correct	60/64	94%
LH Pitches Correct	38/41	93%	LH Pitches Correct	41/41	100%
LH Rhythms Correct	20/48	42%	LH Rhythms Correct	17/48	35%
LH Beats Correct	58/64	91%	LH Beats Correct	60/64	94%
RH % Correct	174/194	90%	RH % Correct	183/196	93%
LH % Correct	116/153	76%	LH % Correct	118/137	86%
Pitch % Correct	77/105	73%	Pitch % Correct	103/105	98%
Rhythm % Correct	77/114	68%	Rhythm % Correct	78/114	68%
Beat % Correct	58/64	91%	Beat % Correct	60/64	94%

*Melody for Left Hand*

Pretest			Posttest		
Hand Practiced First	RH		Hand Practiced First	RH	
Function Practiced First	Accompaniment		Function Practiced First	Accompaniment	
Performance Tempo	74		Performance Tempo	92	
RH Pitches Correct	156/183	85%	RH Pitches Correct	160/183	87%
RH Rhythms Correct	61/62	98%	RH Rhythms Correct	59/62	95%
RH Beats Correct	60/61	98%	RH Beats Correct	58/61	95%
LH Pitches Correct	30/32	94%	LH Pitches Correct	30/32	94%
LH Rhythms Correct	33/34	97%	LH Rhythms Correct	31/34	91%
LH Beats Correct	60/61	98%	LH Beats Correct	58/61	95%
RH % Correct	277/306	91%	RH % Correct	277/306	91%
LH % Correct	123/127	97%	LH % Correct	119/127	94%
Pitch % Correct	186/215	87%	Pitch % Correct	190/215	88%
Rhythm % Correct	94/96	98%	Rhythm % Correct	90/96	94%
Beat % Correct	60/61	98%	Beat % Correct	58/61	95%

## T.04.M.DRH.MLH

*Dance for Right Hand*

Pretest			Posttest		
Hand Practiced First	RH		Hand Practiced First	LH	
Function Practiced First	Melody		Function Practiced First	Accompaniment	
Performance Tempo	60		Performance Tempo	60	
RH Pitches Correct	64/64	100%	RH Pitches Correct	64/64	100%
RH Rhythms Correct	65/66	98%	RH Rhythms Correct	66/66	100%
RH Beats Correct	63/64	98%	RH Beats Correct	64/64	100%
LH Pitches Correct	37/41	90%	LH Pitches Correct	35/41	85%
LH Rhythms Correct	38/48	79%	LH Rhythms Correct	46/48	96%
LH Beats Correct	63/64	98%	LH Beats Correct	64/64	100%
RH % Correct	192/194	99%	RH % Correct	194/194	100%
LH % Correct	138/153	90%	LH % Correct	145/153	95%
Pitch % Correct	101/105	96%	Pitch % Correct	99/105	94%
Rhythm % Correct	103/114	90%	Rhythm % Correct	112/114	98%
Beat % Correct	63/64	98%	Beat % Correct	64/64	100%

*Melody for Left Hand*

Pretest			Posttest		
Hand Practiced First	RH		Hand Practiced First	RH	
Function Practiced First	Accompaniment		Function Practiced First	Accompaniment	
Performance Tempo	60		Performance Tempo	60	
RH Pitches Correct	169/183	92%	RH Pitches Correct	182/183	99%
RH Rhythms Correct	61/62	98%	RH Rhythms Correct	62/62	100%
RH Beats Correct	61/61	100%	RH Beats Correct	61/61	100%
LH Pitches Correct	27/32	84%	LH Pitches Correct	32/32	100%
LH Rhythms Correct	29/34	85%	LH Rhythms Correct	34/34	100%
LH Beats Correct	61/61	100%	LH Beats Correct	61/61	100%
RH % Correct	291/306	95%	RH % Correct	305/306	99.6%
LH % Correct	117/127	92%	LH % Correct	127/127	100%
Pitch % Correct	196/215	91%	Pitch % Correct	214/215	99.5%
Rhythm % Correct	90/96	94%	Rhythm % Correct	96/96	100%
Beat % Correct	61/61	100%	Beat % Correct	61/61	100%

## T.05.NM.MRH.DLH

*Melody for Right Hand*

Pretest			Posttest		
Hand Practiced First	LH		Hand Practiced First	Both	
Function Practiced First	Accompaniment		Function Practiced First	Both	
Performance Tempo	60		Performance Tempo	68	
RH Pitches Correct	29/32	91%	RH Pitches Correct	30/32	94%
RH Rhythms Correct	23/34	68%	RH Rhythms Correct	33/34	97%
RH Beats Correct	48/61	79%	RH Beats Correct	59/61	97%
LH Pitches Correct	159/183	87%	LH Pitches Correct	157/183	86%
LH Rhythms Correct	55/62	89%	LH Rhythms Correct	61/62	98%
LH Beats Correct	48/61	79%	LH Beats Correct	59/61	97%
RH % Correct	100/127	79%	RH % Correct	122/127	96%
LH % Correct	262/306	86%	LH % Correct	277/306	91%
Pitch % Correct	188/215	87%	Pitch % Correct	187/215	87%
Rhythm % Correct	78/96	81%	Rhythm % Correct	94/96	98%
Beat % Correct	48/61	79%	Beat % Correct	59/61	97%

*Dance for Left Hand*

Pretest			Posttest		
Hand Practiced First	LH		Hand Practiced First	RH	
Function Practiced First	Melody		Function Practiced First	Accompaniment	
Performance Tempo	60		Performance Tempo	68	
RH Pitches Correct	36/41	88%	RH Pitches Correct	34/41	83%
RH Rhythms Correct	40/48	83%	RH Rhythms Correct	43/48	90%
RH Beats Correct	55/64	86%	RH Beats Correct	60/64	94%
LH Pitches Correct	60/64	94%	LH Pitches Correct	60/64	94%
LH Rhythms Correct	57/66	86%	LH Rhythms Correct	62/66	94%
LH Beats Correct	55/64	86%	LH Beats Correct	60/64	94%
RH % Correct	131/153	86%	RH % Correct	137/153	90%
LH % Correct	172/194	89%	LH % Correct	182/194	94%
Pitch % Correct	96/105	91%	Pitch % Correct	94/105	90%
Rhythm % Correct	97/114	85%	Rhythm % Correct	105/114	92%
Beat % Correct	55/64	86%	Beat % Correct	60/64	94%



## T.06.NM.DRH.MLH

*Dance for Right Hand*

Pretest			Posttest		
Hand Practiced First	RH		Hand Practiced First	LH	
Function Practiced First	Melody		Function Practiced First	Accompaniment	
Performance Tempo	60		Performance Tempo	60	
RH Pitches Correct	53/64	83%	RH Pitches Correct	64/64	100%
RH Rhythms Correct	51/66	77%	RH Rhythms Correct	62/66	94%
RH Beats Correct	47/64	73%	RH Beats Correct	64/64	100%
LH Pitches Correct	27/41	66%	LH Pitches Correct	40/41	98%
LH Rhythms Correct	4/48	8%	LH Rhythms Correct	28/48	58%
LH Beats Correct	47/64	73%	LH Beats Correct	64/64	100%
RH % Correct	151/194	78%	RH % Correct	190/194	98%
LH % Correct	78/153	51%	LH % Correct	132/153	86%
Pitch % Correct	80/105	76%	Pitch % Correct	104/105	99%
Rhythm % Correct	55/114	48%	Rhythm % Correct	90/114	79%
Beat % Correct	47/64	73%	Beat % Correct	64/64	100%

*Melody for Left Hand*

Pretest			Posttest		
Hand Practiced First	LH		Hand Practiced First	LH	
Function Practiced First	Melody		Function Practiced First	Melody	
Performance Tempo	44		Performance Tempo	50	
RH Pitches Correct	163/183	89%	RH Pitches Correct	167/183	91%
RH Rhythms Correct	56/62	90%	RH Rhythms Correct	61/62	98%
RH Beats Correct	50/61	82%	RH Beats Correct	61/61	100%
LH Pitches Correct	29/32	91%	LH Pitches Correct	32/32	100%
LH Rhythms Correct	31/34	91%	LH Rhythms Correct	34/34	100%
LH Beats Correct	50/61	82%	LH Beats Correct	61/61	100%
RH % Correct	269/306	88%	RH % Correct	289/306	94%
LH % Correct	110/127	87%	LH % Correct	127/127	100%
Pitch % Correct	192/215	89%	Pitch % Correct	199/215	93%
Rhythm % Correct	87/96	91%	Rhythm % Correct	95/96	99%
Beat % Correct	50/61	82%	Beat % Correct	61/61	100%

## T.07.NM.DLH.MRH

*Dance for Left Hand*

Pretest			Posttest		
Hand Practiced First	LH		Hand Practiced First	RH	
Function Practiced First	Melody		Function Practiced First	Accompaniment	
Performance Tempo	60		Performance Tempo	66	
RH Pitches Correct	24/41	59%	RH Pitches Correct	40/41	98%
RH Rhythms Correct	38/48	79%	RH Rhythms Correct	48/48	100%
RH Beats Correct	58/64	91%	RH Beats Correct	64/64	100%
LH Pitches Correct	58/64	91%	LH Pitches Correct	63/64	98%
LH Rhythms Correct	22/66	33%	LH Rhythms Correct	66/66	100%
LH Beats Correct	58/64	91%	LH Beats Correct	64/64	100%
RH % Correct	120/153	78%	RH % Correct	152/153	99%
LH % Correct	138/194	71%	LH % Correct	193/194	99%
Pitch % Correct	82/105	78%	Pitch % Correct	103/105	98%
Rhythm % Correct	60/114	53%	Rhythm % Correct	114/114	100%
Beat % Correct	58/64	91%	Beat % Correct	64/64	100%

*Melody for Right Hand*

Pretest			Posttest		
Hand Practiced First	LH		Hand Practiced First	LH	
Function Practiced First	Accompaniment		Function Practiced First	Accompaniment	
Performance Tempo	60		Performance Tempo	64	
RH Pitches Correct	31/32	97%	RH Pitches Correct	31/32	97%
RH Rhythms Correct	33/34	97%	RH Rhythms Correct	34/34	100%
RH Beats Correct	61/61	100%	RH Beats Correct	61/61	100%
LH Pitches Correct	166/183	91%	LH Pitches Correct	172/183	94%
LH Rhythms Correct	61/62	98%	LH Rhythms Correct	62/62	100%
LH Beats Correct	61/61	100%	LH Beats Correct	61/61	100%
RH % Correct	125/127	98%	RH % Correct	126/127	99%
LH % Correct	288/306	94%	LH % Correct	295/306	96%
Pitch % Correct	197/215	92%	Pitch % Correct	203/215	94%
Rhythm % Correct	94/96	98%	Rhythm % Correct	96/96	100%
Beat % Correct	61/61	100%	Beat % Correct	61/61	100%

## T.08.M.DRH.MLH

*Dance for Right Hand*

Pretest			Posttest		
Hand Practiced First	LH		Hand Practiced First	Both	
Function Practiced First	Accompaniment		Function Practiced First	Both	
Performance Tempo	60		Performance Tempo	60	
RH Pitches Correct	42/64	66%	RH Pitches Correct	51/64	80%
RH Rhythms Correct	44/66	67%	RH Rhythms Correct	46/66	70%
RH Beats Correct	32/64	50%	RH Beats Correct	52/64	81%
LH Pitches Correct	0/41	0%	LH Pitches Correct	24/41	59%
LH Rhythms Correct	4/48	8%	LH Rhythms Correct	27/48	56%
LH Beats Correct	32/64	50%	LH Beats Correct	52/64	81%
RH % Correct	118/194	61%	RH % Correct	149/194	77%
LH % Correct	36/153	24%	LH % Correct	103/153	67%
Pitch % Correct	42/105	40%	Pitch % Correct	75/105	71%
Rhythm % Correct	48/114	42%	Rhythm % Correct	73/114	64%
Beat % Correct	32/64	50%	Beat % Correct	52/64	81%

*Melody for Left Hand*

Pretest			Posttest		
Hand Practiced First	RH		Hand Practiced First	RH	
Function Practiced First	Accompaniment		Function Practiced First	Accompaniment	
Performance Tempo	60		Performance Tempo	60	
RH Pitches Correct	93/183	51%	RH Pitches Correct	60/183	33%
RH Rhythms Correct	31/62	50%	RH Rhythms Correct	32/62	52%
RH Beats Correct	38/61	62%	RH Beats Correct	39/61	64%
LH Pitches Correct	9/32	28%	LH Pitches Correct	14/32	44%
LH Rhythms Correct	10/34	29%	LH Rhythms Correct	13/34	38%
LH Beats Correct	38/61	62%	LH Beats Correct	39/61	64%
RH % Correct	162/306	53%	RH % Correct	131/306	42%
LH % Correct	57/127	45%	LH % Correct	66/127	52%
Pitch % Correct	102/215	47%	Pitch % Correct	74/215	34%
Rhythm % Correct	41/96	43%	Rhythm % Correct	45/96	47%
Beat % Correct	38/61	62%	Beat % Correct	39/61	64%

## T.09.NM.MLH.DRH

*Melody for Left Hand*

Pretest			Posttest		
Hand Practiced First	RH		Hand Practiced First	LH	
Function Practiced First	Accompaniment		Function Practiced First	Melody	
Performance Tempo	60		Performance Tempo	64	
RH Pitches Correct	166/183	91%	RH Pitches Correct	170/183	93%
RH Rhythms Correct	62/62	100%	RH Rhythms Correct	62/62	100%
RH Beats Correct	61/61	100%	RH Beats Correct	61/61	100%
LH Pitches Correct	31/32	97%	LH Pitches Correct	32/32	100%
LH Rhythms Correct	22/34	65%	LH Rhythms Correct	32/34	94%
LH Beats Correct	61/61	100%	LH Beats Correct	61/61	100%
RH % Correct	289/306	94%	RH % Correct	293/306	96%
LH % Correct	114/127	90%	LH % Correct	125/127	98%
Pitch % Correct	197/215	92%	Pitch % Correct	202/215	94%
Rhythm % Correct	84/96	88%	Rhythm % Correct	94/96	98%
Beat % Correct	61/61	100%	Beat % Correct	61/61	100%

*Dance for Right Hand*

Pretest			Posttest		
Hand Practiced First	RH		Hand Practiced First	LH	
Function Practiced First	Melody		Function Practiced First	Accompaniment	
Performance Tempo	60		Performance Tempo	60	
RH Pitches Correct	63/64	98%	RH Pitches Correct	64/64	100%
RH Rhythms Correct	65/66	98%	RH Rhythms Correct	66/66	100%
RH Beats Correct	64/64	100%	RH Beats Correct	64/64	100%
LH Pitches Correct	41/41	100%	LH Pitches Correct	41/41	100%
LH Rhythms Correct	46/48	96%	LH Rhythms Correct	46/48	96%
LH Beats Correct	64/64	100%	LH Beats Correct	64/64	100%
RH % Correct	192/194	99%	RH % Correct	194/194	100%
LH % Correct	151/153	99%	LH % Correct	151/153	99%
Pitch % Correct	104/105	99%	Pitch % Correct	105/105	100%
Rhythm % Correct	111/114	97%	Rhythm % Correct	112/114	98%
Beat % Correct	64/64	100%	Beat % Correct	64/64	100%

## T.10.M.MLH.DRH

*Melody for Left Hand*

Pretest			Posttest		
Hand Practiced First	LH		Hand Practiced First	LH	
Function Practiced First	Melody		Function Practiced First	Melody	
Performance Tempo	60		Performance Tempo	60	
RH Pitches Correct	89/183	49%	RH Pitches Correct	155/183	85%
RH Rhythms Correct	32/62	52%	RH Rhythms Correct	57/62	92%
RH Beats Correct	61/61	100%	RH Beats Correct	61/61	100%
LH Pitches Correct	27/32	84%	LH Pitches Correct	24/32	75%
LH Rhythms Correct	25/34	74%	LH Rhythms Correct	24/34	71%
LH Beats Correct	61/61	100%	LH Beats Correct	61/61	100%
RH % Correct	182/306	59%	RH % Correct	273/306	89%
LH % Correct	113/127	89%	LH % Correct	109/127	86%
Pitch % Correct	116/215	54%	Pitch % Correct	179/215	83%
Rhythm % Correct	57/96	59%	Rhythm % Correct	81/96	84%
Beat % Correct	61/61	100%	Beat % Correct	61/61	100%

*Dance for Right Hand*

Pretest			Posttest		
Hand Practiced First	RH		Hand Practiced First	RH	
Function Practiced First	Melody		Function Practiced First	Melody	
Performance Tempo	60		Performance Tempo	60	
RH Pitches Correct	58/64	91%	RH Pitches Correct	60/64	94%
RH Rhythms Correct	59/66	89%	RH Rhythms Correct	56/66	85%
RH Beats Correct	64/64	100%	RH Beats Correct	62/64	97%
LH Pitches Correct	20/41	49%	LH Pitches Correct	35/41	85%
LH Rhythms Correct	20/48	42%	LH Rhythms Correct	9/48	19%
LH Beats Correct	64/64	100%	LH Beats Correct	62/64	97%
RH % Correct	181/194	93%	RH % Correct	178/194	92%
LH % Correct	104/153	68%	LH % Correct	106/153	69%
Pitch % Correct	78/105	74%	Pitch % Correct	95/105	90%
Rhythm % Correct	79/114	69%	Rhythm % Correct	65/114	57%
Beat % Correct	64/64	100%	Beat % Correct	62/64	97%

T.11.M.DRH.MLH

*Dance for Right Hand*

Pretest			Posttest		
Hand Practiced First	RH		Hand Practiced First	RH	
Function Practiced First	Melody		Function Practiced First	Melody	
Performance Tempo	60		Performance Tempo	60	
RH Pitches Correct	59/64	92%	RH Pitches Correct	63/64	98%
RH Rhythms Correct	62/66	94%	RH Rhythms Correct	66/66	100%
RH Beats Correct	63/64	98%	RH Beats Correct	64/64	100%
LH Pitches Correct	32/41	78%	LH Pitches Correct	40/41	98%
LH Rhythms Correct	33/48	69%	LH Rhythms Correct	48/48	100%
LH Beats Correct	63/64	98%	LH Beats Correct	64/64	100%
RH % Correct	184/194	95%	RH % Correct	193/194	99%
LH % Correct	128/153	84%	LH % Correct	152/153	99%
Pitch % Correct	91/105	87%	Pitch % Correct	103/105	98%
Rhythm % Correct	95/114	83%	Rhythm % Correct	114/114	100%
Beat % Correct	63/64	98%	Beat % Correct	64/64	100%

*Melody for Left Hand*

Pretest			Posttest		
Hand Practiced First	RH		Hand Practiced First	RH	
Function Practiced First	Accompaniment		Function Practiced First	Accompaniment	
Performance Tempo	60		Performance Tempo	60	
RH Pitches Correct	173/183	95%	RH Pitches Correct	154/183	84%
RH Rhythms Correct	62/62	100%	RH Rhythms Correct	60/62	97%
RH Beats Correct	61/61	100%	RH Beats Correct	59/61	97%
LH Pitches Correct	31/32	97%	LH Pitches Correct	29/32	91%
LH Rhythms Correct	31/34	91%	LH Rhythms Correct	30/34	88%
LH Beats Correct	61/61	100%	LH Beats Correct	59/61	97%
RH % Correct	296/306	97%	RH % Correct	273/306	89%
LH % Correct	123/127	97%	LH % Correct	118/127	93%
Pitch % Correct	204/215	95%	Pitch % Correct	183/215	85%
Rhythm % Correct	93/96	97%	Rhythm % Correct	90/96	94%
Beat % Correct	61/61	100%	Beat % Correct	59/61	97%

T.12.M.DLH.MRH

*Dance for Left Hand*

Pretest			Posttest		
Hand Practiced First	LH		Hand Practiced First	Both	
Function Practiced First	Melody		Function Practiced First	Both	
Performance Tempo	60		Performance Tempo	60	
RH Pitches Correct	41/41	100%	RH Pitches Correct	41/41	100%
RH Rhythms Correct	48/48	100%	RH Rhythms Correct	48/48	100%
RH Beats Correct	64/64	100%	RH Beats Correct	64/64	100%
LH Pitches Correct	64/64	100%	LH Pitches Correct	63/64	98%
LH Rhythms Correct	61/66	92%	LH Rhythms Correct	64/66	97%
LH Beats Correct	64/64	100%	LH Beats Correct	64/64	100%
RH % Correct	153/153	100%	RH % Correct	153/153	100%
LH % Correct	189/194	97%	LH % Correct	191/194	98%
Pitch % Correct	105/105	100%	Pitch % Correct	104/105	99%
Rhythm % Correct	109/114	96%	Rhythm % Correct	112/114	98%
Beat % Correct	64/64	100%	Beat % Correct	64/64	100%

*Melody for Right Hand*

Pretest			Posttest		
Hand Practiced First	RH		Hand Practiced First	Both	
Function Practiced First	Melody		Function Practiced First	Both	
Performance Tempo	60		Performance Tempo	60	
RH Pitches Correct	32/32	100%	RH Pitches Correct	32/32	100%
RH Rhythms Correct	34/34	100%	RH Rhythms Correct	33/34	97%
RH Beats Correct	61/61	100%	RH Beats Correct	61/61	100%
LH Pitches Correct	179/183	98%	LH Pitches Correct	178/183	97%
LH Rhythms Correct	62/62	100%	LH Rhythms Correct	62/62	100%
LH Beats Correct	61/61	100%	LH Beats Correct	61/61	100%
RH % Correct	127/127	100%	RH % Correct	126/127	99%
LH % Correct	302/306	99%	LH % Correct	301/306	98%
Pitch % Correct	211/215	98%	Pitch % Correct	210/215	98%
Rhythm % Correct	96/96	100%	Rhythm % Correct	95/96	99%
Beat % Correct	61/61	100%	Beat % Correct	61/61	100%

T.13.M.DLH.MRH

*Dance for Left Hand*

Pretest			Posttest		
Hand Practiced First	RH		Hand Practiced First	RH	
Function Practiced First	Accompaniment		Function Practiced First	Accompaniment	
Performance Tempo	60		Performance Tempo	60	
RH Pitches Correct	30/41	73%	RH Pitches Correct	33/41	80%
RH Rhythms Correct	47/48	98%	RH Rhythms Correct	12/48	25%
RH Beats Correct	62/64	97%	RH Beats Correct	64/64	100%
LH Pitches Correct	51/64	80%	LH Pitches Correct	64/64	100%
LH Rhythms Correct	51/66	77%	LH Rhythms Correct	59/66	89%
LH Beats Correct	62/64	97%	LH Beats Correct	64/64	100%
RH % Correct	139/153	91%	RH % Correct	109/153	71%
LH % Correct	164/194	85%	LH % Correct	187/194	96%
Pitch % Correct	81/105	77%	Pitch % Correct	97/105	92%
Rhythm % Correct	98/114	86%	Rhythm % Correct	71/114	62%
Beat % Correct	62/64	97%	Beat % Correct	64/64	100%

*Melody for Right Hand*

Pretest			Posttest		
Hand Practiced First	RH		Hand Practiced First	RH	
Function Practiced First	Melody		Function Practiced First	Melody	
Performance Tempo	60		Performance Tempo	60	
RH Pitches Correct	32/32	100%	RH Pitches Correct	31/32	97%
RH Rhythms Correct	30/34	88%	RH Rhythms Correct	32/34	94%
RH Beats Correct	61/61	100%	RH Beats Correct	61/61	100%
LH Pitches Correct	178/183	97%	LH Pitches Correct	130/183	71%
LH Rhythms Correct	60/62	97%	LH Rhythms Correct	45/62	73%
LH Beats Correct	61/61	100%	LH Beats Correct	61/61	100%
RH % Correct	123/127	97%	RH % Correct	124/127	98%
LH % Correct	299/306	98%	LH % Correct	236/306	77%
Pitch % Correct	210/215	98%	Pitch % Correct	161/215	75%
Rhythm % Correct	90/96	94%	Rhythm % Correct	77/96	80%
Beat % Correct	61/61	100%	Beat % Correct	61/61	100%



## T.14.NM.MLH.DRH

*Melody for Left Hand*

Pretest			Posttest		
Hand Practiced First	RH		Hand Practiced First	RH	
Function Practiced First	Accompaniment		Function Practiced First	Accompaniment	
Performance Tempo	60		Performance Tempo	60	
RH Pitches Correct	174/183	95%	RH Pitches Correct	144/183	79%
RH Rhythms Correct	55/62	89%	RH Rhythms Correct	48/62	77%
RH Beats Correct	58/61	95%	RH Beats Correct	57/61	93%
LH Pitches Correct	32/32	100%	LH Pitches Correct	24/32	75%
LH Rhythms Correct	31/34	91%	LH Rhythms Correct	22/34	65%
LH Beats Correct	58/61	95%	LH Beats Correct	57/61	93%
RH % Correct	287/306	94%	RH % Correct	249/306	81%
LH % Correct	121/127	95%	LH % Correct	103/127	81%
Pitch % Correct	206/215	96%	Pitch % Correct	168/215	78%
Rhythm % Correct	86/96	90%	Rhythm % Correct	70/96	73%
Beat % Correct	58/61	95%	Beat % Correct	57/61	93%

*Dance for Right Hand*

Pretest			Posttest		
Hand Practiced First	LH		Hand Practiced First	RH	
Function Practiced First	Accompaniment		Function Practiced First	Melody	
Performance Tempo	60		Performance Tempo	60	
RH Pitches Correct	50/64	78%	RH Pitches Correct	63/64	98%
RH Rhythms Correct	50/66	76%	RH Rhythms Correct	66/66	100%
RH Beats Correct	52/64	81%	RH Beats Correct	64/64	100%
LH Pitches Correct	31/41	76%	LH Pitches Correct	40/41	98%
LH Rhythms Correct	37/48	77%	LH Rhythms Correct	45/48	94%
LH Beats Correct	52/64	81%	LH Beats Correct	64/64	100%
RH % Correct	152/194	78%	RH % Correct	193/194	99%
LH % Correct	120/153	78%	LH % Correct	149/153	97%
Pitch % Correct	81/105	77%	Pitch % Correct	103/105	98%
Rhythm % Correct	87/114	76%	Rhythm % Correct	111/114	97%
Beat % Correct	52/64	81%	Beat % Correct	64/64	100%

## T.15.NM.DRH.MLH

*Dance for Right Hand*

Pretest			Posttest		
Hand Practiced First	RH		Hand Practiced First	RH	
Function Practiced First	Melody		Function Practiced First	Melody	
Performance Tempo	66		Performance Tempo	60	
RH Pitches Correct	61/64	95%	RH Pitches Correct	61/64	95%
RH Rhythms Correct	63/66	95%	RH Rhythms Correct	62/66	94%
RH Beats Correct	56/64	88%	RH Beats Correct	57/64	89%
LH Pitches Correct	27/41	66%	LH Pitches Correct	35/41	85%
LH Rhythms Correct	46/48	96%	LH Rhythms Correct	44/48	92%
LH Beats Correct	56/64	88%	LH Beats Correct	57/64	89%
RH % Correct	180/194	93%	RH % Correct	180/194	93%
LH % Correct	129/153	84%	LH % Correct	136/153	89%
Pitch % Correct	88/105	84%	Pitch % Correct	96/105	91%
Rhythm % Correct	109/114	96%	Rhythm % Correct	106/114	93%
Beat % Correct	56/64	88%	Beat % Correct	57/64	89%

*Melody for Left Hand*

Pretest			Posttest		
Hand Practiced First	RH		Hand Practiced First	RH	
Function Practiced First	Accompaniment		Function Practiced First	Accompaniment	
Performance Tempo	40		Performance Tempo	40	
RH Pitches Correct	163/183	89%	RH Pitches Correct	170/183	93%
RH Rhythms Correct	58/62	94%	RH Rhythms Correct	58/62	94%
RH Beats Correct	59/61	97%	RH Beats Correct	55/61	90%
LH Pitches Correct	26/32	81%	LH Pitches Correct	27/32	84%
LH Rhythms Correct	29/34	85%	LH Rhythms Correct	26/34	76%
LH Beats Correct	59/61	97%	LH Beats Correct	55/61	90%
RH % Correct	280/306	92%	RH % Correct	283/306	92%
LH % Correct	114/127	90%	LH % Correct	108/127	85%
Pitch % Correct	189/215	88%	Pitch % Correct	197/215	92%
Rhythm % Correct	87/96	91%	Rhythm % Correct	84/96	88%
Beat % Correct	59/61	97%	Beat % Correct	55/61	90%

## T.16.NM.MRH.DLH

*Melody for Right Hand*

Pretest			Posttest		
Hand Practiced First	RH		Hand Practiced First	RH	
Function Practiced First	Melody		Function Practiced First	Melody	
Performance Tempo	80		Performance Tempo	68	
RH Pitches Correct	28/32	88%	RH Pitches Correct	32/32	100%
RH Rhythms Correct	30/34	88%	RH Rhythms Correct	34/34	100%
RH Beats Correct	58/61	95%	RH Beats Correct	61/61	100%
LH Pitches Correct	153/183	84%	LH Pitches Correct	170/183	93%
LH Rhythms Correct	57/62	92%	LH Rhythms Correct	62/62	100%
LH Beats Correct	58/61	95%	LH Beats Correct	61/61	100%
RH % Correct	116/127	91%	RH % Correct	127/127	100%
LH % Correct	268/306	88%	LH % Correct	293/306	96%
Pitch % Correct	181/215	84%	Pitch % Correct	202/215	94%
Rhythm % Correct	87/96	91%	Rhythm % Correct	96/96	100%
Beat % Correct	58/61	95%	Beat % Correct	61/61	100%

*Dance for Left Hand*

Pretest			Posttest		
Hand Practiced First	RH		Hand Practiced First	LH	
Function Practiced First	Accompaniment		Function Practiced First	Melody	
Performance Tempo	74		Performance Tempo	96	
RH Pitches Correct	37/41	90%	RH Pitches Correct	41/41	100%
RH Rhythms Correct	36/48	75%	RH Rhythms Correct	39/48	81%
RH Beats Correct	61/64	95%	RH Beats Correct	64/64	100%
LH Pitches Correct	59/64	92%	LH Pitches Correct	64/64	100%
LH Rhythms Correct	64/66	97%	LH Rhythms Correct	57/66	86%
LH Beats Correct	61/64	95%	LH Beats Correct	64/64	100%
RH % Correct	134/153	88%	RH % Correct	144/153	94%
LH % Correct	184/194	95%	LH % Correct	185/194	95%
Pitch % Correct	96/105	91%	Pitch % Correct	105/105	100%
Rhythm % Correct	100/114	88%	Rhythm % Correct	96/114	84%
Beat % Correct	61/64	95%	Beat % Correct	64/64	100%

T.17.M.DLH.MRH

*Dance for Left Hand*

Pretest			Posttest		
Hand Practiced First	Both		Hand Practiced First	Both	
Function Practiced First	Both		Function Practiced First	Both	
Performance Tempo	60		Performance Tempo	60	
RH Pitches Correct	41/41	100%	RH Pitches Correct	41/41	100%
RH Rhythms Correct	18/48	38%	RH Rhythms Correct	39/48	81%
RH Beats Correct	64/64	100%	RH Beats Correct	64/64	100%
LH Pitches Correct	64/64	100%	LH Pitches Correct	64/64	100%
LH Rhythms Correct	61/66	92%	LH Rhythms Correct	61/66	92%
LH Beats Correct	64/64	100%	LH Beats Correct	64/64	100%
RH % Correct	123/153	80%	RH % Correct	144/153	94%
LH % Correct	189/194	97%	LH % Correct	189/194	97%
Pitch % Correct	105/105	100%	Pitch % Correct	105/105	100%
Rhythm % Correct	79/114	69%	Rhythm % Correct	100/114	88%
Beat % Correct	64/64	100%	Beat % Correct	64/64	100%

*Melody for Right Hand*

Pretest			Posttest		
Hand Practiced First	LH		Hand Practiced First	RH	
Function Practiced First	Accompaniment		Function Practiced First	Melody	
Performance Tempo	60		Performance Tempo	60	
RH Pitches Correct	32/32	100%	RH Pitches Correct	32/32	100%
RH Rhythms Correct	32/34	94%	RH Rhythms Correct	32/34	94%
RH Beats Correct	61/61	100%	RH Beats Correct	61/61	100%
LH Pitches Correct	182/183	99%	LH Pitches Correct	179/183	98%
LH Rhythms Correct	62/62	100%	LH Rhythms Correct	62/62	100%
LH Beats Correct	61/61	100%	LH Beats Correct	61/61	100%
RH % Correct	125/127	98%	RH % Correct	125/127	98%
LH % Correct	305/306	99.6%	LH % Correct	302/306	99%
Pitch % Correct	214/215	99.5%	Pitch % Correct	211/215	98%
Rhythm % Correct	94/96	98%	Rhythm % Correct	94/96	98%
Beat % Correct	61/61	100%	Beat % Correct	61/61	100%

## T.18.NM.DRH.MLH

*Dance for Right Hand*

Pretest			Posttest		
Hand Practiced First	LH		Hand Practiced First	Both	
Function Practiced First	Accompaniment		Function Practiced First	Both	
Performance Tempo	74		Performance Tempo	60	
RH Pitches Correct	52/64	81%	RH Pitches Correct	55/64	86%
RH Rhythms Correct	53/66	80%	RH Rhythms Correct	57/66	86%
RH Beats Correct	50/64	78%	RH Beats Correct	53/64	83%
LH Pitches Correct	27/41	66%	LH Pitches Correct	20/41	49%
LH Rhythms Correct	7/48	15%	LH Rhythms Correct	32/48	67%
LH Beats Correct	50/64	78%	LH Beats Correct	53/64	83%
RH % Correct	155/194	80%	RH % Correct	165/194	85%
LH % Correct	84/153	55%	LH % Correct	105/153	69%
Pitch % Correct	79/105	75%	Pitch % Correct	75/105	71%
Rhythm % Correct	60/114	53%	Rhythm % Correct	89/114	78%
Beat % Correct	50/64	78%	Beat % Correct	53/64	83%

*Melody for Left Hand*

Pretest			Posttest		
Hand Practiced First	RH		Hand Practiced First	RH	
Function Practiced First	Accompaniment		Function Practiced First	Accompaniment	
Performance Tempo	58		Performance Tempo	58	
RH Pitches Correct	133/183	73%	RH Pitches Correct	148/183	81%
RH Rhythms Correct	52/62	84%	RH Rhythms Correct	53/62	85%
RH Beats Correct	58/61	95%	RH Beats Correct	54/61	88%
LH Pitches Correct	25/32	78%	LH Pitches Correct	27/32	84%
LH Rhythms Correct	28/34	82%	LH Rhythms Correct	27/34	79%
LH Beats Correct	58/61	95%	LH Beats Correct	54/61	88%
RH % Correct	243/306	79%	RH % Correct	255/306	83%
LH % Correct	111/127	87%	LH % Correct	108/127	85%
Pitch % Correct	158/215	73%	Pitch % Correct	175/215	81%
Rhythm % Correct	80/96	83%	Rhythm % Correct	80/96	83%
Beat % Correct	58/61	95%	Beat % Correct	54/61	88%

## T.19.NM.MRH.DLH

*Melody for Right Hand*

Pretest			Posttest		
Hand Practiced First	LH		Hand Practiced First	LH	
Function Practiced First	Accompaniment		Function Practiced First	Accompaniment	
Performance Tempo	52		Performance Tempo	60	
RH Pitches Correct	30/32	94%	RH Pitches Correct	32/32	100%
RH Rhythms Correct	29/34	85%	RH Rhythms Correct	32/34	94%
RH Beats Correct	61/61	100%	RH Beats Correct	61/61	100%
LH Pitches Correct	162/183	89%	LH Pitches Correct	179/183	98%
LH Rhythms Correct	62/62	100%	LH Rhythms Correct	62/62	100%
LH Beats Correct	61/61	100%	LH Beats Correct	61/61	100%
RH % Correct	120/127	94%	RH % Correct	125/127	98%
LH % Correct	285/306	93%	LH % Correct	302/306	99%
Pitch % Correct	192/215	89%	Pitch % Correct	211/215	98%
Rhythm % Correct	91/96	95%	Rhythm % Correct	94/96	98%
Beat % Correct	61/61	100%	Beat % Correct	61/61	100%

*Dance for Left Hand*

Pretest			Posttest		
Hand Practiced First	LH		Hand Practiced First	LH	
Function Practiced First	Melody		Function Practiced First	Melody	
Performance Tempo	48		Performance Tempo	64	
RH Pitches Correct	16/41	39%	RH Pitches Correct	22/41	54%
RH Rhythms Correct	40/48	83%	RH Rhythms Correct	46/48	96%
RH Beats Correct	58/64	91%	RH Beats Correct	63/64	98%
LH Pitches Correct	35/64	55%	LH Pitches Correct	52/64	81%
LH Rhythms Correct	48/66	73%	LH Rhythms Correct	63/66	95%
LH Beats Correct	58/64	91%	LH Beats Correct	63/64	98%
RH % Correct	114/153	75%	RH % Correct	131/153	86%
LH % Correct	141/194	73%	LH % Correct	178/194	92%
Pitch % Correct	51/105	49%	Pitch % Correct	74/105	70%
Rhythm % Correct	88/114	77%	Rhythm % Correct	109/114	96%
Beat % Correct	58/64	91%	Beat % Correct	63/64	98%

*Melody for Right Hand*

Pretest			Posttest		
Hand Practiced First	RH		Hand Practiced First	LH	
Function Practiced First	Melody		Function Practiced First	Accompaniment	
Performance Tempo	56		Performance Tempo	52	
RH Pitches Correct	30/32	94%	RH Pitches Correct	32/32	100%
RH Rhythms Correct	29/34	85%	RH Rhythms Correct	32/34	94%
RH Beats Correct	61/61	100%	RH Beats Correct	61/61	100%
LH Pitches Correct	175/183	96%	LH Pitches Correct	173/183	95%
LH Rhythms Correct	58/62	94%	LH Rhythms Correct	60/62	97%
LH Beats Correct	61/61	100%	LH Beats Correct	61/61	100%
RH % Correct	120/127	94%	RH % Correct	125/127	98%
LH % Correct	294/306	96%	LH % Correct	294/306	96%
Pitch % Correct	205/215	95%	Pitch % Correct	205/215	95%
Rhythm % Correct	87/96	91%	Rhythm % Correct	92/96	96%
Beat % Correct	61/61	100%	Beat % Correct	61/61	100%

*Dance for Left Hand*

Pretest			Posttest		
Hand Practiced First	RH		Hand Practiced First	RH	
Function Practiced First	Accompaniment		Function Practiced First	Accompaniment	
Performance Tempo	76		Performance Tempo	74	
RH Pitches Correct	35/41	85%	RH Pitches Correct	41/41	100%
RH Rhythms Correct	38/48	79%	RH Rhythms Correct	38/48	79%
RH Beats Correct	59/64	92%	RH Beats Correct	64/64	100%
LH Pitches Correct	61/64	95%	LH Pitches Correct	64/64	100%
LH Rhythms Correct	58/66	88%	LH Rhythms Correct	64/66	97%
LH Beats Correct	59/64	92%	LH Beats Correct	64/64	100%
RH % Correct	132/153	86%	RH % Correct	143/153	93%
LH % Correct	178/194	92%	LH % Correct	192/194	99%
Pitch % Correct	96/105	91%	Pitch % Correct	105 /105	100%
Rhythm % Correct	96/114	84%	Rhythm % Correct	102/114	89%
Beat % Correct	59/64	92%	Beat % Correct	64/64	100%

## T.21.M.MRH.DLH

*Melody for Right Hand*

Pretest			Posttest		
Hand Practiced First	RH		Hand Practiced First	LH	
Function Practiced First	Melody		Function Practiced First	Accompaniment	
Performance Tempo	60		Performance Tempo	60	
RH Pitches Correct	26/32	81%	RH Pitches Correct	32/32	100%
RH Rhythms Correct	29/34	85%	RH Rhythms Correct	31/34	91%
RH Beats Correct	61/61	100%	RH Beats Correct	61/61	100%
LH Pitches Correct	164/183	90%	LH Pitches Correct	169/183	92%
LH Rhythms Correct	56/62	90%	LH Rhythms Correct	58/62	94%
LH Beats Correct	61/61	100%	LH Beats Correct	61/61	100%
RH % Correct	116/127	91%	RH % Correct	124/127	98%
LH % Correct	281/306	92%	LH % Correct	288/306	94%
Pitch % Correct	190/215	88%	Pitch % Correct	201/215	93%
Rhythm % Correct	85/96	89%	Rhythm % Correct	89/96	93%
Beat % Correct	61/61	100%	Beat % Correct	61/61	100%

*Dance for Left Hand*

Pretest			Posttest		
Hand Practiced First	RH		Hand Practiced First	RH	
Function Practiced First	Accompaniment		Function Practiced First	Accompaniment	
Performance Tempo	60		Performance Tempo	60	
RH Pitches Correct	27/41	66%	RH Pitches Correct	30/41	73%
RH Rhythms Correct	41/48	85%	RH Rhythms Correct	47/48	98%
RH Beats Correct	64/64	100%	RH Beats Correct	64/64	100%
LH Pitches Correct	44/64	69%	LH Pitches Correct	59/64	92%
LH Rhythms Correct	47/66	84%	LH Rhythms Correct	61/66	92%
LH Beats Correct	64/64	100%	LH Beats Correct	64/64	100%
RH % Correct	132/153	86%	RH % Correct	141/153	92%
LH % Correct	155/194	80%	LH % Correct	184/194	95%
Pitch % Correct	71/105	68%	Pitch % Correct	89/105	85%
Rhythm % Correct	88/114	77%	Rhythm % Correct	108/114	95%
Beat % Correct	64/64	100%	Beat % Correct	64/64	100%



*Melody for Left Hand*

Pretest			Posttest		
Hand Practiced First	RH		Hand Practiced First	Both	
Function Practiced First	Accompaniment		Function Practiced First	Both	
Performance Tempo	88		Performance Tempo	76	
RH Pitches Correct	124/183	68%	RH Pitches Correct	153/183	84%
RH Rhythms Correct	40/62	65%	RH Rhythms Correct	54/62	87%
RH Beats Correct	46/61	75%	RH Beats Correct	51/61	84%
LH Pitches Correct	19/32	59%	LH Pitches Correct	26/32	81%
LH Rhythms Correct	21/34	62%	LH Rhythms Correct	26/34	76%
LH Beats Correct	46/61	75%	LH Beats Correct	51/61	84%
RH % Correct	210/306	69%	RH % Correct	258/306	84%
LH % Correct	86/127	68%	LH % Correct	103/127	81%
Pitch % Correct	143/215	67%	Pitch % Correct	179/215	83%
Rhythm % Correct	61/96	64%	Rhythm % Correct	80/96	83%
Beat % Correct	46/61	75%	Beat % Correct	51/61	84%

*Dance for Right Hand*

Pretest			Posttest		
Hand Practiced First	LH		Hand Practiced First	RH	
Function Practiced First	Accompaniment		Function Practiced First	Melody	
Performance Tempo	94		Performance Tempo	84	
RH Pitches Correct	20/64	31%	RH Pitches Correct	43/64	67%
RH Rhythms Correct	25/66	38%	RH Rhythms Correct	45/66	68%
RH Beats Correct	40/64	63%	RH Beats Correct	43/64	67%
LH Pitches Correct	9/41	22%	LH Pitches Correct	10/41	24%
LH Rhythms Correct	9/48	19%	LH Rhythms Correct	8/48	17%
LH Beats Correct	40/64	63%	LH Beats Correct	43/64	67%
RH % Correct	85/194	44%	RH % Correct	131/194	68%
LH % Correct	58/153	38%	LH % Correct	61/153	40%
Pitch % Correct	29/105	28%	Pitch % Correct	53/105	50%
Rhythm % Correct	34/114	30%	Rhythm % Correct	53/114	46%
Beat % Correct	40/64	63%	Beat % Correct	43/64	67%

## C.01.NM.MLH.DRH

*Melody for Left Hand*

Pretest			Posttest		
Hand Practiced First	RH		Hand Practiced First	Both	
Function Practiced First	Accompaniment		Function Practiced First	Both	
Performance Tempo	46		Performance Tempo	48	
RH Pitches Correct	144/183	79%	RH Pitches Correct	132/183	72%
RH Rhythms Correct	47/62	76%	RH Rhythms Correct	56/62	90%
RH Beats Correct	47/61	77%	RH Beats Correct	53/61	87%
LH Pitches Correct	27/32	84%	LH Pitches Correct	29/32	91%
LH Rhythms Correct	17/34	50%	LH Rhythms Correct	28/34	82%
LH Beats Correct	47/61	77%	LH Beats Correct	53/61	87%
RH % Correct	238/306	78%	RH % Correct	241/306	79%
LH % Correct	91/127	72%	LH % Correct	110/127	87%
Pitch % Correct	171/215	79%	Pitch % Correct	161/215	75%
Rhythm % Correct	64/96	67%	Rhythm % Correct	84/96	88%
Beat % Correct	47/61	77%	Beat % Correct	53/61	87%

*Dance for Right Hand*

Pretest			Posttest		
Hand Practiced First	RH		Hand Practiced First	Both	
Function Practiced First	Melody		Function Practiced First	Both	
Performance Tempo	42		Performance Tempo	50	
RH Pitches Correct	37/64	58%	RH Pitches Correct	46/64	72%
RH Rhythms Correct	32/66	48%	RH Rhythms Correct	40/66	61%
RH Beats Correct	36/64	56%	RH Beats Correct	38/64	59%
LH Pitches Correct	12/41	29%	LH Pitches Correct	27/41	66%
LH Rhythms Correct	0/48	0%	LH Rhythms Correct	5/48	10%
LH Beats Correct	36/64	56%	LH Beats Correct	38/64	59%
RH % Correct	105/194	54%	RH % Correct	124/194	64%
LH % Correct	48/153	31%	LH % Correct	70/153	46%
Pitch % Correct	49/105	47%	Pitch % Correct	73/105	70%
Rhythm % Correct	32/114	28%	Rhythm % Correct	45/114	39%
Beat % Correct	36/64	56%	Beat % Correct	38/64	59%

## C.02.M.DLH.MRH

*Dance for Left Hand*

Pretest			Posttest		
Hand Practiced First	LH		Hand Practiced First	LH	
Function Practiced First	Melody		Function Practiced First	Melody	
Performance Tempo	60		Performance Tempo	60	
RH Pitches Correct	28/41	68%	RH Pitches Correct	26/41	63%
RH Rhythms Correct	42/48	88%	RH Rhythms Correct	43/48	90%
RH Beats Correct	59/64	92%	RH Beats Correct	63/64	98%
LH Pitches Correct	62/64	97%	LH Pitches Correct	55/64	86%
LH Rhythms Correct	60/66	91%	LH Rhythms Correct	54/66	82%
LH Beats Correct	59/64	92%	LH Beats Correct	63/64	98%
RH % Correct	129/153	84%	RH % Correct	132/153	86%
LH % Correct	181/194	93%	LH % Correct	172/194	89%
Pitch % Correct	90/105	86%	Pitch % Correct	81/105	77%
Rhythm % Correct	102/114	89%	Rhythm % Correct	97/114	85%
Beat % Correct	59/64	92%	Beat % Correct	63/64	98%

*Melody for Right Hand*

Pretest			Posttest		
Hand Practiced First	LH		Hand Practiced First	LH	
Function Practiced First	Accompaniment		Function Practiced First	Accompaniment	
Performance Tempo	60		Performance Tempo	60	
RH Pitches Correct	24/32	75%	RH Pitches Correct	31/32	97%
RH Rhythms Correct	20/34	59%	RH Rhythms Correct	29/34	85%
RH Beats Correct	44/61	72%	RH Beats Correct	57/61	93%
LH Pitches Correct	147/183	80%	LH Pitches Correct	164/183	90%
LH Rhythms Correct	53/62	85%	LH Rhythms Correct	57/62	92%
LH Beats Correct	44/61	72%	LH Beats Correct	57/61	93%
RH % Correct	88/127	69%	RH % Correct	117/127	92%
LH % Correct	244/306	80%	LH % Correct	278/306	91%
Pitch % Correct	171/215	80%	Pitch % Correct	195/215	91%
Rhythm % Correct	73/96	76%	Rhythm % Correct	86/96	90%
Beat % Correct	44/61	72%	Beat % Correct	57/61	93%

## C.03.M.MLH.DRH

*Melody for Left Hand*

Pretest			Posttest		
Hand Practiced First	RH		Hand Practiced First	RH	
Function Practiced First	Accompaniment		Function Practiced First	Accompaniment	
Performance Tempo	60		Performance Tempo	60	
RH Pitches Correct	122/183	67%	RH Pitches Correct	168/183	92%
RH Rhythms Correct	48/62	77%	RH Rhythms Correct	62/62	100%
RH Beats Correct	49/61	80%	RH Beats Correct	61/61	100%
LH Pitches Correct	16/32	50%	LH Pitches Correct	31/32	97%
LH Rhythms Correct	22/34	65%	LH Rhythms Correct	29/34	85%
LH Beats Correct	49/61	80%	LH Beats Correct	61/61	100%
RH % Correct	219/306	72%	RH % Correct	291/306	95%
LH % Correct	87/127	69%	LH % Correct	121/127	95%
Pitch % Correct	138/215	64%	Pitch % Correct	199/215	93%
Rhythm % Correct	70/96	73%	Rhythm % Correct	91/96	95%
Beat % Correct	49/61	80%	Beat % Correct	61/61	100%

*Dance for Right Hand*

Pretest			Posttest		
Hand Practiced First	RH		Hand Practiced First	LH	
Function Practiced First	Melody		Function Practiced First	Accompaniment	
Performance Tempo	60		Performance Tempo	60	
RH Pitches Correct	44/64	69%	RH Pitches Correct	59/64	92%
RH Rhythms Correct	41/66	62%	RH Rhythms Correct	61/66	92%
RH Beats Correct	49/64	77%	RH Beats Correct	64/64	100%
LH Pitches Correct	24/41	58%	LH Pitches Correct	38/41	93%
LH Rhythms Correct	27/48	56%	LH Rhythms Correct	10/48	21%
LH Beats Correct	49/64	77%	LH Beats Correct	64/64	100%
RH % Correct	134/194	69%	RH % Correct	184/194	95%
LH % Correct	100/153	65%	LH % Correct	112/153	73%
Pitch % Correct	68/105	65%	Pitch % Correct	97/105	92%
Rhythm % Correct	68/114	60%	Rhythm % Correct	71/114	62%
Beat % Correct	49/64	77%	Beat % Correct	64/64	100%

## C.04.NM.DRH.MLH

*Dance for Right Hand*

Pretest			Posttest		
Hand Practiced First	RH		Hand Practiced First	RH	
Function Practiced First	Melody		Function Practiced First	Melody	
Performance Tempo	60		Performance Tempo	60	
RH Pitches Correct	50/64	78%	RH Pitches Correct	57/64	89%
RH Rhythms Correct	61/66	92%	RH Rhythms Correct	61/66	92%
RH Beats Correct	57/64	89%	RH Beats Correct	61/64	95%
LH Pitches Correct	25/41	61%	LH Pitches Correct	26/41	63%
LH Rhythms Correct	1/48	2%	LH Rhythms Correct	0/48	0%
LH Beats Correct	57/64	89%	LH Beats Correct	61/64	95%
RH % Correct	168/194	87%	RH % Correct	179/194	92%
LH % Correct	83/153	54%	LH % Correct	87/153	57%
Pitch % Correct	75/105	71%	Pitch % Correct	83/105	79%
Rhythm % Correct	62/114	54%	Rhythm % Correct	61/114	54%
Beat % Correct	57/64	89%	Beat % Correct	61/64	95%

*Melody for Left Hand*

Pretest			Posttest		
Hand Practiced First	RH		Hand Practiced First	RH	
Function Practiced First	Accompaniment		Function Practiced First	Accompaniment	
Performance Tempo	58		Performance Tempo	54	
RH Pitches Correct	140/183	77%	RH Pitches Correct	126/183	69%
RH Rhythms Correct	52/62	84%	RH Rhythms Correct	49/62	79%
RH Beats Correct	40/61	66%	RH Beats Correct	47/61	77%
LH Pitches Correct	19/32	59%	LH Pitches Correct	22/32	69%
LH Rhythms Correct	20/34	59%	LH Rhythms Correct	11/34	32%
LH Beats Correct	40/61	66%	LH Beats Correct	47/61	77%
RH % Correct	232/306	76%	RH % Correct	222/306	73%
LH % Correct	79/127	62%	LH % Correct	80/127	63%
Pitch % Correct	159/215	74%	Pitch % Correct	148/215	69%
Rhythm % Correct	72/96	75%	Rhythm % Correct	60/96	63%
Beat % Correct	40/61	66%	Beat % Correct	47/61	77%

## C.05.NM.MRH.DLH

*Melody for Right Hand*

Pretest			Posttest		
Hand Practiced First	RH		Hand Practiced First	LH	
Function Practiced First	Melody		Function Practiced First	Accompaniment	
Performance Tempo	44		Performance Tempo	44	
RH Pitches Correct	16/32	50%	RH Pitches Correct	30/32	94%
RH Rhythms Correct	23/34	68%	RH Rhythms Correct	27/34	79%
RH Beats Correct	34/61	56%	RH Beats Correct	51/61	84%
LH Pitches Correct	125/183	68%	LH Pitches Correct	164/183	90%
LH Rhythms Correct	43/62	69%	LH Rhythms Correct	60/62	97%
LH Beats Correct	34/61	56%	LH Beats Correct	51/61	84%
RH % Correct	73/127	57%	RH % Correct	108/127	85%
LH % Correct	202/306	66%	LH % Correct	275/306	90%
Pitch % Correct	141/215	66%	Pitch % Correct	194/215	90%
Rhythm % Correct	66/96	69%	Rhythm % Correct	87/96	91%
Beat % Correct	34/61	56%	Beat % Correct	51/61	84%

*Dance for Left Hand*

Pretest			Posttest		
Hand Practiced First	LH		Hand Practiced First	RH	
Function Practiced First	Melody		Function Practiced First	Accompaniment	
Performance Tempo	56		Performance Tempo	92	
RH Pitches Correct	2/41	5%	RH Pitches Correct	7/41	17%
RH Rhythms Correct	31/48	65%	RH Rhythms Correct	8/48	17%
RH Beats Correct	54/64	84%	RH Beats Correct	29/64	45%
LH Pitches Correct	49/64	77%	LH Pitches Correct	51/64	80%
LH Rhythms Correct	57/66	86%	LH Rhythms Correct	36/66	55%
LH Beats Correct	54/64	84%	LH Beats Correct	29/64	45%
RH % Correct	87/153	57%	RH % Correct	44/153	29%
LH % Correct	160/194	82%	LH % Correct	116/194	60%
Pitch % Correct	51/105	49%	Pitch % Correct	58/105	55%
Rhythm % Correct	88/114	77%	Rhythm % Correct	44/114	39%
Beat % Correct	54/64	84%	Beat % Correct	29/64	45%

## C.06.NM.DLH.MRH

*Dance for Left Hand*

Pretest			Posttest		
Hand Practiced First	LH		Hand Practiced First	LH	
Function Practiced First	Melody		Function Practiced First	Melody	
Performance Tempo	60		Performance Tempo	60	
RH Pitches Correct	28/41	68%	RH Pitches Correct	40/41	98%
RH Rhythms Correct	39/48	81%	RH Rhythms Correct	43/48	90%
RH Beats Correct	46/64	72%	RH Beats Correct	60/64	94%
LH Pitches Correct	54/64	84%	LH Pitches Correct	59/64	92%
LH Rhythms Correct	49/66	74%	LH Rhythms Correct	58/66	88%
LH Beats Correct	46/64	72%	LH Beats Correct	60/64	94%
RH % Correct	113/153	74%	RH % Correct	143/153	93%
LH % Correct	149/194	77%	LH % Correct	177/194	91%
Pitch % Correct	82/105	78%	Pitch % Correct	99/105	94%
Rhythm % Correct	88/114	77%	Rhythm % Correct	101/114	89%
Beat % Correct	46/64	72%	Beat % Correct	60/64	94%

*Melody for Right Hand*

Pretest			Posttest		
Hand Practiced First	LH		Hand Practiced First	LH	
Function Practiced First	Accompaniment		Function Practiced First	Accompaniment	
Performance Tempo	60		Performance Tempo	60	
RH Pitches Correct	31/32	97%	RH Pitches Correct	30/32	94%
RH Rhythms Correct	32/34	94%	RH Rhythms Correct	32/34	94%
RH Beats Correct	58/61	95%	RH Beats Correct	57/61	93%
LH Pitches Correct	168/183	92%	LH Pitches Correct	160/183	87%
LH Rhythms Correct	60/62	97%	LH Rhythms Correct	60/62	97%
LH Beats Correct	58/61	95%	LH Beats Correct	57/61	93%
RH % Correct	121/127	95%	RH % Correct	119/127	94%
LH % Correct	286/306	93%	LH % Correct	277/306	91%
Pitch % Correct	199/215	93%	Pitch % Correct	190/215	88%
Rhythm % Correct	92/96	96%	Rhythm % Correct	92/96	96%
Beat % Correct	58/61	95%	Beat % Correct	57/61	93%

## C.07.M.MRH.DLH

*Melody for Right Hand*

Pretest			Posttest		
Hand Practiced First	RH		Hand Practiced First	RH	
Function Practiced First	Melody		Function Practiced First	Melody	
Performance Tempo	60		Performance Tempo	60	
RH Pitches Correct	32/32	100%	RH Pitches Correct	32/32	100%
RH Rhythms Correct	34/34	100%	RH Rhythms Correct	34/34	100%
RH Beats Correct	61/61	100%	RH Beats Correct	61/61	100%
LH Pitches Correct	183/183	100%	LH Pitches Correct	179/183	98%
LH Rhythms Correct	62/62	100%	LH Rhythms Correct	61/62	98%
LH Beats Correct	61/61	100%	LH Beats Correct	61/61	100%
RH % Correct	127/127	100%	RH % Correct	127/127	100%
LH % Correct	306/306	100%	LH % Correct	301/306	98%
Pitch % Correct	215/215	100%	Pitch % Correct	211/215	98%
Rhythm % Correct	96/96	100%	Rhythm % Correct	95/96	99%
Beat % Correct	61/61	100%	Beat % Correct	61/61	100%

*Dance for Left Hand*

Pretest			Posttest		
Hand Practiced First	RH		Hand Practiced First	RH	
Function Practiced First	Accompaniment		Function Practiced First	Accompaniment	
Performance Tempo	60		Performance Tempo	60	
RH Pitches Correct	41/41	100%	RH Pitches Correct	40/41	98%
RH Rhythms Correct	48/48	100%	RH Rhythms Correct	48/48	100%
RH Beats Correct	64/64	100%	RH Beats Correct	64/64	100%
LH Pitches Correct	64/64	100%	LH Pitches Correct	64/64	100%
LH Rhythms Correct	61/66	92%	LH Rhythms Correct	61/66	92%
LH Beats Correct	64/64	100%	LH Beats Correct	64/64	100%
RH % Correct	153/153	100%	RH % Correct	152/153	99%
LH % Correct	189/194	97%	LH % Correct	189/194	97%
Pitch % Correct	105/105	100%	Pitch % Correct	104/105	99%
Rhythm % Correct	109/114	96%	Rhythm % Correct	109/114	96%
Beat % Correct	64/64	100%	Beat % Correct	64/64	100%



## C.09.NM.MRH.DLH

*Melody for Right Hand*

Pretest			Posttest		
Hand Practiced First	LH		Hand Practiced First	RH	
Function Practiced First	Accompaniment		Function Practiced First	Melody	
Performance Tempo	76		Performance Tempo	60	
RH Pitches Correct	32/32	100%	RH Pitches Correct	32/32	100%
RH Rhythms Correct	29/34	85%	RH Rhythms Correct	34/34	100%
RH Beats Correct	61/61	100%	RH Beats Correct	61/61	100%
LH Pitches Correct	80/183	44%	LH Pitches Correct	175/183	96%
LH Rhythms Correct	0/62	0%	LH Rhythms Correct	62/62	100%
LH Beats Correct	61/61	100%	LH Beats Correct	61/61	100%
RH % Correct	122/127	96%	RH % Correct	127/127	100%
LH % Correct	141/306	46%	LH % Correct	298/306	97%
Pitch % Correct	112/215	52%	Pitch % Correct	207/215	96%
Rhythm % Correct	29/96	30%	Rhythm % Correct	96/96	100%
Beat % Correct	61/61	100%	Beat % Correct	61/61	100%

*Dance for Left Hand*

Pretest			Posttest		
Hand Practiced First	LH		Hand Practiced First	LH	
Function Practiced First	Melody		Function Practiced First	Melody	
Performance Tempo	72		Performance Tempo	64	
RH Pitches Correct	29/41	71%	RH Pitches Correct	36/41	88%
RH Rhythms Correct	38/48	79%	RH Rhythms Correct	41/48	85%
RH Beats Correct	57/64	89%	RH Beats Correct	64/64	100%
LH Pitches Correct	62/64	97%	LH Pitches Correct	64/64	100%
LH Rhythms Correct	55/66	83%	LH Rhythms Correct	59/66	89%
LH Beats Correct	57/64	89%	LH Beats Correct	64/64	100%
RH % Correct	124/153	81%	RH % Correct	141/153	92%
LH % Correct	174/194	90%	LH % Correct	187/194	96%
Pitch % Correct	91/105	87%	Pitch % Correct	100/105	95%
Rhythm % Correct	93/114	82%	Rhythm % Correct	100/114	88%
Beat % Correct	57/64	89%	Beat % Correct	64/64	100%

C.10.M.MRH.DLH

*Melody for Right Hand*

Pretest			Posttest		
Hand Practiced First	LH		Hand Practiced First	LH	
Function Practiced First	Accompaniment		Function Practiced First	Accompaniment	
Performance Tempo	60		Performance Tempo	60	
RH Pitches Correct	29/32	91%	RH Pitches Correct	32/32	100%
RH Rhythms Correct	30/34	88%	RH Rhythms Correct	30/34	88%
RH Beats Correct	61/61	100%	RH Beats Correct	61/61	100%
LH Pitches Correct	167/183	91%	LH Pitches Correct	171/183	93%
LH Rhythms Correct	61/62	98%	LH Rhythms Correct	62/62	100%
LH Beats Correct	61/61	100%	LH Beats Correct	61/61	100%
RH % Correct	120/127	94%	RH % Correct	123/127	97%
LH % Correct	289/306	94%	LH % Correct	294/306	96%
Pitch % Correct	196/215	91%	Pitch % Correct	203/215	94%
Rhythm % Correct	91/96	95%	Rhythm % Correct	92/96	96%
Beat % Correct	61/61	100%	Beat % Correct	61/61	100%

*Dance for Left Hand*

Pretest			Posttest		
Hand Practiced First	LH		Hand Practiced First	LH	
Function Practiced First	Melody		Function Practiced First	Melody	
Performance Tempo	60		Performance Tempo	60	
RH Pitches Correct	33/41	80%	RH Pitches Correct	39/41	95%
RH Rhythms Correct	15/48	31%	RH Rhythms Correct	35/48	73%
RH Beats Correct	64/64	100%	RH Beats Correct	64/64	100%
LH Pitches Correct	59/64	92%	LH Pitches Correct	62/64	97%
LH Rhythms Correct	63/66	95%	LH Rhythms Correct	58/66	88%
LH Beats Correct	64/64	100%	LH Beats Correct	64/64	100%
RH % Correct	112/153	73%	RH % Correct	138/153	90%
LH % Correct	186/194	96%	LH % Correct	184/194	95%
Pitch % Correct	92/105	88%	Pitch % Correct	101/105	96%
Rhythm % Correct	78/114	68%	Rhythm % Correct	93/114	82%
Beat % Correct	64/64	100%	Beat % Correct	64/64	100%

C.11.NM.DLH.MRH

*Dance for Left Hand*

Pretest			Posttest		
Hand Practiced First	LH		Hand Practiced First	LH	
Function Practiced First	Melody		Function Practiced First	Melody	
Performance Tempo	48		Performance Tempo	56	
RH Pitches Correct	0/41	0%	RH Pitches Correct	27/41	66%
RH Rhythms Correct	1/48	2%	RH Rhythms Correct	37/48	77%
RH Beats Correct	3/64	5%	RH Beats Correct	30/48	63%
LH Pitches Correct	24/64	38%	LH Pitches Correct	58/64	91%
LH Rhythms Correct	24/66	36%	LH Rhythms Correct	53/66	80%
LH Beats Correct	3/64	5%	LH Beats Correct	30/48	63%
RH % Correct	4/153	3%	RH % Correct	94/153	61%
LH % Correct	51/194	26%	LH % Correct	141/194	73%
Pitch % Correct	24/105	23%	Pitch % Correct	85/105	81%
Rhythm % Correct	25/114	22%	Rhythm % Correct	90/114	79%
Beat % Correct	3/64	5%	Beat % Correct	30/48	63%

*Melody for Right Hand*

Pretest			Posttest		
Hand Practiced First	LH		Hand Practiced First	LH	
Function Practiced First	Accompaniment		Function Practiced First	Accompaniment	
Performance Tempo	48		Performance Tempo	50	
RH Pitches Correct	17/32	53%	RH Pitches Correct	23/32	72%
RH Rhythms Correct	11/34	32%	RH Rhythms Correct	23/34	68%
RH Beats Correct	45/61	74%	RH Beats Correct	51/61	84%
LH Pitches Correct	131/183	72%	LH Pitches Correct	155/183	85%
LH Rhythms Correct	39/62	63%	LH Rhythms Correct	53/62	85%
LH Beats Correct	45/61	74%	LH Beats Correct	51/61	84%
RH % Correct	73/127	57%	RH % Correct	97/127	76%
LH % Correct	215/306	70%	LH % Correct	259/306	85%
Pitch % Correct	148/215	69%	Pitch % Correct	178/215	83%
Rhythm % Correct	50/96	52%	Rhythm % Correct	76/96	79%
Beat % Correct	45/61	74%	Beat % Correct	51/61	84%

C.12.M.MLH.DRH

*Melody for Left Hand*

Pretest			Posttest		
Hand Practiced First	RH		Hand Practiced First	LH	
Function Practiced First	Accompaniment		Function Practiced First	Melody	
Performance Tempo	60		Performance Tempo	60	
RH Pitches Correct	167/183	91%	RH Pitches Correct	156/183	85%
RH Rhythms Correct	61/62	98%	RH Rhythms Correct	59/62	95%
RH Beats Correct	61/61	100%	RH Beats Correct	59/61	97%
LH Pitches Correct	32/32	100%	LH Pitches Correct	29/32	91%
LH Rhythms Correct	34/34	100%	LH Rhythms Correct	30/34	88%
LH Beats Correct	61/61	100%	LH Beats Correct	59/61	97%
RH % Correct	289/306	94%	RH % Correct	274/306	90%
LH % Correct	127/127	100%	LH % Correct	118/127	93%
Pitch % Correct	199/215	93%	Pitch % Correct	185/215	86%
Rhythm % Correct	95/96	99%	Rhythm % Correct	89/96	93%
Beat % Correct	61/61	100%	Beat % Correct	59/61	97%

*Dance for Right Hand*

Pretest			Posttest		
Hand Practiced First	RH		Hand Practiced First	RH	
Function Practiced First	Melody		Function Practiced First	Melody	
Performance Tempo	60		Performance Tempo	60	
RH Pitches Correct	60/64	94%	RH Pitches Correct	64/64	100%
RH Rhythms Correct	54/66	82%	RH Rhythms Correct	62/66	94%
RH Beats Correct	64/64	100%	RH Beats Correct	64/64	100%
LH Pitches Correct	40/41	98%	LH Pitches Correct	39/41	95%
LH Rhythms Correct	48/48	100%	LH Rhythms Correct	48/48	100%
LH Beats Correct	64/64	100%	LH Beats Correct	64/64	100%
RH % Correct	178/194	92%	RH % Correct	190/194	98%
LH % Correct	152/153	99%	LH % Correct	151/153	99%
Pitch % Correct	100/105	95%	Pitch % Correct	103/105	98%
Rhythm % Correct	102/114	89%	Rhythm % Correct	110/114	96%
Beat % Correct	64/64	100%	Beat % Correct	64/64	100%

## C.13.M.DRH.MLH

*Dance for Right Hand*

Pretest			Posttest		
Hand Practiced First	LH		Hand Practiced First	LH	
Function Practiced First	Accompaniment		Function Practiced First	Accompaniment	
Performance Tempo	60		Performance Tempo	60	
RH Pitches Correct	63/64	98%	RH Pitches Correct	61/64	95%
RH Rhythms Correct	61/66	92%	RH Rhythms Correct	63/66	95%
RH Beats Correct	63/64	98%	RH Beats Correct	64/64	100%
LH Pitches Correct	39/41	95%	LH Pitches Correct	41/41	100%
LH Rhythms Correct	46/48	96%	LH Rhythms Correct	45/48	94%
LH Beats Correct	63/64	98%	LH Beats Correct	64/64	100%
RH % Correct	187/194	96%	RH % Correct	188/194	97%
LH % Correct	148/153	97%	LH % Correct	150/153	98%
Pitch % Correct	102/105	97%	Pitch % Correct	102/105	97%
Rhythm % Correct	107/114	94%	Rhythm % Correct	108/114	95%
Beat % Correct	63/64	98%	Beat % Correct	64/64	100%

*Melody for Left Hand*

Pretest			Posttest		
Hand Practiced First	RH		Hand Practiced First	RH	
Function Practiced First	Accompaniment		Function Practiced First	Accompaniment	
Performance Tempo	60		Performance Tempo	60	
RH Pitches Correct	153/183	84%	RH Pitches Correct	179/183	98%
RH Rhythms Correct	53/62	85%	RH Rhythms Correct	59/62	95%
RH Beats Correct	61/61	100%	RH Beats Correct	60/61	98%
LH Pitches Correct	24/32	75%	LH Pitches Correct	31/32	97%
LH Rhythms Correct	22/34	65%	LH Rhythms Correct	31/34	91%
LH Beats Correct	61/61	100%	LH Beats Correct	60/61	98%
RH % Correct	267/306	87%	RH % Correct	298/306	97%
LH % Correct	107/127	84%	LH % Correct	122/127	96%
Pitch % Correct	177/215	82%	Pitch % Correct	210/215	98%
Rhythm % Correct	75/96	78%	Rhythm % Correct	90/96	94%
Beat % Correct	61/61	100%	Beat % Correct	60/61	98%

C.14.NM.DLH.MRH

*Dance for Left Hand*

Pretest			Posttest		
Hand Practiced First	RH		Hand Practiced First	LH	
Function Practiced First	Accompaniment		Function Practiced First	Melody	
Performance Tempo	70		Performance Tempo	64	
RH Pitches Correct	20/41	49%	RH Pitches Correct	23/41	56%
RH Rhythms Correct	13/48	27%	RH Rhythms Correct	40/48	83%
RH Beats Correct	40/64	63%	RH Beats Correct	44/64	69%
LH Pitches Correct	51/64	80%	LH Pitches Correct	46/64	72%
LH Rhythms Correct	47/66	71%	LH Rhythms Correct	40/66	61%
LH Beats Correct	40/64	63%	LH Beats Correct	44/64	69%
RH % Correct	73/153	48%	RH % Correct	107/153	70%
LH % Correct	138/194	71%	LH % Correct	130/194	67%
Pitch % Correct	71/105	68%	Pitch % Correct	69/105	66%
Rhythm % Correct	60/114	53%	Rhythm % Correct	80/114	70%
Beat % Correct	40/64	63%	Beat % Correct	44/64	69%

*Melody for Right Hand*

Pretest			Posttest		
Hand Practiced First	LH		Hand Practiced First	LH	
Function Practiced First	Accompaniment		Function Practiced First	Accompaniment	
Performance Tempo	74		Performance Tempo	76	
RH Pitches Correct	27/32	84%	RH Pitches Correct	30/32	94%
RH Rhythms Correct	27/34	79%	RH Rhythms Correct	30/34	88%
RH Beats Correct	56/61	92%	RH Beats Correct	60/61	98%
LH Pitches Correct	0/183	0%	LH Pitches Correct	145/183	79%
LH Rhythms Correct	47/62	76%	LH Rhythms Correct	60/62	97%
LH Beats Correct	56/61	92%	LH Beats Correct	60/61	98%
RH % Correct	110/127	87%	RH % Correct	120/127	94%
LH % Correct	103/306	34%	LH % Correct	265/306	87%
Pitch % Correct	27/215	13%	Pitch % Correct	175/215	81%
Rhythm % Correct	74/96	77%	Rhythm % Correct	90/96	94%
Beat % Correct	56/61	92%	Beat % Correct	60/61	98%

C.15.M.MRH.DLH

*Melody for Right Hand*

Pretest			Posttest		
Hand Practiced First	RH		Hand Practiced First	RH	
Function Practiced First	Melody		Function Practiced First	Melody	
Performance Tempo	54		Performance Tempo	30	
RH Pitches Correct	26/32	81%	RH Pitches Correct	32/32	100%
RH Rhythms Correct	13/34	38%	RH Rhythms Correct	31/34	91%
RH Beats Correct	44/61	72%	RH Beats Correct	61/61	100%
LH Pitches Correct	119/183	65%	LH Pitches Correct	176/183	96%
LH Rhythms Correct	30/62	48%	LH Rhythms Correct	58/62	94%
LH Beats Correct	44/61	72%	LH Beats Correct	61/61	100%
RH % Correct	83/127	65%	RH % Correct	124/127	98%
LH % Correct	193/306	63%	LH % Correct	295/306	96%
Pitch % Correct	145/215	67%	Pitch % Correct	208/215	97%
Rhythm % Correct	43/96	45%	Rhythm % Correct	89/96	93%
Beat % Correct	44/61	72%	Beat % Correct	61/61	100%

*Dance for Left Hand*

Pretest			Posttest		
Hand Practiced First	LH		Hand Practiced First	RH	
Function Practiced First	Melody		Function Practiced First	Accompaniment	
Performance Tempo	58		Performance Tempo	60	
RH Pitches Correct	22/41	54%	RH Pitches Correct	28/41	68%
RH Rhythms Correct	10/48	21%	RH Rhythms Correct	4/48	8%
RH Beats Correct	55/64	86%	RH Beats Correct	58/64	91%
LH Pitches Correct	30/64	47%	LH Pitches Correct	45/64	70%
LH Rhythms Correct	42/66	64%	LH Rhythms Correct	49/66	74%
LH Beats Correct	55/64	86%	LH Beats Correct	58/64	91%
RH % Correct	87/153	57%	RH % Correct	90/153	59%
LH % Correct	127/194	65%	LH % Correct	152/194	78%
Pitch % Correct	52/105	49%	Pitch % Correct	73/105	70%
Rhythm % Correct	52/114	46%	Rhythm % Correct	53/114	46%
Beat % Correct	55/64	86%	Beat % Correct	58/64	91%

## C.16.NM.DRH.MLH

*Dance for Right Hand*

Pretest			Posttest		
Hand Practiced First	Both		Hand Practiced First	Both	
Function Practiced First	Both		Function Practiced First	Both	
Performance Tempo	92		Performance Tempo	80	
RH Pitches Correct	63/64	98%	RH Pitches Correct	53/64	83%
RH Rhythms Correct	57/66	86%	RH Rhythms Correct	61/66	92%
RH Beats Correct	58/64	91%	RH Beats Correct	61/64	95%
LH Pitches Correct	40/41	98%	LH Pitches Correct	41/41	100%
LH Rhythms Correct	15/48	31%	LH Rhythms Correct	18/48	38%
LH Beats Correct	58/64	91%	LH Beats Correct	61/64	95%
RH % Correct	178/194	92%	RH % Correct	175/194	90%
LH % Correct	113/153	74%	LH % Correct	120/153	78%
Pitch % Correct	103/105	98%	Pitch % Correct	94/105	90%
Rhythm % Correct	72/114	63%	Rhythm % Correct	79/114	69%
Beat % Correct	58/64	91%	Beat % Correct	61/64	95%

*Melody for Left Hand*

Pretest			Posttest		
Hand Practiced First	RH		Hand Practiced First	Both	
Function Practiced First	Accompaniment		Function Practiced First	Both	
Performance Tempo	60		Performance Tempo	56	
RH Pitches Correct	174/183	95%	RH Pitches Correct	183/183	100%
RH Rhythms Correct	61/62	98%	RH Rhythms Correct	62/62	100%
RH Beats Correct	57/61	93%	RH Beats Correct	60/61	98%
LH Pitches Correct	31/32	97%	LH Pitches Correct	31/32	97%
LH Rhythms Correct	29/34	85%	LH Rhythms Correct	33/34	97%
LH Beats Correct	57/61	93%	LH Beats Correct	60/61	98%
RH % Correct	292/306	95%	RH % Correct	305/306	99.6%
LH % Correct	117/127	92%	LH % Correct	124/127	98%
Pitch % Correct	205/215	95%	Pitch % Correct	214/215	99.5%
Rhythm % Correct	90/96	94%	Rhythm % Correct	95/96	99%
Beat % Correct	57/61	93%	Beat % Correct	60/61	98%



## C.18.M.DLH.MRH

*Dance for Left Hand*

Pretest			Posttest		
Hand Practiced First	Both		Hand Practiced First	Both	
Function Practiced First	Both		Function Practiced First	Both	
Performance Tempo	60		Performance Tempo	60	
RH Pitches Correct	41/41	100%	RH Pitches Correct	41/41	100%
RH Rhythms Correct	48/48	100%	RH Rhythms Correct	48/48	100%
RH Beats Correct	64/64	100%	RH Beats Correct	64/64	100%
LH Pitches Correct	64/64	100%	LH Pitches Correct	64/64	100%
LH Rhythms Correct	61/66	92%	LH Rhythms Correct	61/66	92%
LH Beats Correct	64/64	100%	LH Beats Correct	64/64	100%
RH % Correct	153/153	100%	RH % Correct	153/153	100%
LH % Correct	189/194	97%	LH % Correct	189/194	97%
Pitch % Correct	105/105	100%	Pitch % Correct	105/105	100%
Rhythm % Correct	109/114	96%	Rhythm % Correct	109/114	96%
Beat % Correct	64/64	100%	Beat % Correct	64/64	100%

*Melody for Right Hand*

Pretest			Posttest		
Hand Practiced First	LH		Hand Practiced First	LH	
Function Practiced First	Accompaniment		Function Practiced First	Accompaniment	
Performance Tempo	60		Performance Tempo	60	
RH Pitches Correct	32/32	100%	RH Pitches Correct	32/32	100%
RH Rhythms Correct	27/34	79%	RH Rhythms Correct	27/34	79%
RH Beats Correct	61/61	100%	RH Beats Correct	61/61	100%
LH Pitches Correct	182/183	99%	LH Pitches Correct	180/183	98%
LH Rhythms Correct	62/62	100%	LH Rhythms Correct	62/62	100%
LH Beats Correct	61/61	100%	LH Beats Correct	61/61	100%
RH % Correct	120/127	94%	RH % Correct	120/127	94%
LH % Correct	305/306	99.6%	LH % Correct	303/306	99%
Pitch % Correct	214/215	99%	Pitch % Correct	212/215	99%
Rhythm % Correct	89/96	93%	Rhythm % Correct	89/96	93%
Beat % Correct	61/61	100%	Beat % Correct	61/61	100%

## C.19.NM.DRH.MLH

*Dance for Right Hand*

Pretest			Posttest		
Hand Practiced First	RH		Hand Practiced First	RH	
Function Practiced First	Melody		Function Practiced First	Melody	
Performance Tempo	62		Performance Tempo	64	
RH Pitches Correct	53/64	83%	RH Pitches Correct	60/64	94%
RH Rhythms Correct	64/66	97%	RH Rhythms Correct	57/66	86%
RH Beats Correct	62/64	97%	RH Beats Correct	57/64	89%
LH Pitches Correct	19/41	46%	LH Pitches Correct	33/41	80%
LH Rhythms Correct	38/48	79%	LH Rhythms Correct	21/48	44%
LH Beats Correct	62/64	97%	LH Beats Correct	57/64	89%
RH % Correct	179/194	92%	RH % Correct	174/194	90%
LH % Correct	119/153	78%	LH % Correct	111/153	73%
Pitch % Correct	72/105	69%	Pitch % Correct	93/105	89%
Rhythm % Correct	102/114	89%	Rhythm % Correct	78/114	68%
Beat % Correct	62/64	97%	Beat % Correct	57/64	89%

*Melody for Left Hand*

Pretest			Posttest		
Hand Practiced First	LH		Hand Practiced First	RH	
Function Practiced First	Melody		Function Practiced First	Melody	
Performance Tempo	62		Performance Tempo	62	
RH Pitches Correct	123/183	67%	RH Pitches Correct	159/183	87%
RH Rhythms Correct	53/62	85%	RH Rhythms Correct	56/62	90%
RH Beats Correct	59/61	97%	RH Beats Correct	57/61	93%
LH Pitches Correct	27/32	84%	LH Pitches Correct	28/32	88%
LH Rhythms Correct	28/34	82%	LH Rhythms Correct	30/34	88%
LH Beats Correct	59/61	97%	LH Beats Correct	57/61	93%
RH % Correct	235/306	77%	RH % Correct	272/306	89%
LH % Correct	114/127	90%	LH % Correct	115/127	91%
Pitch % Correct	150/215	70%	Pitch % Correct	187/215	87%
Rhythm % Correct	81/96	84%	Rhythm % Correct	86/96	90%
Beat % Correct	59/61	97%	Beat % Correct	57/61	93%

## APPENDIX J

### SUBJECT SCORE ANALYSIS PROCEDURES

Strategy	Treatment Pretest Subject Number	Treatment Posttest Subject Number	Control Pretest Subject Number	Control Posttest Subject Number
Added accidental		1, 16, 17, 22	3, 5, 9	5, 9, 11
Added dynamics & shaping			7	
Added finger number(s)	6, 17	2, 17	7, 9, 19	4, 5, 9, 13, 19
Added incorrect pitches to the score				19
Added phrase markings				7
Added vertical lines for the beat				5
Added words in her language	6	6		
Changed finger #s				6
Chord symbols in Dance for RH	4	4		
Circled a rest				6
Circled accidental	22	1, 2, 7, 9, 16, 17, 22	3	5, 11
Circled changing pitches	17	1, 13, 15, 16	3, 13	
Circled climax of each phrase				7
Circled finger #s	9	2, 6, 7, 9, 13, 15, 16, 17	2, 3,	5, 6, 14, 19
Circled hand position change				6, 14
Circled unfamiliar chord		2, 6, 7,		

Drew arrow to changing pitch	17, 22	17	3, 13	6, 9, 10
Drew arrows for LH position change				5
Drew eyeglasses to remind her to watch				9
Drew line to indicate no pitch change				10
Identified meter		1, 22		
Identified form	22			
Identified key		1, 2, 13	5	5, 11
Label lh pitches in Dance for LH			14	
Label LH pitches in Dance for LH				14
Label LH pitches in Dance for RH	1, 4, 8, 22		4, 17, 19	19
Label LH pitches in Melody for LH	1,		4	
Label LH pitches with solfege numbers in Dance for LH			5	
Label RH pitches in Dance for LH			5, 15	
Labeled interval	17	17	9	
Marked repeating sections		1, 6, 10, 13, 16, 18, 21		
Roman numeral for Dance for LH			15	
Roman numerals for Melody for LH	8, 10,	1, 22		19
Roman numerals in Dance for RH		1		
Roman numerals in Melody for RH		17	15	5, 6, 14

Starred LH position change			5	2
Starred RH hand shifts	4	1, 4		
Wrote “back to beg” for repeating sections in Melody for LH	4			
Wrote “don’t speed up”			7	
Wrote “hello” to remind of change in pitch	22			
Wrote “HOOP”		1, 6, 10, 13, 17		
Wrote “ICE3”		13		
Wrote “move” for LH position change				5
Wrote “same” for repeating chords or pitches	17			
Wrote “thumb down” for change in pitch				19
Wrote “watch” for LH position change in Melody for LH	4			
Wrote letter name(s)		1, 4, 22	9, 14	4, 5, 6

## VITA

Melody Anne Hanberry was born October 31, 1975, to Jerry and Linda Hanberry of Sumrall, Mississippi. She attended school at Sumrall Attendance Center and graduated from Sumrall High School as valedictorian in 1994. In 1998, she received the degree of Bachelor of Music in piano performance from William Carey College in Hattiesburg, Mississippi, and was the recipient of the Winters School of Music's Distinguished Music Graduate Award. From 1990 to 1998, Ms. Hanberry also taught piano lessons from her home studio in Sumrall.

Ms. Hanberry received the degree of Master of Music in piano pedagogy from Louisiana State University, Baton Rouge, in 2000. While working on this degree, her graduate assistantship duties consisted of teaching all levels of group piano courses for non-keyboard music majors. Her thesis project was a lecture recital entitled *Pedagogical Applications of Bohuslav Martinu's Puppets, Books I, II, and III*, which she presented as a poster session at the National Conference on Keyboard Pedagogy in Oak Brook, Illinois in 2001.

Ms. Hanberry is a candidate for the degree of Doctor of Philosophy in music with a concentration in music education and a minor in piano pedagogy at Louisiana State University, Baton Rouge. As a graduate assistant, she co-coordinated the LSU Music Academy, the university's community music school, where she also maintained a studio of pre-college and adult piano students. Other duties included teaching a music fundamentals course for elementary education majors and group piano for non-keyboard music majors. She also taught group piano for non-music majors during summer sessions.

Ms. Hanberry is an active member of the Music Teachers National Association, and has presented research poster sessions at three national conferences. Results of her dissertation were presented at the poster session of the 2004 National Conference of MTNA in Kansas City, Missouri. She is also active in the Louisiana Music Teachers Association and the Baton Rouge Music Teachers Association, where she has presented workshops and lectures, and she frequently serves as an adjudicator of pre-college piano events throughout the state of Louisiana. Her other professional affiliations include MENC: The National Association for Music Education, Delta Omicron International Music Fraternity, and Pi Kappa Lambda National Honor Society in Music.