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THE UNIVERSITY OF OKLAHOMA
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A DESCRIPTIVE ANALYSIS OF DYNAMIC (LOUDNESS) ACCURACY
TEST SCORES FOR COLLEGE NON-KEYBOARD MUSIC MAJORS
IN GROUP PIANO CLASSES WHO PRACTICED WITH
FOUR TYPES OF MIDI ACCOMPANIMENT

A DISSERTATION SUBMITTED TO THE GRADUATE FACULTY
in partial fulfillment of the requirements for the
degree of
DOCTOR OF PHILOSOPHY

BY
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Norman, Oklahoma
2001

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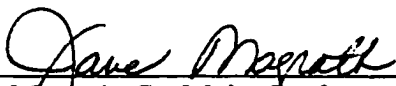
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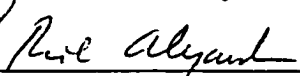
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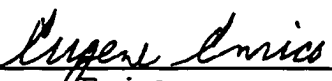
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SCORES FOR COLLEGE NON-KEYBOARD MUSIC MAJORS IN GROUP PIANO
CLASSES WHO PRACTICED WITH FOUR TYPES OF MIDI ACCOMPANIMENT

A Dissertation APPROVED FOR THE SCHOOL OF MUSIC

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Abstract

This study provided a descriptive analysis of test scores for dynamic (loudness) accuracy of pianists who practiced three pieces with various types of non-interactive musical instrument digital interface (MIDI) accompaniment. Participants were 39 university non-keyboard music majors in second semester piano classes and were divided into three treatment groups. One group practiced with subtle dynamic contrast/complex MIDI orchestration accompaniment, the second with exaggerated dynamic contrast/complex MIDI orchestration accompaniment, the third with exaggerated dynamic contrast/simple MIDI orchestration accompaniment, and a control group practiced with no accompaniment.

A sight-reading pretest measured participants' initial dynamic accuracy ability. Next each treatment group with its respective type of accompaniment practiced the pieces for two weeks in class. Participants then recorded posttests, playing without MIDI accompaniment. One piece was also posttested with accompaniment. A panel evaluated these recordings for dynamic accuracy. A Likert-type survey investigated participants' attitudes and perceptions about practicing with MIDI accompaniment.

Participants in the accompaniment groups improved in dynamic accuracy slightly more on average than participants in the control group. Dynamic accuracy, however, was inconsistent both within groups and in many participants' individual scores from posttest to posttest. On average, the exaggerated dynamic contrast/simple MIDI orchestration accompaniment group gained slightly more in dynamic accuracy than other accompaniment groups. Group means for dynamic accuracy of all three treatment groups were slightly higher for the posttest played with accompaniment than for the same piece without accompaniment.

Most participants agreed (47%) or strongly agreed (41%) that they enjoyed playing with the accompaniments. Most also agreed (38%) or strongly agreed (40%) that the accompaniments helped their dynamic accuracy. A significant, positive correlation emerged between gain in dynamic accuracy and a positive attitude toward practicing with MIDI accompaniments.

Although teachers may want to select materials with MIDI accompaniments--especially accompaniments with exaggerated dynamic contrast, simpler orchestrations, and authentic-sounding instrumentation--teachers should not view MIDI accompaniments as an automatic means to improvement in dynamic accuracy. Students' improvement may depend also on attitude, notational difficulty, and tonal control. Students may also need to be trained to retain the effects of an accompaniment when no longer playing with it.

CHAPTER I

THE PURPOSE OF THE STUDY

The Problem

The ability to play with dynamic (loudness) expression has always been an integral part of piano study. Traditional methods of teaching dynamic expression include modeling (aural demonstration), verbal imagery, coaching, conducting, singing, listening to recordings, and accompanying at a second piano. Now recent advances in music technology provide another potential method of teaching dynamic expression—MIDI accompaniment disks with which students may play, either in class or during their practice time.

Learning theory, *gestalt* concepts in particular, and research into the effects of modeling all seem to indicate that MIDI accompaniments would be effective as an aural cue for dynamic accuracy. Studies have documented the success of modeling as an aid to expression (Rosenthal, 1984; Rosenthal, et al., 1988). When a pianist plays with a MIDI accompaniment, the accompaniment supplies a model *sounding simultaneously* with the student's playing. However, several factors complicate the question of MIDI accompaniments' effects on the dynamic accuracy of beginning pianists.

First, while the effectiveness of modeling has been demonstrated, little is known about the cognitive bases that make it work and the conditions in which it will work (Woody, 1998). A pianist typically listens to a model with undivided attention and practices by himself with undivided attention (unlike an instrumentalist in an orchestral rehearsal). Practicing with accompaniments radically changes a pianist's experience—from a solo setting to an ensemble setting. Second, many different styles of MIDI accompaniments exist. These accompaniments differ in the degree of dynamic contrast they possess and in the complexity of their MIDI orchestration. Some pedagogues question whether accompaniments with full orchestrations are distracting to pianists in some stages of learning. Third and most importantly, previous research into the effects of accompaniments on musical expression has yielded seemingly contradictory evidence.

Purpose Statement

Music educators need empirically-based information concerning the dynamic accuracy of pianists who practice with MIDI accompaniments. Therefore, the purpose of this study was to give a descriptive analysis of dynamic accuracy test scores for pianists who practice in this manner. The pianists were college non-keyboard music majors in their second semester of group piano study at the University of Oklahoma. Four types of MIDI accompaniment were used:

1. Subtle dynamic contrast/complex MIDI orchestration accompaniments
2. Exaggerated dynamic contrast/complex MIDI orchestration accompaniments
3. Exaggerated dynamic contrast/simple MIDI orchestration accompaniments
4. No accompaniment (Control group)

Historical Context of the Problem

Dynamic expression is at the core of piano study. In the eighteenth century it was the clavier player's desire to achieve dynamic contrast and touch-sensitive expression that brought about the invention of the piano (originally, the *fortepiano*, or "*loud-soft*"). The desire for greater dynamic contrast also brought about many innovations in piano design in the nineteenth century: longer, thicker, tighter strings; a stronger frame; and the *una corda* pedal. It was a desire for greater touch sensitivity and control of expression that brought about some refinements in the action of the keyboard. From roughly 1850 to the present, the design of the concert grand piano remained fundamentally the same.

The last third of the twentieth century, however, brought a significant innovation in keyboard instruments—the development of the electronic piano. Manufacturers soon engineered a variety of electronic pianos, many of which had touch-sensitive dynamic capabilities. These keyboards had the option of sounding through acoustic speakers or through headphones. Group piano classes incorporated these instruments into "piano laboratories" with multiple electronic

pianos. In these piano laboratories, keyboards could play through their own external speakers, be heard by the individual student alone through headphones, be channeled to an instructor's headphones, or be connected to the headphones of other students in the piano laboratory for ensemble playing.

Several facts render the achievement of dynamic expression more difficult in the group piano context. First, when these electronic pianos channel sound through headphones rather than acoustically, some sensitivity to nuance may be lost through the electronic reproduction of sound. Second, although most keyboards are "touch-sensitive" and therefore capable of some dynamic expression, the sensitivity and range of dynamics may not be as great as that of the acoustic piano. Third, because the instructor is working through the electronic system and dealing with many students at once, there is far less opportunity for individualized feedback on refinements such as dynamic expression.

Fourth, depending on the instructor, many group piano classes tend to focus in large part on functional keyboard skills such as chord progressions, sight-reading, harmonization, and transposition. Many functional skills activities printed in group piano texts lack the detailed expression markings typically found in piano literature. Furthermore, the emphasis on these activities leaves less time available for focusing on the emotional content of music. Normann's (1939) comments about music educators in general have specific relevance to today's group piano situation: "The importance of dynamic contrast in giving expressive power to music is a problem which some . . . are tempted to underestimate. Harassed by the many difficulties encountered in note reading, finger technique,

[and] rhythm, the question of securing dynamic coloring is a factor easily overlooked” (p. 20).

Dynamic expression, nevertheless, remains essential for students in group piano study. Particularly, non-keyboard music majors will eventually accompany their own students or demonstrate at the piano. Expression of dynamic contrasts will be crucial for such job tasks. Many such students will eventually teach in the public school, where piano is significant “as a teaching aid in the classroom during the general music period to illustrate pitch relations, rhythmic patterns, basic harmonies, *expressiveness*, and to encourage the creative impulse” (Sur, 1957, p. 7, italics added).

The burgeoning MIDI accompaniment industry could provide help for this problem of teaching expression. MIDI disks are now published as companion products to many average-age piano methods (N. Davis, 1997a)—*Alfred’s Basic Piano Library* by Palmer, Manus, and Lethco (1995); *Bastien Piano Basics* by Bastien and Bastien (1985, disks 1995); *The Music Tree*, by Clark and Goss (1973, disks 1995); *Piano Adventures: A Basic Piano Method* by Faber and Faber, (1993, disks 1996); *Hal Leonard Student Piano Library* by Kreader, Kern, Keveren, and Rejino (1996); *Music Pathways: A Course for Piano Study* by Olson, Bianchi, and Blickenstaff (1983, disks 1996); and *Noona Comprehensive Piano Library* by Noona & Noona (1997).

Some adult group piano books are also benefiting from such disks, such as *Alfred’s Group Piano for Adults*, by Lancaster and Renfrow (1996); *Keyboard Musicianship* by Lyke, Alexander, Caramia, Haydon, and Elliston (1998); *Piano*

for the Developing Musician--Comprehensive Edition, by Hilley and Olson (1998); and *Piano 101* by Lancaster and Renfrow (1999). Some of these texts are fully supported by MIDI accompaniments, whereas some have accompaniments only for selected pieces or activities. Many other publications, such as adult leisure series or sheet music solos, now also include MIDI accompaniments (Davis, 1997b).

The experience of playing with MIDI accompaniment is different than the experience soloists have had with traditional accompaniment in the context of music history. From a pedagogical standpoint, MIDI accompaniments are an entirely new phenomenon for reasons involving their role in relation to the soloist, their non-interactive format, their educational uses, their computer-generated nature, and several miscellaneous considerations.

First, the role and function of MIDI accompaniments in relation to the soloist is different from that of traditional accompaniments. In the *New Grove Dictionary of Music and Musicians*, Fuller (1980) defines “accompaniment” as “the subordinate parts of any musical texture made up of strands of differing importance” (p. 38). Historically this has referred to two types of accompaniment: a subordinate part within a solo piece (such as a left hand accompaniment to a right hand melody in a piano piece), or a subordinate part in an ensemble setting (such as a piano accompaniment to a vocal solo). In either case, although these accompanying parts were considered subordinate, they were still an integral part of the final performance product. The more important parts

of the texture were not intended to stand alone without the subordinate accompaniment.

The role of most MIDI accompaniments, however, is superfluous in the sense that they are typically comprised of extra material added to the texture of a composition that was originally conceived to stand alone. A MIDI accompaniment's more valuable function is pedagogical in nature. It is designed primarily to have an effect as a temporary practice aid, not to be an integral part of a composition. The publishers of MIDI disks claim general purposes such as the following: "They were especially created to enhance the musical performance. . . . These accompaniments add musical interest and motivate students" (Lancaster & Renfrow, 1995, p. 2). "The use of these disks will help the student to play correct rhythms from the beginning and will reinforce important musical concepts such as dynamics, phrasing, touch, and many other elements that constitute good musicianship" (Palmer, 1995, p. 6). "The [piano parts] provide ideal models for tone inflection, timing, and varieties of articulation" (Holland, 1995, p. 2). "Benefits for the teacher and students include quicker learning, increased motivation . . . [and a] professionally recorded model. . . . [It] allows users to enhance their learning and performance" (Noona & Noona, 1993, inside cover).

The emergence of MIDI accompaniment technology forces teachers to rethink the issues of teaching dynamics, listening, ensemble playing, and the entire process of music education. In commenting on the balance necessary between different parts of a musical texture, Kirshbaum (1986) writes, "The

melody takes preference over everything else. The accompaniment must be kept subordinate” (p. 77). However, because of the complexity of musical texture in some MIDI accompaniments, the student may have trouble mentally maintaining the prominence of the solo part, especially if playing a typical lower level piece with a thin texture. A review of one MIDI accompaniment disk said the accompaniments “may be overwhelming unless the student has mastered the piece. The accompaniments are loud, fast, and lack variety” (Goldberg-Shapiro, 1995, p. 86). Similarly, when looking for material for a beginning pianist, Davis (1997b) says, “I usually look for simple, non-distracting accompaniments. Guiding harmony and rhythm is the skeleton needed. Anything more elaborate often confuses and frustrates the beginning pianist” (p. 46). Davis comments about one accompaniment disk, “The creative orchestrations occasionally confuse the pulse and make these accompaniments somewhat challenging to use” (p. 48).

Another difference between MIDI accompaniments and traditional accompaniments is that the MIDI disks that comprise the majority of the market are non-interactive. Although interactive accompaniment software does exist, music technologists are still perfecting the software’s ability to follow. The focus of this research was on the non-interactive accompaniments, with which the practicing soloist is obligated to follow the accompaniment’s pulse. The traditional idea of an accompaniment, though, implies that the individual who is accompanying is following the *soloist* with respect to rhythm. In a sense, then, practicing with a MIDI disk forces a role reversal, changing a would-be soloist into a follower and potentially hindering the soloist’s expressive freedom.

Because piano teachers are concerned with developing a student's ability to express musical emotion independently, any such effect is worthy of serious consideration.

The technological capabilities of these accompaniments also open up new educational uses. Because the accompaniment disks usually contain the solo piano part, they can serve as performance models in the early stages of learning, especially if the teacher mutes all of the tracks except the piano part. By muting one hand of the solo piano part, the student can even use the disk as a duet partner while playing the other hand alone. The disks can also be used as rhythmic clap-along exercises at various tempi, as a built-in metronome for sake of continuity and steadiness, or even as orchestral backgrounds for final performances if desired.

The fact that MIDI accompaniments are computer-generated also constitutes them as a genre different from traditional accompaniment, especially in the area of expression. It is true that the best MIDI accompaniments are digitally created and edited to have the musical finesse of traditional recordings. The convenience of digitally regularizing rhythm and loudness, however, has detracted from the natural expression of some MIDI recordings. Uszler, Gordon, and Mach (1995) write, "While this may seem useful in reinforcing rhythmic precision, artists do not play with computer-like rhythmic accuracy. . . . The flatness of this mechanical rhythm is often disturbing" (p. 388).

Finally, there are a few miscellaneous ways in which MIDI accompaniments differ from traditional accompaniments. There is usually a rock

or pop style drum beat on the rhythm track of MIDI accompaniments.

Occasionally this drum-set background even appears “cross-stylistically” with pieces from the eighteenth or nineteenth century. In a review, Davis (1997a) comments, “Because accompaniment disks rely solely on the beat to maintain the ensemble, many accompaniments use pop styles with a steady drumbeat. This makes it harder to find accompaniments demonstrating a classical (or orchestral) style” (p. 49). Frequently this rhythm track remains at a constant dynamic level throughout the piece, not exemplifying the natural rise and fall of melody associated with classical training. Some disks, though, are formatted in a way that enables the pianist to mute the rhythm track if so desired.

In many of these accompaniments, especially those for the average-age beginner, a number of non-musical sounds occur, such as chirping birds, honking cars, and bubbling brooks. More importantly, one track of the accompaniment features the piano part itself doubling what the student is to play. None of these elements are true of traditional accompaniments. While these effects may be desirable in some learning contexts, they do constitute MIDI accompaniments as a phenomenon different than traditional accompaniments.

Need for the Study

As with all fields related to computer technology, the market for MIDI disks in piano pedagogy has been expanding rapidly. MIDI accompaniments have swept over the market in the last decade so pervasively that “almost every method either has accompanying MIDI disks, or is considering providing them”

(Davis, 1997a, p. 49). No researchers have documented the effects of MIDI accompaniments on dynamic expression. Furthermore, little is known about the prevailing level of dynamic accuracy among students who typically use these products.

This study will provide direction to teachers in the selection and use of MIDI disks. A better understanding of the value of such music technology will assist teachers and school administrators in budget decisions. This study could even guide those who will create new MIDI software in the future. Most importantly, while describing dynamic accuracy in group piano classes, it will shed light on the educational process itself—how musicians listen, think, and learn; how they develop habits of dynamic expression; and how they interact with music technology.

Research Questions

This study was organized around seven research questions. The first four questions were investigated primarily by the dynamic accuracy test scores. The fifth and sixth questions pertained to the attitudinal questionnaire. The seventh question combined information from the dynamic accuracy test scores and information from the attitudinal questionnaire.

Research Question No. 1. How do dynamic accuracy test scores of participants practicing with MIDI accompaniments compare to those practicing with no accompaniments?

Research Question No. 2. Ignoring the control group, how do dynamic accuracy test scores of groups practicing with different types of MIDI accompaniments compare to each other?

Research Question No. 3. Making within-participant comparisons, is there any difference in dynamic accuracy in a posttest played with the accompaniment and one played without the accompaniment?

Research Question No. 4. Making within-participant comparisons, how much consistency exists in dynamic accuracy test scores from one posttest to the next?

Research Question No. 5. How positive are participants' general attitudes toward the enjoyment and value of practicing with MIDI accompaniments?

Research Question No. 6. Do participants who practiced with MIDI accompaniments feel that the accompaniments aided them in achieving dynamic accuracy?

Research Question No. 7. Is there any correlation between adjusted gain scores for dynamic accuracy and the accompaniment attitudinal rating?

Descriptions of Accompaniments

The researcher designed the three kinds of MIDI accompaniments in response to two main criteria highlighted in the review of literature: the degree of dynamic contrast heard in the accompaniment and the complexity of the MIDI orchestration. These three kinds of accompaniments for each of the three pieces used in the research may be described as follows.

Subtle dynamic contrast/complex MIDI orchestration accompaniment—

These accompaniments were generated on a MIDI sequencer with dynamics digitally set within a moderate range. The resulting dynamic range was approximately between *mezzo piano* and *mezzo forte* [see Appendix F, Appendix I, and Appendix L].

Exaggerated dynamic contrast/complex MIDI orchestration

*accompaniment—*This kind of accompaniment was a copy of the subtle dynamic contrast/complex MIDI orchestration accompaniment, identical in every parameter, except that more obvious dynamic contrasts were digitally added by means of the sequencer [see Appendix G, Appendix J, and Appendix M]. The use of the term “exaggerated” dynamic contrasts was intended simply to mean “more obvious” and not to mean “increased to a point of distortion.”

Exaggerated dynamic contrast/simple MIDI orchestration

*accompaniment—*This kind of accompaniment was an exact copy of the exaggerated dynamic contrast/complex MIDI orchestration accompaniment except that some tracks were deleted. This reduction was done to see whether a less complicated accompaniment might permit better concentration and thus be more beneficial [see Appendix H, Appendix K, and Appendix N].

Definitions of Terms

Accompaniment track, rhythm track—A typical sequenced accompaniment would contain a rhythm part, a left hand soloist part, a right hand soloist part, and a core “accompaniment” part with foundational harmonies,

countermelodies, and possibly special sound effects. Each part would have its own track, be recorded separately, and be capable of being turned on or off by the simple push of a “mute track” button. Together these tracks constitute the complete “MIDI accompaniment.” Occasionally several instruments originally recorded on separate tracks are combined to play together on one track of a MIDI device.

Event list—In sequencing software the event list shows all the parameters of each musical event precisely, such as when each note was played, which pitch was played, and precisely how fast the key descended (loudness). An event list can also contain information such as the addition of pitch bend or the activation of the sustain pedal.

Interactive accompaniment—Such computer applications are designed to be able to sense the rhythmic pulse of a soloist and follow the soloist regardless of tempo changes or rhythmic freedoms taken by the soloist.

MIDI—“MIDI” (Musical Instrument Digital Interface) is not an instrument or a device. MIDI is the protocol or means by which computers and musical instruments may communicate with each other. A keyboard is a MIDI keyboard if it can “interface” or communicate with digital equipment such as computers or other MIDI devices.

MIDI accompaniment disk—This is a 3.5-inch (“floppy”) disk that contains recordings or “sequences” generated on a computer with a MIDI instrument. The disk can be played on other MIDI devices.

Non-interactive accompaniment—This term refers to MIDI software or disks that can be played at any tempo desired but are not designed to follow the soloist. Non-interactive accompaniment disks were the main focus of this study.

Quantization—This computer function digitally “corrects” or regularizes the rhythm of a recording to a specifiable degree of accuracy. Notes played even slightly off the beat are moved to the exact beginning of a quarter note, eighth note, or sixteenth note, for example, depending on the degree of sensitivity desired. Quantizing can result in a perfectly rigid metronomic pulse if desired, or the sequencer can specify a limited degree of imperfection to be included, in order to maintain a feel of “humanness” in the rhythm.

Sequence—A sequence is a recording made using MIDI software having one or more tracks and playable on a MIDI device.

Sequencer—A sequencer is an electronic device used to create or play MIDI accompaniment disks. It can edit or mute tracks independently. It can also change the tempo of a recording without changing the pitch. This cannot be done with analog recordings. In layman’s terms a sequencer is equivalent to a glorified multi-track tape recorder with highly precise digital editing capabilities.

Velocity—Specifically referring to “key descent velocity,” this term denotes the speed with which a key is depressed on a digital keyboard. Measurement of velocity translates directly into a measurement of loudness. The range of velocities is typically 0 to 127. Thus a velocity of 64 would be roughly *mezzo forte*, and a velocity of 120 would be at least *fortissimo*.

Dynamic accuracy—For purposes of this study, dynamics were considered as having been played accurately if played approximately at the point notated in the score and with “noticeable” contrast of loudness or softness. A panel of experienced pianists evaluated the dynamic accuracy. If unsure whether a dynamic mark was played accurately, the panel did not give credit for that mark of expression. Partial credit was given for only one recording by one rater. The concept of dynamic accuracy was viewed as distinct from the idea of expression *artistry*, which was not evaluated. Credit was given for block dynamics when the general section was played accurately, even if the first notes of the section seemed inaccurate in their initial dynamic level. Raters gave full credit for dynamic accuracy even if they felt that the participant played the dynamic mark accurately in only one hand.

Dynamic contrasts—True contrasts were considered to be differences in volume levels that were greater than mere nuances or random unevenness and were readily noticeable to the panel of adjudicators.

Level 2 group piano—This level of piano class is comprised of non-keyboard music majors in their second semester of college group piano study. Typical students in this level can play literature in the second half of the first volume of standard group piano texts such as *Alfred's Group Piano for Adults* (Lancaster & Renfrow, 1995), or *Keyboard Musicianship: Piano for Adults* (Lyke, et al., 1998).

Touch sensitivity—This term refers to the characteristic of keyboard instruments that permits the instrumentalist to control loudness by how quickly

the key is depressed. Organs and harpsichords have no touch-sensitivity, for example, whereas clavichords and pianos do have touch-sensitivity. Many (but not all) digital pianos have this feature.

Basic Assumptions

The basic assumptions of this study were as follows:

1. It was assumed that Level 2 pianists were able to play the pieces with reasonable fluency at first sight, at least hands separately at a moderate tempo.
2. It was assumed that the pianists were also capable of playing with dynamic contrasts as marked in the score, whether or not their particular research group was receiving the treatment of practicing with accompaniments.

Summary

Dynamic expression is an essential part of piano instruction in private or group settings. The music technology field continues to flourish with MIDI accompaniments that may potentially assist the teaching of dynamic expression. However, the effects that these accompaniments have upon this area of musicianship have never been researched. Piano pedagogues need to know whether the various kinds of MIDI accompaniments available make any difference in students' playing and how best to use these new tools within long-range artistic goals. Therefore, the purpose of this study was to give a descriptive analysis of dynamic accuracy test scores for pianists who practiced with four types of accompaniment.

CHAPTER II

RELATED LITERATURE

Introduction

Recent advances in music technology have provided a new potential method of teaching dynamic (loudness) expression—MIDI accompaniment disks with which students may play. Learning theory would seem to indicate that MIDI accompaniments would be effective as an aural cue for dynamic accuracy. Previous research and pedagogical thought concerning the advantages of accompaniments, however, have brought forth conflicting indications. The following discussion has been topically arranged according to the following ideas.

- I. Literature indicating accompaniments may help dynamic accuracy
- II. Literature indicating accompaniments may not help dynamic accuracy
- III. Possible explanations of discrepancies in the literature

Literature Indicating Accompaniments May Help Dynamic Accuracy

Several articles speak of the value of MIDI sequenced recordings. Cole (1991) says, “Phrasing and dynamics are easily taught to a class since the sequencer will play the dynamics correctly with the students, and I can verbally coach them” (p. 44). Concerning teaching students to play accompanied by a sequencer, Sheftel (1990) adds, “Skills are acquired more naturally and with less

frustration. . . . There is a heightened sense of phrasing, articulation, and tone color” (p. 40). One reviewer also writes that “dynamic changes are often reflected in the accompaniment and are likely to remind the player to respond accordingly” (Davis, 1997a, p. 49).

In addition to these articles, several empirical studies indicate that accompaniments help areas of musicianship other than expression, such as intonation. Garman (1992) writes that college-level string players had better intonation when accompanied by acoustic piano than when unaccompanied. Tseng (1996) also concludes that advanced flutists had better intonation when practicing with the interactive accompaniment system, *Vivace*. Kantorski (as cited in Nelson, 1986) notes that string students played with better intonation in their upper register when accompanied in unison rather than thirds. It was especially worthy of note that this last study focused specifically on the difference of effect produced by the *kind* of accompaniment.

While Garman, Tseng, and Kantorski are in agreement that an accompaniment helps intonation, English’s (1985) study seems initially to contradict their studies. English measured intonation of three groups of elementary beginning string players. One group received class instruction for a semester with constant piano accompaniment. Another group received the same instruction with piano accompaniment 50% of the time. A third group received the same instruction without any accompaniment. In the posttest, the groups scored better in direct proportion to the *absence* of piano accompaniment. English, therefore, concludes that piano accompaniment hindered string intonation.

The results of English’s study are brought into question, however, by at least two rival hypotheses. The first is that groups did better because of gender-

related issues. The higher achieving groups had a significantly higher number of girls in them. Bentley (1966) has documented the fact that although boys and girls may have similar musical aptitude, at certain ages boys may feel self-conscious about music instruction and thus not achieve as well as girls. Because the participants in English's study were sixth grade boys and girls, and because the gender-related pattern did hold true in his statistics, this may have been the true cause of between-group variance.

A second and more serious rival hypothesis also emerged in a preliminary survey that English (1985) undertook. He wrote the publishers of string methods and asked them what their intended purposes were for including piano accompaniments in their publications. Respondents answered that they included them in order to provide teaching or performance options, but stated that they would prefer to use piano accompaniment as little as possible or not at all in the early stages of string instruction. Reasons given for their aversion to piano accompaniment were that they preferred a string sound for a model, that accompaniments distracted students' attention, and that the teacher would have to be occupied with playing the piano parts. One respondent recommended that a tape of the accompaniment be used *after* a piece was learned.

These experts raise the very plausible possibility that teachers who accompany their students might not teach as well because their attention is divided. While looking at the score for the accompaniment, for example, they cannot be observing a student's hand position. A research design incorporating accompaniments played on tape or with another person playing the accompaniment would have better focused on his stated research question. In English's experiments, though, the accompaniments for the two treatment groups *were* played by the teacher. Therefore, the significant gains made by the control

group (no accompaniment) may have been due to the teacher's undivided attention, not due to the absence of an accompaniment.

The effects of an accompaniment on other areas of musicianship have also been investigated. Tseng's study (1996) suggests that advanced flute students learn their music more quickly when practicing with the interactive accompaniment software, *Vivace*. Tseng used a qualitative approach to investigate the concept of holistic practice situations. According to the holistic view, students learn more quickly when practicing from the earliest stages of a piece in the authentic performance situation (solo with accompaniment), rather than practicing the solo in isolation from the accompaniment until the last two weeks before the performance. She observed the participants as they practiced with the software and also conducted interviews to explore what it was like for them to practice with the accompaniment.

Tseng's basic conclusion was that the interactive accompaniments did help participants learn a piece more quickly. The accompaniments also provided preparation for performance because of the concentration and focus on continuity necessary in playing with them. However, several things in her study were different from this present study. First of all, the accompaniment software was an *interactive* MIDI accompaniment system. This means that it was designed to respond flexibly to the soloist's variation in tempo and yet still follow the soloist, permitting more expression. The MIDI accompaniments under question in this study were non-interactive accompaniments that make no such allowance for following the pianist's individual expressive nuances.

There was also a more important difference between Tseng's study and this study. For flutists, the authentic performance situation does typically include a solo and accompaniment. Therefore, the accompaniment naturally helped them

to learn a piece in its authentic context more quickly. It familiarized them with the complete picture of the finished product—what the accompaniment would sound like, the length of accompanimental interludes, and the harmonies underlying the solo flute lines. MIDI disk accompaniments for pianists, though, are generally superfluous in the sense that they add orchestration and rhythm tracks to a solo part that in most cases was originally conceived to stand alone as a final performance product. A solo piano piece by itself *is* the authentic performance situation, and there is no need to learn such things as the length of interludes or underlying harmonies in such cases. Unless the student is ultimately planning to perform the piece with the MIDI accompaniment, practicing with the accompaniment is a *non-authentic* situation.

Another area of musicianship that may be improved by practicing with an accompaniment is that of rhythmic accuracy. This is suggested by Watkins (1984). Her study tested the effect of the use of a recorded soloist as an aid to the teaching of sight-reading accompaniments at the piano. Although Watkins was testing the converse question—how a recorded *soloist* affects a live *accompanist*--there was similarity to this study: any ensemble situation conceivably produces effects of interaction that would be consistent with other ensemble situations, whether viewed from the soloist's standpoint or from the accompanist's standpoint. Watkins did find that accompanists played with significantly better rhythmic accuracy when practicing with a recorded soloist. This would also support the above-mentioned view of the value of an authentic practice situation (Tseng, 1996).

Beeler's (1995) study is even closer to this present study. She tested the effect of practicing sight-reading with a cue for continuity—non-interactive MIDI accompaniments. She found that participants sight-read with significantly better

rhythmic accuracy and continuity when playing with a MIDI accompaniment. However, Beeler's study did not address the effect of the accompaniments on the area of expression.

The studies cited suggest that practicing with accompaniments may help students in the above-mentioned areas of musicianship—intonation, rate of learning, performance preparation, rhythmic accuracy, and continuity. None of these, however, found any evidence that accompaniments help in the area of dynamic expression. Folts' research (1973) comes the closest to supporting this idea directly. His study involved the use of a recording as a sound model. Although this is different than the use of a recording as an accompaniment, there is some similarity. A MIDI accompaniment disk functions as a model sounding simultaneously with the student's playing. Producers of MIDI accompaniment disks, such as Lancaster and Renfrow (1995) and Holland (1995), suggest using them as a model. In a review of MIDI accompaniment software, Davis (1997b) said of modeling, "If music is a language, then imitation is a natural way to learn. . . . Playing with a MIDI accompaniment can also effectively reinforce musical concepts such as dynamics and expressive tempo changes" (p. 46). Therefore, Folts' results concerning the effects of modeling may have bearing on this study.

Folts' study touched directly on the area of expression, among other areas. He used forty-five matched pairs of flute, clarinet, and trumpet students in an elementary school. These participants were pretested on the Watkins-Farnum Performance Scale which measures accuracy in the areas of pitch, time, slurs, rests, change of tempo, pauses, and repeats, as well as expression. Since it does not include tone quality, the committee used a separate scale to evaluate tone quality.

Folts' control group "followed traditional procedures for practicing; that is, playing exercises repeatedly, aiming to perform them without mistakes" (p. 2). The experimental group, though, listened to recordings of their exercises as a sound model. Then they played their exercises with recorded piano accompaniment. (These, of course, were non-interactive analog audio accompaniments, because the interactive MIDI format was not yet developed at the time of his experiment.) The control and experimental group both practiced for fourteen weeks in this manner. They were then posttested with the Watkins-Farnum Performance Scale and evaluated again by the committee for tone quality. Results showed no significant improvement in tone quality, but significant improvement on the Watkins-Farnum performance skills, which include the area of expression as one consideration.

Two other studies incorporating the use of sound models are those of Deihl and Zeigler (1973) and of Adams (1989). Deihl and Zeigler tested the effectiveness of a computer-assisted instruction (CAI) program in articulation, phrasing, and rhythm for intermediate instrumentalists. The CAI software incorporated aural models to which the students listened before practicing related material on their instrument. The researchers note, "The most dramatic gain was on one of the phrasing objectives in which scores rose from 12% on the pretest to 100% on the posttest" (p. 9).

Adams (1989) developed a computer program specifically for "instruction in tempo, dynamics, articulation" and other things (p. 1841). The program integrated professionally recorded audio examples that related directly to the educational content of the program. Students were instructed to imitate what they heard. Adams concludes, "It would appear that the computer-based interactive

multimedia approach is viable for instruction in interpretive aspects of wind instrument notation” (p. 1841).

Literature Indicating Accompaniments May Not Help Dynamic Accuracy

The above-mentioned studies suggest that accompaniments would be beneficial to students throughout the learning stages of a piece. The research of Folts (1973), Deihl and Zeigler (1973), and Adams (1989) are the only studies that touch in particular on the area of expression. Both Adams’ study and Deihl and Zeigler’s study incorporated sound models though, rather than accompaniments, in the experimental treatment. Folts’ research is the only study that found any evidence that an accompaniment may help musicians in the area of expression.

Folts’ research, however, is inconclusive about an accompaniment’s effect on expression for two reasons. First, Folts’ experiment involved two separate and distinct elements of treatment—listening to model recordings and practicing with a recorded accompaniment. The effects of these two elements of treatment, however, were not measured in isolation from each other. Variance in results could have been due to the use of a recording as a sound model, rather than due to practicing with an accompaniment. A research design that varied only one element per group could have yielded more clear implications.

To show the feasibility of this rival hypothesis in Folts’ study, results will be cited from Rosenthal, Wilson, Evans and Greenwalt (1988). They document the powerful effects of recordings as sound models. Their experiment measured the effects of different practice conditions on advanced instrumentalists’ performance accuracy. The various practice conditions were examined in five experimental groups. One listened to a recording as a sound model of the

composition to be used in posttesting, another sang the composition, a third group analyzed it silently, a fourth group engaged in free practice, and a fifth group practiced an unrelated composition as a warm-up technique. Results indicated that when advanced instrumentalists were learning new music, listening to a recording as a sound model was roughly as effective as practicing. This held true for the area of phrasing and dynamics, which they evaluated separately, as well as other areas of performance accuracy.

Another reason Folts' (1973) research is inconclusive about an accompaniment's effects on expression involves his use of the Watkins-Farnum Performance Scale in his posttest. While this system does include the area of expression, the scores for expression were not tabulated separately. Rather, several musicianship areas, such as expression, rhythm, pitch, and slurs, were combined into one final composite score for performance skills for each participant. The only area of musicianship that was isolated in measurement and statistical analysis was that of tone quality, since tone quality is not measured on the Watkins-Farnum Performance Scale. It is possible that gains made by the treatment group could have been the result of significantly higher rhythm and pitch accuracy scores that counterbalanced weak expression scores. Without scores published separately for each area of musicianship, it is impossible to know. Therefore, Folts' study does not necessarily indicate that practicing with accompaniments improves expression.

Other evidence indicates that accompaniments may not necessarily help expression. Klee (1998) found that flutists did not play with significantly better quality, accuracy, and musicality when practicing with an accompaniment than they did when practicing with a metronome. He tested 26 flutists who each learned two pieces of similar style and difficulty. Each learned one piece with a

computer-generated accompaniment and one piece with the metronome. Results showed that, although the difference was not at a statistically significant level, most pieces learned with accompaniment were rated slightly higher than the pieces learned with a metronome.

Several details of Klee's study render uncertain its implications for teaching expression by means of an accompaniment. First, as in Folts' (1973) study, the final scores, including phrasing and expression as one of many areas, were averaged into a composite score. Expression achievement was not statistically isolated. Without access to these scores, it is impossible to know whether expression itself was truly affected. Second, no quality controls are documented for the researcher-produced accompaniments. A committee of experienced teachers could have examined the accompaniments to ensure that they were of sufficient expressive quality to have an effect on a student's expression. This may partially explain why statistical significance was not obtained in Klee's research, whereas Folts' similar work did obtain statistical significance.

Third, in the posttest, Klee brought in a professional pianist to accompany participants from both research groups. This was apparently in an effort to simulate a situation parallel to the performing profession, in which soloists practice without accompaniment until just prior to the performance. However, the professional pianist no doubt played the accompaniment with expression. This could have influenced participants in the no-accompaniment group in the 15-minute rehearsal before the posttest. Because both groups did this, it could feasibly have caused scores to regress toward the mean, thus reducing the potential for statistical significance.

A fourth uncertainty of the study is the effort to pair pieces of similar style and difficulty within the available flute repertoire. This effort may or may not have been successful. Determining difficulty levels of pieces is subjective, and only one flute teacher was consulted on the pairings. The level of difficulty could vary according to a student's particular strengths and weaknesses in technique. Also, the researcher himself conceded that participants themselves could easily have become fonder of one of the pieces.

Finally, the interrater reliability for Klee's study was in question. No statistical level of agreement is given in the results, but the researcher stated that two of the three raters were significantly inconsistent with each other. This may have been due to the fact that the raters were allowed to evaluate the tapes at their own convenience. Having the rating committee meet and discuss general boundaries before evaluating the performances might have increased their interrater reliability. These five considerations of uncertainty, taken together, leave still unanswered the question of the effect of accompaniments on expression.

One study that did measure expression accuracy as an individual category is that of Watkins (1984). She investigated the effect of the use of a recorded soloist as an aid to the teaching of sight-reading accompaniments at the piano. As mentioned above, this question (the effect of a recorded soloist on learning accompaniments) is essentially the converse side of this study (the effect of *accompaniments* on *pianists*). Because both studies involve the question of the effect of interacting members of an ensemble on each other, Watkins' study had valid implications for this study.

The two groups in Watkins' research both learned an accompaniment each week of the ten-week experimental period. One group played with a recorded

soloist and one group used traditional practice procedures. Watkins then posttested participants in the areas of pitch and rhythm accuracy as well as expression accuracy. The group that played with the accompaniments scored significantly better in rhythmic accuracy. The pitch and expression accuracy scores were not significantly different.

There are several reasons that the use of a recorded soloist may not have had a significant effect on expression accuracy. The first reason is similar to a potential question concerning Klee's study—the lack of documentation about quality control for the recorded soloist. There is no mention of an experienced committee's having confirmed that the recorded soloist followed the expression marks of the score distinctly enough to have an effect on the accompanists. The second reason is perhaps more important. The pieces used for the pretest and posttest contained very few marks of expression in the score. This could potentially have skewed the results in either direction. Missing (or observing) just one or two marks in the pretest or the posttest would have a major impact on the results. A greater number of expression marks to be observed would permit a more sensitive measurement of variability.

A more serious question about MIDI accompaniments' aid to expression comes from Tseng's study. Her research involving interactive accompaniment software was cited above as providing evidence that instrumental students learn music more quickly and play with better intonation after practicing with computer-generated accompaniments. However, Tseng's findings concerning the accompaniments' effects on the area of expression were not mentioned above.

Tseng's research was a qualitative approach involving researcher observations and interviews of ten advanced flutists who practiced with an interactive MIDI accompaniment system for a semester. Two regular themes

emerged from her study concerning the area of rhythmic expression. One was that participants wanted to change the expression in the accompaniment because they preferred another interpretation. The second and more important emerging theme was that the accompaniments constricted the soloist's individual rhythmic expression. One participant, when interviewed, said students who use the program "may lose their sensitivities in responding to the expressive nature of the music" (p. 156). Other students complained that they played more strictly and "less musically" and that this tendency to unmusical strictness was even retained later during the rehearsal with live accompaniment (p. 145). The reason given for this effect of strictness was that they felt it was necessary for them to follow the accompaniment, rather than lead according to their own interpretation. Although it was an interactive system, and the soloist could set the degree of sensitivity with which the accompaniment should follow, the participants nevertheless were frustrated with the success of the interactivity.

Because this frustration of musical expression occurred with an *interactive* accompaniment system designed to allow rhythmic freedom, the implications could be even more serious for non-interactive accompaniment disks, such as those in this study. It may be, however, that this problem arose because of the advanced level of the performers in Tseng's study. Advanced performers tend to have stronger ideas about interpretation and tend to exaggerate elements of expression more than beginning performers. In fact, one of the conclusions that participants in Tseng's study made was that the computer-generated accompaniments might be more profitable for lower level students. This could be especially true in the realm of expression. Whereas advanced performers may have a habit of playing with expression already, lower level students are still

developing those habits and could benefit more from an expressive accompaniment.

Possible Explanations for Discrepancies in the Related Literature

Evidence has been cited both in support and not in support of the idea that MIDI accompaniments may help dynamic accuracy. The evidence is inconclusive. Possible explanations for this uncertainty follow. These possible explanations were important foundational ideas in the design of this study.

First, the *kind* of accompaniment used may play a critical role in whether or not accompaniment has an effect on expression. Any survey of MIDI accompaniments, both interactive and non-interactive, will show that they vary in many ways. There are differences in amount of expression, in texture, in harmony, in style, in quality, and in interactivity. Any of these areas may have more or less bearing on various areas of musicianship. Beeler's (1995) study, for example, used non-interactive accompaniments and strengthened the continuity of sight-reading. Kantorski (as cited in Nelson, 1986) found that an accompaniment in unison helped the intonation of advanced string players better than an accompaniment in thirds. Hale (1977) found that a melodic accompaniment was better than a harmonic accompaniment for teaching a melody to kindergarten singers. Similarly, Boyle and Lucas (1991) found that college students sang melodies at sight better with no harmonic accompaniment. Sterling (1984) found that melodic replication or traditional tonal harmony was better for teaching children singing than was chromatic harmony or dissonant harmony. Folts' (1973) recordings were intended to be a sound model, and thus may have been handcrafted for effect more than recordings that are intended merely to enhance the general sound during a student's practice. It was interesting to note in the

study done by Deihl and Zeigler (1973) that when the CAI aural excerpts were set up to give instruction about phrasing they did produce highly significant effects in the area of expression.

It may also be that age or ability level is a factor in whether an accompaniment has a significant effect on a student. Younger children may be less able to divide their attention between the solo part they are playing and the accompaniment part to which they are listening. Their accompaniments, therefore, may need to be much simpler in orchestration. This is indicated also by reviewers' complaints (cited in Chapter One) that some accompaniments were "confusing," "distracting," (Davis, 1997b, p. 46), or "overwhelming" (Goldberg-Shapiro, 1995, p. 86).

On the other hand, one of the participants interviewed by Tseng stated that the interactive accompaniment system would be better for younger and less advanced students. This is probably because the participants in Tseng's study were advanced performers who were often frustrated with the imperfect following capabilities of the interactive software. A lower level performer who would have less distinct interpretational ideas might not be as frustrated.

Because expression is so contingent on the performer's listening to himself, a complicated MIDI disk accompaniment may actually hinder expression. Many important pedagogues discuss the importance of self-listening in order to produce dynamic expression. Neuhaus says about tonal (dynamic) coloring, "Work on tone is the most difficult work of all, since it is closely connected to the ear. By training [the student's] ear, (which can be done in a variety of ways), we directly influence his tone" (p. 55). Last adds, "To produce the tone required, a pupil needs a sensitive ear" (p. 134). Philipps states, "To

improve tone production, the student has to listen attentively to the tonal effect he is producing” (p. 15). He also feels that “the ears control the intensity of tone” (p. 44). Wheeler (1999) asserts, “More than ever, teachers are needed who can cultivate internal listening in students who are bombarded with sound” (p. 11).

Another possibility is that dynamic expression in an accompaniment simply needs to be exaggerated in order to have a statistically significant effect on a soloist. Hilley (1992) states, “Dynamics are best understood when exaggerated. Approach the exercise from the angle of audibly different levels” (p. 3). Camp (1992) reiterates this idea with his advice on teaching expression: “Playing duets or accompanying the student at a second piano is another way to foster the student’s hearing of phrase shapes. . . . The teacher can dynamically emphasize the changes in harmony, denoting the rise and fall of intensity levels. Here again, the student is experiencing the rise and fall of harmonic tension and resolution” (p. 55).

Summary

The related literature considered here gives mixed evidence—both in support of and not in support of the idea that a MIDI accompaniment will benefit dynamic expression of beginning pianists. Possible explanations for the discrepancies in the related literature were incorporated into the research design and procedures in order to investigate this question further. It was the purpose of this study, therefore, to give a descriptive analysis of dynamic accuracy of three groups of pianists who practiced with different kinds of MIDI accompaniments and of a fourth group who practiced with no accompaniment.

CHAPTER III

METHODS AND PROCEDURES

Purpose of the Study

The purpose of this study was to give an experimental, descriptive analysis of dynamic accuracy test scores of college non-keyboard music majors in group piano study who practiced with various types of MIDI accompaniment.

Pilot Study

During the 1998-1999 school year, the researcher conducted a pilot study. All students in the three sections of Level 4 (fourth semester) non-keyboard music major group piano classes at the University of Oklahoma participated. The treatment consisted of three separate groups practicing a melody and an arpeggio exercise, each with a different type of accompaniment. One group practiced with an expressive dynamic contrast accompaniment, another group practiced with a flat dynamic contrast accompaniment (no dynamic contrast), and the third group practiced with no accompaniment (control group). Specific ideas gleaned from the pilot study are mentioned throughout this chapter as they have bearing on elements of the design and procedure.

Choice of Research Design

In this dissertation study a pretest-posttest control group design was used in an effort to describe dynamic accuracy of three accompaniment groups in comparison to a group practicing with no accompaniment. Five intact Level 2 piano classes at the University of Oklahoma were taught by three instructors. All of the instructors had about ten years of teaching experience, including teaching group piano classes, and were in the later stages of the Doctor of Philosophy program in piano pedagogy at the University of Oklahoma. One instructor taught three of the classes, another instructor taught one of the classes, and the researcher taught the fifth class. All sections used the same textbook, same course syllabus, and the same examination procedures.

Students in group piano study were chosen for two reasons. First, a system was already in place for grouping the students into levels. Second, the participants were accustomed to playing on the digital pianos and playing with MIDI accompaniments. This prevented any skewing of results due to a potential novelty effect in the technological setting of the experiments.

Because random assignment of individual participants to treatment groups was not possible, the pretest was used to determine whether the intact classes differed significantly in dynamic accuracy ability prior to the treatment. Two of the intact classes were combined into one group on the basis of size and equality of dynamic accuracy ability as measured by the pretest. This resulted in four research groups that were then randomly assigned to practice with one type of accompaniment (or with no accompaniment in the case of the control group).

The four groups were labeled according to the kind of accompaniment with which they practiced. The accompaniments varied in their range of dynamic contrast and in the complexity of the MIDI orchestration as follows:

1. No accompaniment group (control group)
2. Subtle dynamic contrast/complex MIDI orchestration accompaniment group
3. Exaggerated dynamic contrast/complex MIDI orchestration accompaniment group
4. Exaggerated dynamic contrast/simple MIDI orchestration accompaniment group

No accompaniment group (control group). The control group's practice time was, except for the absence of an accompaniment, as much like the other treatment groups' practice time as possible. A metronome set at the pulse of the MIDI accompaniments gave a two-measure "count-in" tempo to begin each repetition of a piece in the participants' practice time. Participants then played through each piece the same number of times that the treatment groups did. They were asked to play continuously through the piece, rather than to engage in "free practice." This was done in an effort to focus on the main question of the study, the effect of an accompaniment, rather than on a comparison of free practice versus continuous practice. Participants did not practice with a metronome, however, since the metronome was turned off after the two-measure introduction. The non-expressive nature of a metronome could have hindered the natural expression of those in the control group and thus have skewed the results.

Subtle dynamic contrast/complex MIDI orchestration accompaniment

group. The pilot study had employed a flat dynamic (no contrast) accompaniment group in which the accompaniments were digitally regularized to have absolutely no dynamic expression. In the main study, however, a subtle dynamic contrast/complex MIDI orchestration accompaniment group was substituted for the flat dynamic contrast accompaniment group that had been used in the pilot study. An accompaniment with subtle dynamic contrasts was believed to represent the current market more closely and thus to be more beneficial for research.

Exaggerated dynamic contrast/complex MIDI orchestration

accompaniment group. Some pedagogical theory discussed in the review of literature (Hilley, 1992; Camp, 1992) suggested that the degree of dynamic contrast in an accompaniment could make a difference in the dynamic accuracy of the one practicing with accompaniment. Exaggerated dynamic contrasts [see “Definitions of Terms” in Chapter One] were digitally added by means of the sequencing software. The “exaggerated” degree of the dynamic contrasts in these accompaniments was evaluated in consultation with experienced group piano teachers. All other parameters of this accompaniment were identical to the subtle dynamic contrast/complex MIDI orchestration accompaniment.

Exaggerated dynamic contrast/simple MIDI orchestration accompaniment

group. The review of literature also revealed that some reviewers and teachers who use MIDI disk accompaniments felt that some accompaniments are too

complicated and thus may distract students from listening to their own playing. Other pedagogues commented that dynamic expression especially was tied to self-listening. Therefore, the researcher designed a group of accompaniments with a simpler orchestration. The dynamic contrasts in these accompaniments were digitally manipulated to be identical to those in the exaggerated dynamic contrast/complex MIDI orchestration accompaniments, although the number of instruments sounding at one time was different.

Participants

The participants for the study were 39 group piano students who were non-keyboard music majors in Level 2 (second semester) group piano at the University of Oklahoma during the 2000 spring semester. Level 2 pianists were used because they typically have enough keyboard training to be able to play with dynamic expression, and they are at a general ability level for which MIDI accompaniments on the market are designed. Dynamic contrasts are commonly expected in the literature for this level. The participants were also familiar with ensemble music environments and were currently enrolled in applied music lessons on another instrument.¹

Most participants had been auditioned and placed into first semester group piano at the beginning of the previous semester. A small number (less than 10%) had not been in the Level 1 piano class, but had auditioned and begun in the Level

¹ The only exception was one music theatre major for whom piano was the sole instrument. This participant was allowed to remain in the study because his placement into the Level 2 piano class indicated a similar keyboard ability level and because his dynamic accuracy test scores later proved not to be dissimilar from those of the other participants.

2 piano class. By the midpoint of the semester, the point at which the experiments took place, all possessed enough experience in the group piano setting to be comfortable with the electronic pianos. All were by then also familiar with the experience of playing with MIDI accompaniments channeled through the headphones in the electronic piano laboratory. All participants met their class at 9:30, 10:30, or 11:30 in the morning on Monday and Wednesday or Tuesday and Thursday.

Selection of Compositions for the Experiment

Three compositions were selected that were typical of second semester group piano difficulty level: *Free At Last* by Magrath (Magrath, 1992b), [Appendix C]; *Russian Dance*, by Goedicke (Magrath, 1992a), [Appendix D]; and *Hymn*, by Schytte (Magrath, 1992b), [Appendix E]. These pieces are all included in standard beginning level publications. They were, however, considered unfamiliar enough that they probably had not been played by the participants prior to the study. Each piece was different in mood and keyboard texture, and each piece had a number of dynamic expression marks to be observed. Compositions in the textbook currently in use in the intact classes were avoided so that participants would not be able to practice the pieces outside of the treatment setting and thus corrupt the results.

Development of MIDI Accompaniments

It was necessary to use researcher-designed accompaniments for the following reasons:

1. The research design focused on treatment groups that differed according to the kind of accompaniment with which they practiced. Literature related to this study indicated that not only the presence of an accompaniment, but also the *kind* of accompaniment could influence the playing of those who practice with it. It was therefore necessary to manipulate the accompaniments. It was deemed desirable to alter only the dynamics and complexity of orchestration (number of parts) in the accompaniment and to keep other parameters such as rhythm and tempo the same across treatment groups.

2. It was advantageous to have access to the MIDI data (event lists) so that the differences in the accompaniments could be better adjusted to have “subtle dynamic contrasts” or “exaggerated dynamic contrasts.”

3. It was desirable to use accompaniments typical of market trends but to avoid comparison of specific publishers’ accompaniments.

The researcher possessed graduate level training in MIDI sequencing, composition, and arranging. He also had experience in sequencing and recording for corporate videos and in underscoring for film and audio story tapes. Throughout the development of the accompaniments, the researcher consulted with experienced group piano teachers to ensure that the MIDI accompaniments used in the treatment were of comparable quality to those on the commercial market.

Equipment

The MIDI accompaniments were sequenced on a Macintosh G-3 computer using the software *Performer 5.5* and were saved as Standard MIDI Files onto a 3.5-inch “floppy” disk. This disk was then playable on a Roland MT-120S Digital Sequencer and Sound Module in each classroom used for the experiment. The sequences were channeled through a Kawai Group Lesson Controller KML-SG. During the treatment each participant played on a Kawai Digital Piano MR-370 in the classroom. During the pretest and posttest each participant played on a Kurzweil Mark 10 Ensemble Grand. Both the Kurzweil and the Kawai keyboards were considered acceptable for a study in dynamic expression even though the touch is different from that of an acoustic piano. Flowers, Wapnick, and Ramsey (1997) have confirmed that even children ages five through nine are capable of demonstrating dynamic contrasts on an electronic keyboard.

Pretest

A pretest was conducted in order to determine if there were any significant differences in dynamic expression between groups prior to the treatment. Most of the participants performed the pretest in the last class period before spring break. Due to absences, several participants performed the pretest immediately after spring break, which lasted one week. Participants performed alone while the researcher recorded their playing on the sequencing software *Performer*. The pretest required that each participant sight-read *Free At Last*, the least difficult of the three compositions selected for the treatment. Participants were allowed

approximately thirty seconds to examine the score before playing. All participants performed the pretest without any accompaniment. Participants were allowed to play at their own tempo since the study focused on dynamic expression rather than on rhythmic accuracy or fluency of tempo. The pretest recordings of *Free At Last* were later compared with the posttest recordings of *Free At Last* in order to compute dynamic accuracy gain scores for each participant and for each group. The pretest recording of *Free At Last* also served as a reference point to compare with dynamic accuracy scores in posttest recordings of *Russian Dance* and *Hymn*.

Treatment

The treatment procedure was designed to simulate typical teaching approaches in group piano study as much as possible. The treatment was also patterned after suggestions that the publishers of MIDI disks provide.

In the first class period after spring break, the researcher proctored the first of three treatment days. The time spent on the pieces—including pretesting, treatment, and posttesting—spanned three weeks of class. This is a typical schedule for this level of literature both in second semester group piano study and in beginning level private lessons. For the three groups practicing with MIDI accompaniments instructions were read before each practice session. The instructions for Treatment Day 1 were as follows:

Thank you for participating in this research project. The purpose of this research is to investigate the effects of practicing with accompaniments.

The material that will be covered is relevant to the course content of this class. Please do not make comments about this research during class or outside of class. Such comments could hinder the research.

Now please open your notebook to the first piece, *Free At Last*.

This is the same piece that you sight-read last class period. Today and for the next three class periods you will practice *Free At Last* with an accompaniment channeled through your headphones. Please move the volume control on your piano to “Full volume” now so that the balance with the accompaniment will be the same for every student. Select the “Piano 1” setting. [Pause]. Please do not play at all as you listen to the accompaniment the first time through. Follow along now in the score so you will know what to expect. Note especially where your piano part enters at the end of the introduction.

For demonstration purposes the MIDI accompaniment was then played once through while the participants merely listened without playing along. This procedure, suggested by publishers and teachers, is typical for group piano study usage of MIDI accompaniments. After this demonstration the instructions continued:

Now play *Free At Last* with the accompaniment five times through without stopping. The accompaniment will pause only for a moment between repetitions. You will hear the same introduction each time before

you play. Strive for correct notes, rhythms, articulation, and expression.

Are there any questions? [Pause]. All right. Now play as follows: First time, right hand alone; second time, left hand alone; third, fourth, and fifth time, try to play with both hands together.

After the participants had played *Free At Last* through five times with the accompaniment, they heard this second set of instructions repeated for the second piece, *Russian Dance*. After the participants had played *Russian Dance* through four times, this second set of instructions was repeated for the third piece, *Hymn*. After the participants had played through *Hymn* four times, the notebooks were collected so that participants were not able to practice them outside of the treatment setting.

During the next two class periods, the participants played each of the three pieces again in the same manner as they had on the first day. Each day the beginning tempos were slightly faster, and each repetition of the piece was also slightly faster. The five metronome speeds for *Free At Last* were 60, 60, 66, 72, and 80 to the quarter note. The metronome speeds for *Russian Dance* were 50, 50, 54, 60, and 66 to the half note. The metronome speeds for *Hymn* were 48, 48, 52, 56, and 60 to the quarter note.

The above procedure given for the three groups receiving MIDI disk accompaniment treatment was modified for the control group, who played with no accompaniment. The following instructions were read to them.

Thank you for participating in this research project. Please do not make comments about the research project outside of class. Now please open your notebook to the first piece, *Free At Last*. This is the piece that you played during the last class period on the pretest. Today and for the next two class periods you will practice *Free At Last* by playing continuously through the piece. Please move the volume control on your piano to “Full volume” now. [Pause]. Please do not play at all as you listen the first time through to an orchestrated recording of *Free At Last*. Follow along in the score so you will know what to expect. If you have any trouble with your equipment at any time, please notify the instructor. Now here is the recording.

Participants in the control group then heard the subtle dynamic contrast/complex MIDI orchestration version of the accompaniment. It was necessary for the control group also to hear the recording because the other groups heard the recording. After hearing the subtle dynamic contrast/complex MIDI orchestration version, the control group heard the following instructions:

We will now play through the piece five times. You will hear a metronome tick off two measures and stop. Please then play through the piece right hand alone the first time and stop. You will then hear the two-measure metronome count-in again. Play

through the second time left hand alone and stop. When you hear the metronome count-in again, play through hands together once and stop. The metronome will count in a fifth time, and you will play hands together again and stop. Each time you play, please do not stop to correct mistakes or repeat measures. Avoid slowing down or speeding up. Play continuously through as if you were playing with a recorded accompaniment. Are there any questions?

Once *Free At Last* had been played in this fashion, the other two pieces were played five times similarly.

Participants in the control group were asked to play through continuously in order to prevent them from engaging in free practice. Otherwise, differences in dynamic accuracy posttest scores could have been attributed to a rival hypothesis—that it was the participants’ free practice procedure that made the difference. Likewise, they were asked to play at the metronome tempo in order to simulate as much as possible the setting of the treatment groups except for the absence of accompaniment.

To prevent an “order effect” that could cause an artificial difference between performances of the three pieces, each of the four groups practiced the pieces in a different order each day of the treatment. Each piece was played first one time, second one time, and third one time. Time constraints required that the two longer pieces, *Russian Dance* and *Hymn*, be played through one less time than *Free At Last* on the first treatment day. On the second treatment day, in

order to balance the number of repetitions for each piece, *Russian Dance* and *Hymn* were played through five times and *Free At Last* was played through four times.

By the end of Treatment Day 2, the researcher observed that participants were playing quite fluently on *Free At Last* and *Russian Dance* but were still struggling for continuity on *Hymn*. Participants therefore practiced *Free At Last* and *Russian Dance* only once through on the third treatment day, and practiced *Hymn* five times through. The researcher also surmised that due to its evident greater difficulty, *Hymn* would not provide good comparisons with *Free At Last* and *Russian Dance* in the area of dynamic accuracy at the rate participants were then progressing. Because of this, the researcher asked the participants to practice *Hymn* right hand alone the last treatment day, and to perform the posttest for *Hymn* with right hand alone. All other posttests were performed hands together.²

Posttests

For all posttests all participants performed in the same room on the same Mark 10 Ensemble Grand Piano. The Mark 10 Ensemble Grand Piano sent MIDI information to a Power Macintosh computer for recording purposes. The

² Some inconsistencies occurred in the treatment schedule. For the three days of treatment for 39 participants, there were a total of 22 absences. Each of these treatments was made up as soon as possible after the absence occurred. In only two cases did absences create a serious threat to the validity of the results. The first case occurred with one participant who missed the entire first week of class in which the main portion of accompaniment treatment was proctored. Because this participant's make-up schedule would have involved a very intensive time of treatment, the treatment would not have been equivalent to that of the other participants' treatment. This participant was therefore excluded from the study. The second serious case occurred in a make-up session when a participant in the control group inadvertently practiced several extra repetitions of a piece. The entire set of data received from this participant was also excluded from the study.

researcher sat at the computer and recorded each performance on the sequencing software *Performer 6.0*. All groups played four posttests.

The first posttest was a performance of *Free At Last*. This posttest occurred at the end of the class period on the third treatment day. The accompaniment groups played this first posttest *with* the MIDI accompaniment with which they had practiced. The control group also played a posttest on *Free At Last* at this point in the treatment, but did not play the posttest *with* an accompaniment. This was necessary in order to keep the entire research experience as equivalent as possible between all groups. It is feasible that the experience itself of being posttested could have had an effect on participants as another practice session. Each posttest also gave the participants more familiarity and less anxiety with the testing situation. It was necessary that this posttesting effect then be kept as equivalent as possible in the control group in order to make valid comparisons of test scores.

The posttest of *Free At Last* performed *with* accompaniment was conducted so that dynamic accuracy test scores could be compared with those from another posttest of *Free At Last* performed *without* accompaniment. The posttest with accompaniment was designed to explore the simple question of a MIDI accompaniment's effects on dynamic accuracy, whereas the posttests without accompaniment sought to measure the short-term retention of those effects when participants were performing without the accompaniment.

The second posttest was a performance of *Russian Dance* performed with no accompaniment. This posttest also occurred at the end of the class period on

Treatment Day 3. The third and fourth posttests were performances of *Hymn* and *Free At Last* performed without accompaniment. The third and fourth posttests occurred during the first class period after the final treatment day. Because 48 hours had elapsed between the final treatment and the third and fourth posttests, participants played the pieces through once immediately before the posttest recordings on these days. Except for the control group this “warm-up run through” was done with accompaniment. This warm-up was not considered a “treatment” session due to its brevity.³

Evaluation of Performances

A committee of three doctoral students in piano performance or piano pedagogy evaluated the recordings. The pretest recordings and all four of the posttest recordings were evaluated one test at a time. Within each test, however, the recordings were not evaluated one research group at a time. The performances of the 39 participants were intermingled in random order before being played for the raters. Hearing the recordings one group at a time could have

³ Several procedural inconsistencies occurred which were not considered to create serious threats to the validity of the data. One participant mistakenly did a single extra repetition of *Russian Dance*, and one participant mistakenly did a single extra repetition of *Free At Last*. Because the difference this made in the amount of treatment received was less than 10%, the data for these participants was included in the study. Another participant wore a brace on her left wrist during two days of the treatment. The participant stated that the brace only affected her playing when a passage required an extended left hand position. Because the only left hand extended position occurred in *Hymn*, for which the left hand was omitted from the posttest, this participant's data also was included in the study. The headphones of one accompaniment group participant failed during the treatment of one piece. The researcher later proctored a make-up session for this participant so that the participant could receive an equal number of repetitions with the accompaniment for this piece. Another participant practiced hands alone during a repetition of a piece that was supposed to be done with both hands together. Finally, a technical recording error occurred in one posttest, which was immediately redone. The researcher felt that none of these inconsistencies in the research process were serious enough to invalidate the data of the participants in question.

led to rater bias due to any perception of patterns from group to group. After evaluation, the researcher then reorganized the dynamic accuracy scores according to the intact classes and calculated a group mean for each class.

For purposes of convenience and accuracy, each rater received 39 copies of each piece—one for each participant for every performance to be evaluated. The committee rated dynamic accuracy, not dynamic artistry, as defined in Chapter One [see under “Definitions”]. Raters evaluated each recording by following along in the score and marking each dynamic marking that was accurately observed in performance.

Free At Last had nine dynamic marks for a possible total of nine points. *Russian Dance* had seven dynamics marks printed in the score. The last of these, however, a *pianissimo* marking after a *decrescendo* from *piano*, was considered redundant and was omitted from the evaluation process. This left a total of six possible points of dynamic accuracy for *Russian Dance*.

Eight dynamic marks appear in the score for *Hymn*. The researcher and the evaluation committee decided to omit the final mark from consideration for the same reason that the final dynamic mark was omitted in *Russian Dance*. The only other option would have been to evaluate on the basis of a distinction between a *decrescendo* from *mezzo-forte* to *piano* and a *descrescendo* from *mezzo-forte* to *mezzo-piano*. This distinction would have been too fine to be expected for this level of pianist on a digital keyboard with this amount of practice time. This decision left a total of seven points of dynamic accuracy possible in *Hymn*. The total number of points possible was multiplied times three

and divided by the total scores of all three raters to obtain the percentage of dynamic accuracy for each participant for each piece.

Before the actual evaluation of each piece began, the researcher conducted a brief “practice rating session.” The researcher first defined dynamic accuracy for purposes of this study. The raters then listened to several performances of *Free At Last*. They rated each performance independently, compared answers, and discussed each recording one at a time, until interrater reliability and familiarity with the scoring procedure was adequate. Following this the actual evaluation began. Raters were allowed to hear a performance more than once if necessary in order to feel confident of their evaluations.

Attitudinal Questionnaire

Upon finishing the last posttest, all 32 accompaniment group participants completed an attitudinal questionnaire [Appendix B]. This survey was designed to determine the participants’ perceptions and feelings concerning the pieces and the MIDI accompaniments used in the treatment. It was also used to obtain information concerning the participants’ years of experience in music ensembles to determine whether any correlation existed between amount of ensemble experience and the effects of practicing with MIDI accompaniments.

As each survey was completed it was placed in a manila envelope so that no one could see another completed survey and be influenced by other answers. Because the participants in the control group had not played with accompaniments at any time, they did not complete the survey. No one filled out

the survey until all the posttests had been completed. This prevented the survey response items from sensitizing participants to the fact that dynamic accuracy was the focus of the research.

Summary

In the 1998-1999 school year, the researcher conducted a pilot study. Information gleaned from the pilot study was combined with information from the related literature and incorporated into the research design of the main study. Possible explanations of discrepancies in the evidence from the related literature were guiding factors in the selection of the three kinds of accompaniments to be tested for their effects on the dynamic expression of beginning pianists.

CHAPTER IV

FINDINGS REGARDING POSTTEST SCORES

Introduction

The purpose of this study was to investigate the potential of using MIDI accompaniments as a means of teaching accuracy in dynamic (loudness) expression. A descriptive analysis of dynamic accuracy test scores was done for non-keyboard music majors in group piano classes who practiced with four types of MIDI accompaniment. One type of MIDI accompaniment was assigned to each of three research groups, and a fourth group was a control group practicing with no accompaniment. Research questions addressed dynamic accuracy test scores and participants' attitudes toward MIDI accompaniments. The findings regarding dynamic accuracy test scores are presented in this chapter.

Interrater Reliability

Interrater reliability was calculated using Cronbach's alpha and found to be high. Reliability scores for the pretest and each of the four posttests were .90, .96, .88, .94, and .95, respectively. This yielded a composite interrater reliability of .93 for all five tests combined.

As the committee of raters completed the evaluation of all 39 recordings for each of the five tests, the researcher compared the ratings awarded. There

were nine points possible for *Free At Last*, six points for *Russian Dance*, and seven points for *Hymn*. If any two of the raters had awarded scores that were more than three points different on a given recording, all three raters re-evaluated that recording. This occurred at a later time to prevent raters from being influenced by remembering a specific recording and the scores awarded for it. In each re-evaluation the newly awarded scores were found to be significantly closer to each other. The interrater reliability presented above was based on these closer second evaluations. The percentage of performances that required re-evaluation was less than ten percent.

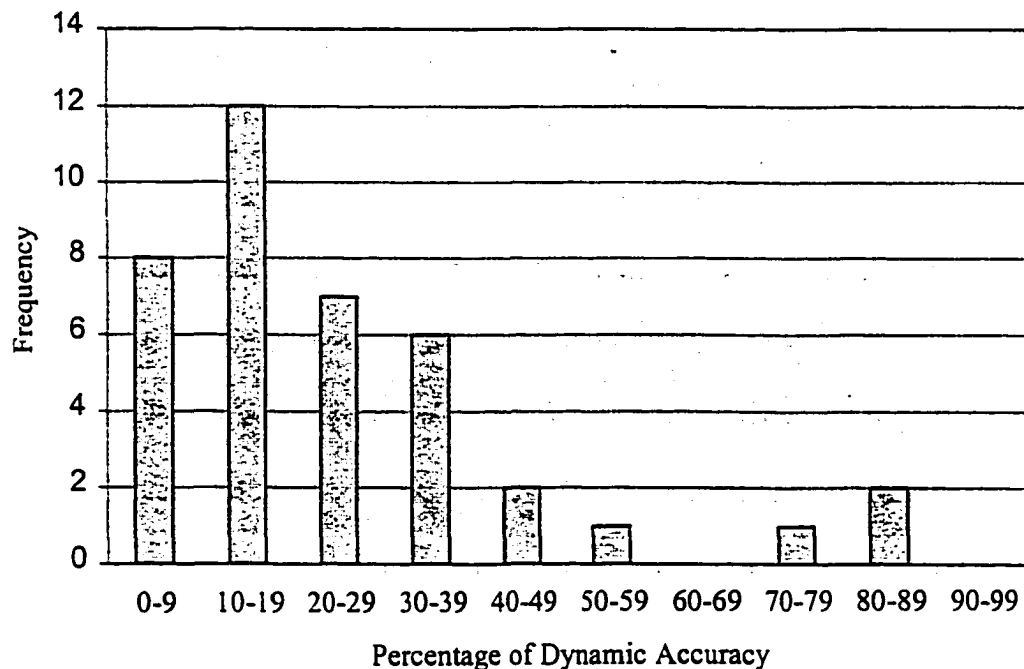
Distribution of Pretest Scores

A pretest was administered to determine the amount of dynamic accuracy ability each participant possessed prior to the treatment of practicing with MIDI accompaniments. The pretest also revealed whether the four groups were initially equivalent to each other in dynamic accuracy ability. The pretest involved sight-reading *Free At Last*, an easy piece for this level of pianist, while being recorded by the sequencing software. As can be seen from the piano score for *Free At Last* [see Appendix C], all of the printed dynamics marks in this piece were hairpin marks indicating gradual rise and fall of short melodic motives.

Figure 1 shows the distribution of pretest scores in dynamic accuracy. A normal distribution is expected to resemble a bell-shaped curve. The vertical bars represent frequencies of dynamic accuracy scores that occurred in the pretest.

Important deviations from a normal distribution appear where the bars indicating frequencies were significantly higher or lower than a bell-shaped curve would be.

Figure 1
Pretest Distribution of Dynamic Accuracy



The vertical comparison of how well the bars fit a line of expected normal distribution is termed the “kurtosis” rating. The two bars representing frequencies of scores between 0-9% and between 10-19% were significantly higher than that expected in a normal distribution, resulting in a non-normal kurtosis rating for the pretest distribution. Any kurtosis rating between 1.0 and -1.0 is considered normal. The kurtosis for this distribution was 2.75, signifying that a large portion of the participants played less than 20% of the printed dynamic marks accurately during sight-reading. Participants were unaware that dynamic accuracy was the

sole element of their sight-reading that would be evaluated, and may have concentrated more on notational accuracy.

In addition to this vertical comparison of the frequencies against the expected distributional curve (kurtosis), horizontal comparisons of fit (skewness) are typically made. A skewness rating between 1.0 and -1.0 is considered a normal distribution. This distribution is positively skewed, with a rating of 1.67. The positive skewness results from the scores of three participants who played with greater than 75% dynamic accuracy even though they had never before played or heard the piece. An “outlier” has traditionally been defined as one whose score is more than two standard deviations from the mean in either direction. The mean pretest score was 25% dynamic accuracy, and the standard deviation was 22 percentage points. Therefore, these three participants are clearly outliers.

The presence of three pretest outliers in a sample size of 39 can be explained by the audition used to place these non-keyboard music majors into group piano classes. It is typically necessary to consider a number of criteria in such placement auditions. The three outliers could have been stronger in keyboard technique but weaker in some other keyboard skill. The placement audition for the intact classes did not include a measurement of dynamic accuracy ability, the sole musical element evaluated during the pretest.

Huck and Cormier (1996) recommend excluding outliers from a pool of data on the basis that they can cause some statistical procedures to “understate or exaggerate the strength of relationship between two variables” (p. 70-71). It was

later evident during posttest comparison of gain scores that a ceiling effect occurred with the dynamic accuracy test scores of these three participants. For these reasons, the following descriptive statistics exclude these three participants from comparisons of dynamic accuracy.

Although the pretest distribution was found to be non-normal, the posttest distribution skewness and kurtosis ratings were much more normal. All were less than 1.0 or very close to it. Table 1 shows the skewness and kurtosis ratings for the pretest and all four posttests. All of these ratings include the three pretest outliers.

Table 1
Skewness and Kurtosis Ratings

	Pretest	Posttest No. 1 <i>Free At Last</i> (With Accomp.)	Posttest No. 2 <i>Russian</i> <i>Dance</i> (No Accomp.)	Posttest No. 3 <i>Hymn</i> (No accomp.)	Posttest No. 4 <i>Free At</i> <i>Last</i> (No accomp.)
Kurtosis	2.75*	-1.19	-0.15	-0.45	-1.01
Skewness	1.67*	-0.24	0.51	0.54	0.25

(n=39)

*Considered a significantly non-normal distribution

Research Question No. 1

Research Question No. 1 read as follows: *How do dynamic accuracy test scores of participants practicing with MIDI accompaniment compare to test scores of participants practicing with no accompaniment?*

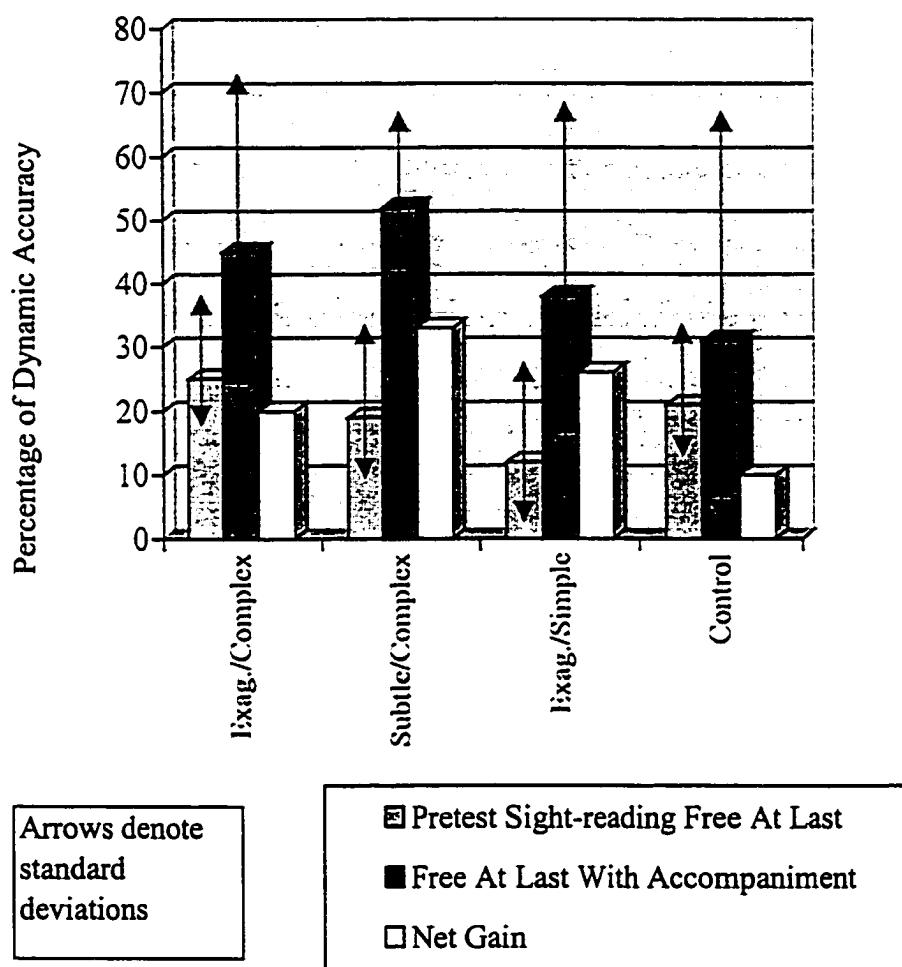
Results from the first posttest will be discussed first. These results are isolated from the other posttests because this was the only posttest in which the accompaniment groups performed *with* accompaniment. A breakdown of how each accompaniment group fared in relation to the control group is also included. This information appears in Figure 2. Pretest scores of each group are also given so that performances of each group can be compared to that group's initial ability in dynamic accuracy. This net gain is reflected in the third bar for each group. The arrows show the standard deviations as an indication of the degree of consistency in dynamic accuracy behind each group mean.

On average, each of the three accompaniment groups played this posttest with slightly better dynamic accuracy than the control group, even though the control group began with slightly higher dynamic accuracy than the accompaniment groups combined together. The accompaniment groups combined (not shown in Figure 2) performed 44% of all printed dynamic marks correctly while hearing MIDI accompaniment, whereas the control group performed only 31% correctly while playing with no accompaniment. It should be noted, however, that within all groups a large amount of variation in individual participants' scores was present. Coupled with the fact that the sample sizes used were small, this indicates that these group comparisons should be interpreted cautiously.

On this posttest alone the subtle dynamic contrast/complex MIDI orchestration accompaniment group played with the highest dynamic accuracy of all four groups, correctly performing 52% of all printed dynamic marks. This

percentage was twice as high as the percentage of dynamic accuracy they had exhibited on the pretest. This group mean, however, was uncharacteristically high in comparison to later posttests by this group.

Figure 2
Group Means for Dynamic Accuracy on the First Posttest Compared to the Pretest



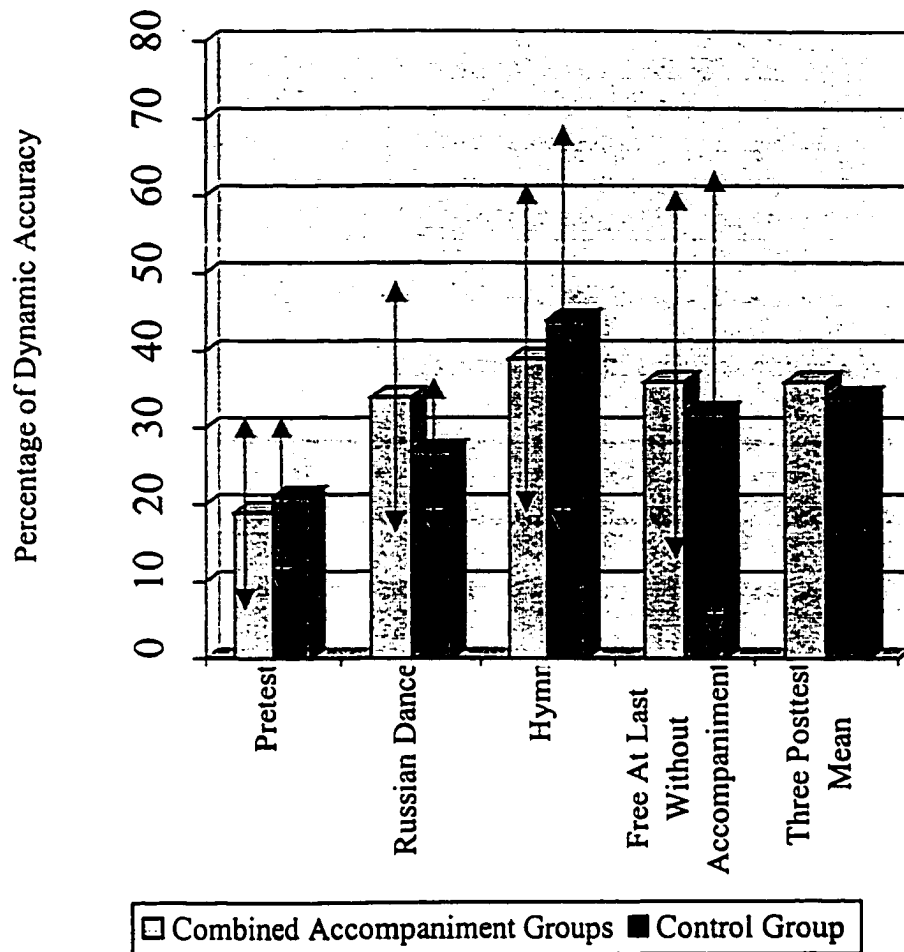
Only the control group did not play with accompaniment on this posttest.

The exaggerated dynamic contrast/complex MIDI orchestration accompaniment group was second highest, correctly observing 45% of the dynamic marks on the printed page. This was nearly twice as high as this group's pretest score of 25% dynamic accuracy, which was the highest of any group on the pretest.

The dynamic accuracy mean for the exaggerated dynamic contrast/simple MIDI orchestration accompaniment group was third highest at 38% dynamic accuracy. This score was roughly three times as high as its pretest dynamic accuracy score, which stood at 12%. Although its first posttest score of 38% was only third best of the four groups, this percentage was nevertheless seven percent better in dynamic accuracy than the control group, which played with 31% dynamic accuracy. This fact was especially notable because the control group's initial dynamic accuracy ability was 21% on the pretest, almost twice as high as that of the exaggerated dynamic contrast/simple MIDI orchestration accompaniment group. Again, however, it should be noted that there was a great deal of variation in individual participants' test scores. This variation was high in all groups.

In contrast to Figure 2, Figure 3 shows the group means for the posttests performed *without* accompaniment. The groups that practiced with accompaniment are combined together. By comparing the two bars for the pretest it can be seen that the initial dynamic accuracy ability for the control group and the combined accompaniment groups are quite close, with the control group two percentage points higher. On the posttest for *Russian Dance* and *Free At Last*

Figure 3
Mean Scores of the Control Group and Combined Accompaniment Groups



This figure excludes the posttest for Free At Last performed with accompaniment.

without accompaniment, however, the accompaniment groups were slightly higher in dynamic accuracy. For *Hymn*, though, the control groups remained higher in dynamic accuracy. The resulting three posttest mean [see Figure 3] then balanced out to have the accompaniment groups and the control group quite close at 36% and 34% dynamic accuracy respectively. In relation to the pretest, the

combined accompaniment groups gained 17 percentage points and the control group gained 13 percentage points.

On the posttests for two of the three pieces, *Free At Last* and *Russian Dance*, the mean score for the combined accompaniment groups was higher than that of the control group. On *Hymn*, however, the control group mean score was slightly higher than the combined accompaniment groups' mean score.

This first research question focused on a comparison of the dynamic accuracy of the participants from three accompaniment groups combined together versus the dynamic accuracy of the control group participants. In the next research question, the focus excludes the control group participants and focuses only on the participants in the three accompaniment groups. Rather than viewing them as combined together, however, their dynamic accuracy scores will be examined as being from participants in distinct groups that practiced with three different types of MIDI accompaniment.

Research Question No. 2

Research Question No. 2 read as follows: *Ignoring the control group, how do dynamic accuracy test scores of groups practicing with different types of MIDI accompaniments compare to each other?*

The review of related literature indicated that experienced teachers prefer certain musical characteristics in MIDI accompaniments or sound models. Both Hilley (1992) and Woody (1998) suggest that dynamic contrasts should be exaggerated in order to make a stronger impression on listeners. Goldberg-

Shapiro (1995) believes that an overly complex orchestration could be distracting to students. This latter idea concurs with the statements of Neuhaus (1973) and Wheeler (1999) on the necessity of self-listening for purposes of expression. The research design for this study, therefore, employed three different types of accompaniments that varied the degree of dynamic contrast and the level of complexity in MIDI orchestration, as explained in Chapter Three.

According to the ideas discussed above, the expected outcome would be that participants would benefit the most in dynamic accuracy by practicing with the exaggerated dynamic contrast/simple MIDI orchestration. The second most benefit would accrue to participants practicing with the exaggerated dynamic contrast/complex MIDI orchestration accompaniments. The third most benefit would be gained by those who practiced with the subtle dynamic contrast/complex MIDI orchestration accompaniments.

Because the accompaniment groups displayed moderate initial differences of ability as revealed by the pretest, it was necessary to compute gain scores for each group and compare them. Without this step it would be impossible to know whether the exaggerated dynamic contrast/complex MIDI orchestration accompaniment group, for example, played with the greatest dynamic accuracy because its accompaniments were more beneficial or simply because it began with the greatest initial ability in dynamic accuracy. The pretest score for dynamic accuracy on *Free At Last* was thus employed as an index of initial dynamic accuracy ability. From this index, gain scores were computed for all three of the pieces used in posttesting.

The gain scores were calculated by subtracting the pretest means from the posttest means for each group's performances, resulting in a number with a "plus" sign in Table 2. The pretest means for *Free At Last* were also subtracted from the four posttest grand mean to obtain one final grand mean gain score. This last score provided the most sensitive summary of the results of the entire experiment.

All of these gain scores were numbers recorded with a "plus" sign in Table 2. It is important to note that not all individual participants achieved higher dynamic accuracy scores on every posttest than they did on their pretest scores. The individual participants' gain scores to be discussed later [Table 4] do include some negative numbers. The *group* mean gain scores, however, were all positive numbers, indicating that the general direction of participants overall was toward greater dynamic accuracy throughout the research project.

A slight pattern emerges in the comparison of mean gain scores in Table 2. Participants in the exaggerated dynamic contrast/simple MIDI orchestration accompaniment group made the most consistently strong gains in dynamic accuracy overall, gaining 26, 23, 23, and 22 percentage points on the four posttests and gaining 24 percentage points in the four posttest grand mean. The exaggerated dynamic contrast/complex MIDI orchestration accompaniment group exhibited the second most consistent gains in dynamic accuracy, increasing in group mean scores by 20, 17, 18, and 16 percentage points on the four posttests. The four posttest grand mean of this group was 18 percentage points above the pretest group mean. This indicates that the two groups that played with accompaniments having exaggerated dynamic contrasts increased in dynamic

accuracy more consistently than either the subtle dynamic contrast/complex MIDI orchestration accompaniment group or the control group, which practiced with no accompaniment. The gains in dynamic accuracy achieved on the four posttests by both the subtle dynamic contrast/complex MIDI orchestration accompaniment group and by the control group were marked by irregularity. The subtle dynamic contrast/complex MIDI orchestration accompaniment group increased 33, 3, 18, and 12 percentage points on the four posttests in comparison to the pretest. The control group obtained gains of 10, 6, 23, and 11 percentage points.

Table 2
Group Mean Gain Scores in Dynamic Accuracy

Group	Pretest	<i>Free At Last</i> performed with accomp.*	<i>Russian Dance</i>	<i>Hymn</i>	<i>Free At Last</i> without accomp.	Four Posttest Grand Mean Gain
Exag. Dynamics/ Complex Orch. (n=11)	25%	(+20)	(+17)	(+18)	(+16)	(+18)
Subtle Dynamics/ Complex Orch. (n=7)**	19%	(+33)	(+3)	(+18)	(+12)	(+18)
Exag. Dynamics/ Simple Orch. (n=11)**	12%	(+26)	(+23)	(+23)	(+22)	(+24)
Control Group (No accomp.) (n=7)	21%	(+10)*	(+6)	(+23)	(+11)	(+12)

*The control group was the only group that did not play this posttest with accompaniment.

**This table excludes the three pretest outliers.

There is no known explanation for why each of these latter two groups achieved uncharacteristically high gains on one of the four posttests—33 percentage points in the case of the subtle dynamic contrast/complex MIDI orchestration accompaniment group and 23 percentage points in the case of the control group. It is interesting to note, however, that the overall gain reflected in the four posttest grand mean was the same—18 percentage points—for both the subtle dynamic contrast/complex MIDI orchestration accompaniment group and the exaggerated dynamic contrast/complex MIDI orchestration accompaniment group. The control group increased less in dynamic accuracy than any of the groups that practiced with a MIDI accompaniment.

Another way to view the gains of the various groups, in addition to comparing the differences between pretest and posttest scores, is to examine the changes in group rankings that occurred from the time of the pretest through each posttest. Table 3 displays the group rankings on the pretest and on each posttest, after the three treatment groups practiced with the MIDI accompaniments. Because the control group is viewed here, the posttest for *Free At Last* performed with accompaniment is excluded and the three posttest mean is displayed, rather than the four posttest grand mean.

The rankings of dynamic accuracy among three groups remained essentially the same on most of the posttest. The exaggerated dynamic contrast/complex MIDI orchestration accompaniment group typically played with greater dynamic accuracy than the control group (no accompaniment) did, which in turn played with greater dynamic accuracy than the subtle dynamic

contrast/complex MIDI orchestration accompaniment group did. The only exception to this order among these three groups was that on the posttest for *Hymn*, the Control group played with greater dynamic accuracy than any of the other groups. The most notable change, however, is that the exaggerated dynamic contrast/simple MIDI orchestration accompaniment group shifted in ranking among the four groups on each posttest as it advanced in group ranking overall. After practicing with the exaggerated dynamic contrast/simple MIDI orchestration accompaniments, this group performed the posttests with the second best dynamic accuracy of the four groups.

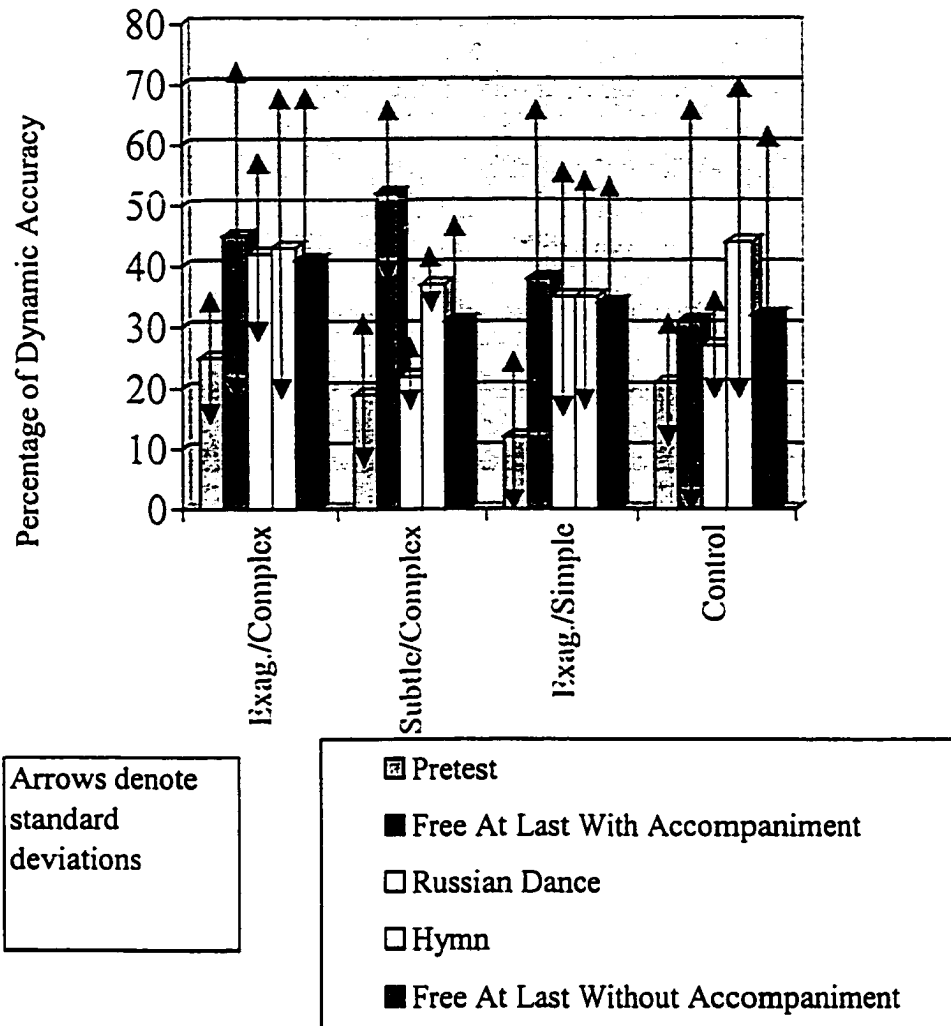
Table 3
Rank Order of Group Means for Dynamic Accuracy

Group Rank	Pretest	<i>Russian Dance</i>	<i>Hymn</i>	<i>Free At Last</i> (No Accomp.)	Three Posttest Mean
1st	Exag. Dynamics/ Complex Orch.	Exag. Dynamics/ Complex Orch.	Control Group	Exag. Dynamics/ Complex Orch.	Exag. Dynamics/ Complex Orch.
2nd	Control Group	Exag. Dynamics/ Simple Orch.	Exag. Dynamics/ Complex Orch.	Exag. Dynamics/ Simple Orch.	Exag. Dynamics/ Simple Orch.
3rd	Subtle Dynamics/ Complex Orch.	Control Group	Subtle Dynamics/ Complex Orch.	Control Group	Control Group
4th	Exag. Dynamics/ Simple Orch.	Subtle Dynamics/ Complex Orch.	Exag. Dynamics/ Simple Orch.	Subtle Dynamics/ Complex Orch.	Subtle Dynamics/ Complex Orch.

In connection with research question No. 2, it should also be noted that a high degree of variability emerged. The standard deviations for many posttests were high even when excluding the three pretest outliers. This indicates that a strong central tendency did not manifest itself; rather, the scores of the individual participants typically deviated or ranged a considerable distance in either direction from the group mean score. The participants, although enrolled in intact classes on the same level of piano study, played with very different abilities in dynamic accuracy. This was true on all posttests and within all groups, though the subtle dynamic contrast/complex MIDI orchestration accompaniment group had the lowest standard deviations of any group and therefore the greatest within-group consistency in dynamic accuracy.

The arrows in Figure 4 show the standard deviations in terms of how many percentage points each individual participant differed on average from his or her own group mean. The two posttests for *Free At Last* display particularly high standard deviations. For example, on the posttest for *Free At Last* performed with accompaniment, the Exaggerated Dynamic Contrast/Complex MIDI Orchestration accompaniment group's mean score for dynamic accuracy was 45%. The standard deviation for this group, however, was 28 percentage points. This indicates that individual participants within this group ranged, on average, 28 percentage points away from the 45% mean score in either direction. The standard deviations of the Control group (no accompaniment) were higher yet for this posttest. With a group mean of 31% dynamic accuracy, the control group's participants ranged on average 35 percentage points away from the group mean in

Figure 4
Summary of Dynamic Accuracy Group Means and Standard Deviations



either direction. The standard deviation on this posttest for the exaggerated dynamic contrast/simple MIDI orchestration accompaniment group was also quite high, ranging on average 29 percentage points away from the group mean score of 38% dynamic accuracy. All of these standard deviations taken together indicate a very large amount of variation in dynamic accuracy within groups from participant to participant.

The amount of variation in dynamic accuracy that occurred within groups in the posttest for *Free At Last* performed without accompaniment was also high, although not as high overall as that in the posttest for *Free At Last* performed *with* accompaniment. As shown in the last bar of each group in Figure 4, the standard deviations were 28, 17, 19, and 30 percentage points respectively. This resulted in a standard deviation for this posttest of 24 percentage points for the combined 36 participants (not shown in Figure 4). The inconsistency of dynamic accuracy within groups was pervasive throughout all four research groups. The posttest for *Hymn* yielded lower standard deviations, and the posttest for *Russian Dance* resulted in the lowest standard deviations of the four posttests overall. The same information summarized by group means and standard deviations in Figure 4 is presented in the form of the participants' raw data in Appendix O.

Whereas the first research question focused on a vertical comparison between dynamic accuracy of the three accompaniment groups combined together versus the control group, this second research question has narrowed to explore vertical comparisons among the three accompaniment groups themselves. The next research question shifts to horizontal comparisons of two dynamic accuracy scores for each participant. These two scores measured dynamic accuracy on the same piece, *Free At Last*, recorded at two points in time under different testing conditions—once while hearing MIDI accompaniment, and once without any accompaniment.

Research Question No. 3

Research Question No. 3 read as follows: *Making within-participant comparisons, is there any difference in dynamic accuracy in a posttest recorded with the accompaniment and one recorded without the accompaniment?*

This research question was designed to investigate the short-term retention of any effect the accompaniments might produce in dynamic accuracy test scores. On the fourth class day of the experiment, participants were posttested performing *Free At Last* while hearing the accompaniment. During the fifth class day participants were again posttested performing *Free At Last* with *no* accompaniment. These two sets of recordings formed a pair of posttest scores for *Free At Last* for each participant who practiced with accompaniment.

The individual participants' scores on both posttests of *Free At Last* appear below in Table 4. Of the 29 participants in the three accompaniment groups, 11 played with better dynamic accuracy on the later posttest (no accompaniment). Three participants played with the same level of dynamic accuracy on both posttests, and 15 participants played with less dynamic accuracy when performing with no accompaniment. Of these 15 participants whose scores decreased, nine decreased 20 percentage points or more. There were more participants who decreased in dynamic accuracy scores when no longer playing with accompaniment than there were participants who increased in dynamic accuracy scores. Furthermore, with all the 29 accompaniment group participants' scores combined together, the sum of the decreasing scores was greater than the

sum of the increasing scores, so that on average, participants decreased 8.4 percentage points when posttested without the accompaniment.

Table 4
Comparison of *Free At Last* Posttested With and Without Accompaniment

Group	Participant	<i>Free At Last</i> (Posttest done with accompaniment)	<i>Free At Last</i> (Posttest done with <i>no</i> accompaniment)	Difference
Exaggerated	1	96%	70%	-26
Dynamic	2	56%	86%	+30
Contrast/Complex	3	67%	67%	(same score)
MIDI	4	56%	45%	-11
Orchestration	5	67%	0%	-67
Accompaniment	6	11%	18%	+7
Group	7	37%	48%	+11
	8	33%	33%	(same score)
	9	11%	15%	+4
	10	7%	7%	(same score)
	11	52%	59%	+7
Mean		45%	41%	-4
Subtle Dynamic	1	78%	37%	-41
Contrast/Complex	2	44%	14%	-30
MIDI	3	50%	30%	-20
Orchestration	4	48%	11%	-37
Accompaniment	5	67%	56%	-11
Group	6	37%	18%	-19
	7	41%	34%	+7
Mean		52%	34%	-18
Exaggerated	1	7%	29%	+22
Dynamic	2	4%	23%	+19
Contrast/Simple	3	52%	11%	-41
MIDI	4	70%	74%	+4
Orchestration	5	22%	52%	+30
Accompaniment	6	48%	41%	-7
Group	7	74%	30%	-44
	8	19%	12%	-7
	9	56%	49%	-7
	10	70%	37%	-33
	11	0%	15%	+15
Mean		38%	32%	-6

Because participants in the control group did not practice or perform any posttests with an accompaniment, they were excluded from the above comparison. They are, however, included separately in Table 5 as a reference point for the above comparison. They serve to gauge whether participants' dynamic accuracy scores would likely have differed on a repeated measurement of the same piece regardless of whether participants heard an accompaniment while playing. In other words, if the differences in accompaniment group scores were due merely to the passing of time between repeated measurements or due to some other factor, the same differences in scores would be expected to appear in the control group.

Overall, the level of dynamic accuracy in the control group was significantly more stable in this repeated measurement comparison than it was in the accompaniment groups, which performed one posttest of *Free At Last* with the accompaniment and the other posttest of *Free At Last* without it. Three of the seven participants in the control group played with the same level of dynamic accuracy on both of these posttests. Three more of the control group participants improved in dynamic accuracy, and only one participant decreased in dynamic accuracy on the later posttest.

The control group mean was virtually the same on both posttests for *Free At Last*, increasing only 1.4 percentage points in dynamic accuracy. However, it should be noted that the control group mean was single-handedly swayed by the score of the only participant who decreased in dynamic accuracy. This participant's score fell dramatically by 63 percentage points on the second

posttest of *Free At Last*. This one decrease offset the gains of two other participants whose scores increased by at least 30 percentage points.

Table 5
Repeated Measurement Comparison of the Control Group for *Free At Last*

Participant	Posttest for <i>Free At Last</i> Class Day Four (No accompaniment)	Posttest for <i>Free At Last</i> Class Day Five (No accompaniment)	Difference
1	0%	0%	(Same score)
2	59%	59%	(Same score)
3	7%	44%	+37
4	78%	78%	(Same score)
5	0%	7%	+7
6	4%	25%	+29
7	67%	4%	-63%
Mean	31%	32.4%	+1.4

No special cause is known that would explain why this participant would have such a sharp decline in dynamic accuracy in a repeated measurement of the same piece one class period later. This sharp decline in one participant's score is especially surprising in light of the fact that all the other scores in that group stayed the same or improved as participants gained more experience with the posttesting situation. If this one participant's scores had not been included, the control group mean score for the later posttest of *Free At Last* would have been notably higher than on the first posttest of *Free At Last*.

The first two research questions focused on vertical comparisons among the various groups. The third research question concentrated on horizontal comparisons of each participant's dynamic accuracy in repeated measurements of the same piece. The data discussed in connection with Research Question No. 3

raises the question of a given participant's own consistency in dynamic accuracy from one class period to the next. Everyday factors such as a participant's own disposition, his mental alertness on a given day, the passing of time, or chance may affect dynamic accuracy. Any conclusions reached from the three research questions depend to some extent on the level of consistency in dynamic accuracy that exists in participants in these group piano classes. This led inevitably to the emergence of the next research question.

Research Question No. 4

Research Question No. 4 read as follows: *Ignoring between-group comparisons and making within-participant comparisons, how much consistency exists in dynamic accuracy test scores from one posttest to the next posttest for each participant?*

This question focuses on an issue of consistency different than that mentioned in connection with research question No. 2. There the consistency of individual participants *within a group* was examined relative to the group mean score. Here, ignoring group comparisons and participant-to-participant comparisons, the focus has been narrowed to an investigation of each individual's four posttest scores, one participant at a time. This determined the degree of *within-participant* consistency in dynamic accuracy that was present.

The posttest for *Free At Last* played with accompaniment was not included in this question of consistency. It was deemed an inappropriate comparison with the three posttests that were played with *no* accompaniment. The

three pretest outliers are included here because their scores were not outlying in the *posttest* distributions, which are the only scores in view here. Furthermore, their degree of consistency was typical of the kind of consistency found in the other participants. The level of within-participant consistency in dynamic accuracy test scores was slightly weaker in the control group, as indicated by the slightly higher mean standard deviation and slightly higher mean range. The three accompaniment groups had very slight differences in level of consistency.

The within-participant consistency is evaluated in terms of an individual participant's standard deviations and range in Table 6. It should be emphasized that these are not standard deviations within a group, but standard deviations within a given participant's own posttest scores. These standard deviations function as a measure of how much a participant's scores tended to deviate from the participant's own average performance in dynamic accuracy. A lower standard deviation indicated a higher level of consistency in how well an individual participant performed the dynamic marks on the printed page, and a higher standard deviation indicated a lower level of consistency in dynamic accuracy.

Table 6 contains the standard deviation and range of posttest scores for each participant. The mean standard deviation was 14 percentage points, and the mean range was 26 percentage points. All percentages marked are rounded to the nearest integer. As can be seen, many participants scored considerably lower on one posttest than they did on their other two posttests without accompaniment. Examples of this are participants number three and number six in the exaggerated

dynamic contrast/simple MIDI orchestration accompaniment group, participants number one and number four in the control group, and participant number five in the subtle dynamic contrast/complex MIDI orchestration accompaniment group. Of the 39 participants, 19 had a range of more than 25 percentage points and 15 had a range of more than 30 percentage points on the three posttests.

The participants with the most consistent dynamic accuracy as reflected in their standard deviations and ranges were scattered throughout the spectrum of low and high grand totals. Although the participant with the single best dynamic accuracy also had the greatest consistency (participant number one in the exaggerated dynamic contrast/complex MIDI orchestration accompaniment group), there emerged no definite pattern of association between strong dynamic accuracy and strong *consistency* in dynamic accuracy.

For example, participant number one in the exaggerated dynamic contrast/complex MIDI orchestration accompaniment group and participant number nine in the exaggerated dynamic contrast/simple MIDI orchestration accompaniment group had very low standard deviations and very high posttest grand means. On the other hand, participants number one and number two in the exaggerated dynamic contrast/simple MIDI orchestration accompaniment group and participant number nine in the exaggerated dynamic contrast/complex MIDI orchestration accompaniment group had very low standard deviations and middle or lower posttest grand means. No definite association emerged between high scores in dynamic accuracy and high *consistency* in dynamic accuracy as measured by standard deviations in a given participant's posttest scores.

Table 6
Individual Participants' Standard Deviations and Ranges
for Posttests Played Without Accompaniment

Group/Participant	<i>Russian Dance</i>	<i>Hymn</i>	<i>Free At Last (No accomp.)</i>	Partici- pant's St. Dev.	Partici- pant's Range*
Exag. Dyn. Contrast/ Complex MIDI Orch.					
1	67%	67%	70%	2%	3
2	56%	86%	85%	17%	30
3	44%	86%	67%	21%	42
4	56%	24%	44%	16%	32
5	17%	19%	0%	10%	19
6	44%	29%	19%	13%	25
7	33%	48%	48%	9%	15
8	44%	48%	33%	8%	15
9	17%	19%	15%	2%	4
10	50%	24%	7%	22%	43
11	33%	29%	59%	16%	30
Subtle Dyn. Contrast/ Complex MIDI Orch.					
1	28%	43%	37%	8%	15
2	22%	33%	15%	9%	18
3	17%	33%	30%	9%	16
4	17%	38%	11%	14%	21
5**	39%	67%	81%	21%	42
6	22%	43%	56%	17%	34
7	17%	29%	19%	6%	12
8	33%	38%	48%	8%	15

(This table is continued on the next page.)

Group	<i>Russian Dance</i>	<i>Hymn</i>	<i>Free At Last (No accomp.)</i>	Partici- pant's St. Dev.	Partici- pant's Range*
Exag. Dyn. Contrast/ Simple MIDI Orch.					
1	28%	33%	30%	3%	5
2	17%	19%	22%	3%	5
3	56%	76%	11%	33%	65
4	17%	14%	74%	34%	60
5	67%	33%	52%	17%	29
6	0%	33%	41%	22%	41
7	39%	57%	30%	14%	27
8	39%	24%	11%	14%	28
9	50%	52%	48%	2%	4
10	50%	33%	37%	9%	17
11	22%	14%	15%	4%	8
12**	78%	71%	56%	11%	22
13**	44%	57%	78%	17%	34
Control Group (no accompaniment)					
1	33%	52%	0%	26%	52
2	22%	76%	59%	28%	54
3	44%	38%	44%	3%	6
4	22%	62%	78%	29%	56
5	22%	5%	7%	9%	17
6	28%	24%	33%	5%	9
7	17%	48%	4%	23%	44
Combined means of all four groups (n=39)	27%	44%	32%	14%	26

*Ranges are given in terms of percentage points.

**Includes the three pretest outliers.

Summary

In this chapter a descriptive analysis of dynamic accuracy posttest scores is given for participants who practiced with three types of MIDI accompaniment and for participants in a control group who did not practice with MIDI

accompaniment. Interrater reliability was strong throughout the study. The distribution of pretest scores for dynamic accuracy in sight-reading was found to be a non-normal distribution, necessitating that three participants with outlying scores be omitted from most comparisons. Test scores varied considerably on all three pieces used and varied also among all four groups. Furthermore, test scores of many individual participants were moderately inconsistent in comparing their own posttest scores with each other.

Slight trends that emerged are as follows. Test scores were noticeably higher for posttests performed with an accompaniment than for the same piece performed without an accompaniment two days later. In comparison to the pretest, posttest scores of participants in accompaniment groups increased slightly more on average than did those in the control group. The exaggerated dynamic contrast/simple MIDI orchestration accompaniment group had slightly better gains than did any of the other groups.

CHAPTER V

FINDINGS REGARDING THE ATTITUDINAL QUESTIONNAIRE

Introduction

The researcher devised an attitudinal questionnaire containing ten items [Appendix B] in order to investigate participants' attitudes toward the pieces employed in the study and their attitudes toward the use of the MIDI accompaniments in the experiments. The survey also served to check for any correlation between dynamic accuracy and participants' attitudes toward MIDI accompaniments. The attitudinal questionnaire was not given to the participants in the control group because they did not play with the MIDI accompaniments during the research.

Of the ten items on the survey, the first three asked how much the participants enjoyed playing each of the three pieces themselves. The fourth item on the survey pertained to the experience of merely listening to the accompaniments as aural demonstrations without playing along. The fifth through the ninth items concentrated on participants' feelings about the experience of practicing with the accompaniments. The tenth item asked participants the number of years they had participated in music ensemble settings.

Calculation of the Accompaniment Attitude Rating

Items four through nine formed the central portion of the survey since these items pertained directly to the accompaniments themselves. Both the experience of listening to the accompaniment as an aural demonstration (response item four) and the experience of practicing with the accompaniments (response items five through nine) were experiences that had been included in the treatment administered to the participants. For each participant, responses to these six items comprised the data for a unitary numerical rating called the “accompaniment attitude rating.” The accompaniment attitude rating did not incorporate responses about the pieces themselves or the response stating the number of years of ensemble experience each possessed. These 32 accompaniment attitude ratings, when organized by accompaniment group, enabled the researcher to check for differences in attitudes of participants using different kinds of accompaniments.

The course syllabus prepared for the participants’ group piano classes prior to the research project included usage of supplementary MIDI accompaniments that were coordinated with the course text. The survey was worded to apply only to the researcher-designed MIDI accompaniments used in the experiments and not to accompaniments that the participants had used in class previously. Participants’ prior experiences with MIDI accompaniments, however, may have affected their predisposition toward the accompaniments used in the experiments either positively or negatively. Although the three instructors may have used text-related MIDI accompaniments a different amount or in a

different way, all participants had used the same MIDI accompaniments in the course.

The accompaniment attitude rating for each accompaniment group participant was obtained as follows. All response items had been worded in a positive tone so that they could be answered on a five point Likert-type scale. For example, response item number four read, "I enjoy listening to the MIDI accompaniments." If a participant marked "5" ("Strongly agree"), the participant was indicating the most positive feelings toward the MIDI accompaniments. If a participant marked "1" ("Strongly disagree"), it was an indication of the most negative feelings. A response of "3" was neutral. Each response on the five-point scale was later transformed according to an index ranging from "1" to "-1" so that positive overall attitudes would be reflected by positive numbers, negative attitudes by a negative number, and neutral attitudes by "0" as follows:

Strongly agree	1
Agree	0.5
Neutral	0
Disagree	-0.5
Strongly Disagree	-1

Answers for each of the six questions about practicing with the accompaniments were combined. The average of these numbers formed the accompaniment attitude rating for each participant. An example of this method of calculation appears in Table 7. The responses shown are hypothetical only and are not responses from an actual participant. Although these five responses are not precisely equivalent to interval/ratio numbers, it is common to sum and

average them “to place an individual somewhere on an agreement continuum of the attitude in question” (Kerlinger, 1986, p. 454). This further permits an investigation of any potential association between attitude and achievement. It is important, however, to bear in mind the approximate nature of these numbers.

Table 7
Sample Calculation of an Accompaniment Attitude Rating

Response item	Response	Mathematical Transformation
4. “I enjoy listening to the MIDI accompaniments”	Neutral	0
5. “I enjoy practicing with MIDI accompaniments”	Agree	0.5
6. “Accompaniments aid my continuity”	Strongly agree	1.0
7. “Accompaniments aid my note accuracy”	Disagree	-0.5
8. “Accompaniments aid my dynamic accuracy”	Agree	0.5
9. “Accompaniments make practice more interesting”	Agree	0.5
Accompaniment attitude rating (average of transformed values) =		.33, “Slightly positive” attitude toward practicing with MIDI accompaniments

Research Question No. 5

Research Question No. 5 read as follows: *How positive are participants’ general attitudes toward the enjoyment and value of listening to MIDI accompaniments and practicing with MIDI accompaniments?*

Table 8 shows the accompaniment attitude rating for each participant (including the pretest outliers). The participants’ ratings are organized within the participants’ respective accompaniment groups. The table also shows each

group's mean accompaniment attitude rating. At no time did accompaniment group participants hear the accompaniments from another group or know that different types of accompaniments were being used by the other groups. Each participant's responses therefore pertained only to the participant's own set of accompaniments and were an isolated assessment of their perception of the educational value of MIDI accompaniments. Responses did not reflect a comparison of the three types of accompaniments used in the study.

Overall, the three groups' accompaniment attitude ratings were similar, and the distribution of high and low ratings was similar within each group. The mean accompaniment attitude rating for all groups combined together was .54, an indication that participants in general had a clearly positive attitude toward the use of MIDI accompaniments.

The mean accompaniment attitude rating for the Exaggerated Dynamic Contrast/Complex MIDI Orchestration accompaniment group was .45. Although this was the lowest of the three groups, it was only slightly lower than the combined group mean of .54 for all 32 participants who practiced with MIDI accompaniment. The exaggerated dynamic contrast/complex MIDI orchestration accompaniment group's rating of .45 indicates a moderately positive disposition toward the experience of practicing with the accompaniments. This group's mean rating was comprised of responses that primarily agreed with the positively worded response items about the use of MIDI accompaniments but also were mixed with some that were marked "Neutral." Occasionally they marked that they "strongly agreed" with the statements.

Table 8
Accompaniment Attitude Ratings Organized by Group

Group	Participant	Accompaniment Attitude Rating
Exaggerated	1	.75
Dynamic	2	.25
Contrast/Complex	3	.92
MIDI Orchestration	4	.25
Accompaniment	5	.42
Group	6	.33
	7	.75
	8	.25
	9	.25
	10	.42
	11	.42
(Group Mean)		.45
Subtle Dynamic	1	.75
Contrast/Complex	2	.67
MIDI Orchestration	3	.83
Accompaniment	4	.58
Group	5*	.08
	6	.50
	7	.67
	8	.42
(Group Mean)		.56
Exaggerated	1	.08
Dynamic	2	.42
Contrast/Simple	3	.92
MIDI Orchestration	4	.42
Accompaniment	5	.67
Group	6	.42
	7	.50
	8	.58
	9	.58
	10	1.00
	11	.42
	12*	.92
	13*	1.00
(Group Mean)		.61
All groups	Combined Mean (n=32)	.54

*Pretest outliers are included in this table.

The subtle dynamic contrast/complex MIDI orchestration accompaniment group, whose mean accompaniment attitude rating was .56, possessed a clearly positive attitude toward the use of the MIDI accompaniments. This was only slightly higher than the exaggerated dynamic contrast/complex MIDI orchestration accompaniment group and was very close to the combined group mean of .54. These participants primarily marked that they agreed with the positively worded responses items and marked only a few times that they were “neutral.” Frequently they also “strongly agreed” with the statements.

The third accompaniment group, the exaggerated dynamic contrast/simple MIDI orchestration accompaniment group, had the most positive attitudes of all three groups with a mean rating of .61. This was, however, fairly close to the rating of the other two groups and was only slightly higher than the combined mean rating of .54. All three accompaniment groups had an overall positive attitude toward the experience of practicing with MIDI accompaniments. Although the accompaniments with which these three groups practiced were different in their degree of dynamic contrast and the complexity of their MIDI orchestration, the mean accompaniment attitude ratings for all three groups were not significantly different.

The extent to which these participants’ attitudes were positive toward practicing with accompaniments may be estimated by referring back to the above-mentioned transformations of the Likert-type responses. If a participant had marked a “Neutral” response to each of the six items about the accompaniments, the participant’s resulting accompaniment attitude rating would have been “0.” If

a participant had marked “Agree” to all six of these items, the participant’s resulting accompaniment attitude rating would have been “.50.” If a participant had marked “Strongly agree” for each item, the participant’s resulting accompaniment attitude rating would have been “1.00.” On this basis then, the group mean accompaniment attitude ratings of .45, .56, and .61 may be interpreted in general as “agreeing” with the positive statements of the attitudinal questionnaire. No group was even close to possessing a neutral or negative disposition toward using MIDI accompaniments of the type employed in this research.

The same information that appears in Table 8 is reorganized and displayed a different way in Table 9. The attention in Table 8 was on participants’ attitudes as grouped by the different kinds of accompaniments with which they practiced. No significant differences between groups emerged there. The focus shifts in Table 9 to an examination of how many individual participants, regardless of the group to which they belonged, fell into various categories of accompaniment attitude ratings.

Of the 32 participants who practiced with accompaniments, 9 had a very positive attitude, 8 had a clearly positive attitude, 8 more had a moderately positive attitude, and 7 had only a slightly positive attitude. The overall disposition toward the accompaniments was consistently positive then, whether participants were viewed by their respective groups or combined together.

Table 9
Breakdown of Accompaniment Attitude Ratings Across Groups

Category	Number of Participants	Accompaniment Attitude Rating
Slightly positive attitude	7	0 to .33
Moderately positive attitude	8	.34 to .49
Clearly positive attitude	8	.50 to .74
Very positive attitude	9	.75 to 1.00

This table includes the three pretest outliers.

The focus in Table 9 was on the composite rating of a person's general attitude toward the use of MIDI accompaniments, but responses to specific items were not displayed there. Table 10 presents this information. It is organized according to accompaniment group, due to the fact that each group practiced with a different kind of accompaniment. It was conceivable, for example, that participants who practiced with accompaniments incorporating greater dynamic expression might have enjoyed listening to or practicing with the accompaniments more than participants in the group that used accompaniments incorporating subtle dynamic expression. The organization of Table 10 reveals whether the various types of accompaniment made any difference in attitude on each response item.

Table 10
Mean of Attitudinal Responses Organized by Accompaniment Group
1=Strongly Agree, .5=Agree, 0=Neutral, -.5=Disagree, -1=Strongly Disagree

Group	"I enjoy practicing with MIDI accompaniments."	"I enjoy listening to MIDI accompaniments."	"Accompaniments help my continuity."	"Accompaniments help my note accuracy."	"Accompaniments help my dynamic accuracy."	"Accompaniments make practice more interesting."
Exaggerated Dynamic Contrast/Complex MIDI Orchestration Accompaniment Group (n=11)	.55	.05	.55	.45	.55	.59
Subtle Dynamic Contrast/Complex MIDI Orchestration Accompaniment Group* (n=8)	.56	.25	.69	.56	.56	.75
Exaggerated Dynamic Contrast/Simple MIDI Orchestration Accompaniment Group* (n=13)	.73	.35	.69	.56	.56	.65
Combined (n=32)*	.63	.22	.64	.58	.55	.66

*Includes pretest outliers.

All five of the various response items about the enjoyment and value of *practicing* with accompaniments (numbers five through nine) were answered positively. This reflects not only a strong opinion about the accompaniments in general, but a specific persuasion that they help in dynamic accuracy, note accuracy, and continuity; that they are musically enjoyable to practice with; and that they make practice time more interesting. Although it might appear that participants merely answered positively because of a positive mindset, or because of a natural desire to please the researcher, it should be borne in mind that the participants were not told that the researcher had created the accompaniments. The responses to item number four, furthermore, demonstrate the fact that participants *were* willing to make negative assessments and were apparently responding objectively.

Response item number four, "I enjoy listening to the accompaniments without playing along," was answered with a significant number of neutral or negative responses. The attitude of participants in the exaggerated dynamic contrast/complex MIDI orchestration accompaniment group for this response item was only slightly better than a "Neutral" attitude with a mean of .05. Attitudes were only slightly more positive in the other two groups on this item. The subtle dynamic contrast/complex MIDI orchestration accompaniment group mean for this response item was .25, and that of the exaggerated dynamic contrast/simple MIDI orchestration accompaniment group was .35. The attitude for this response item for all 32 accompaniment group participants combined together was a mean rating of .22, only "Slightly positive."

It is also enlightening to see the breakdown of responses to each item with all accompaniment group participants combined together. These data appear in the following five figures [Figures 5-9]. The data for response item number eight, “Accompaniments help my dynamic accuracy,” is omitted in these figures but will appear in detail later in this chapter. All responses are detailed in Appendix P.

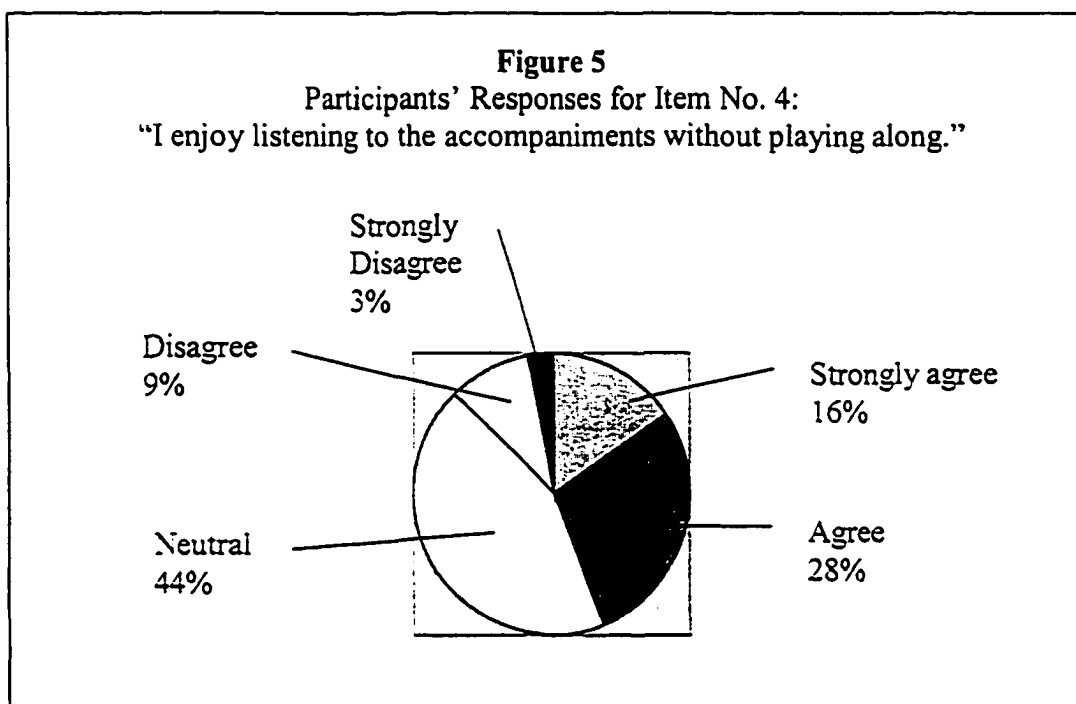


Figure 6
Participants' Responses for Item No. 5:
"I enjoy playing with the accompaniments."

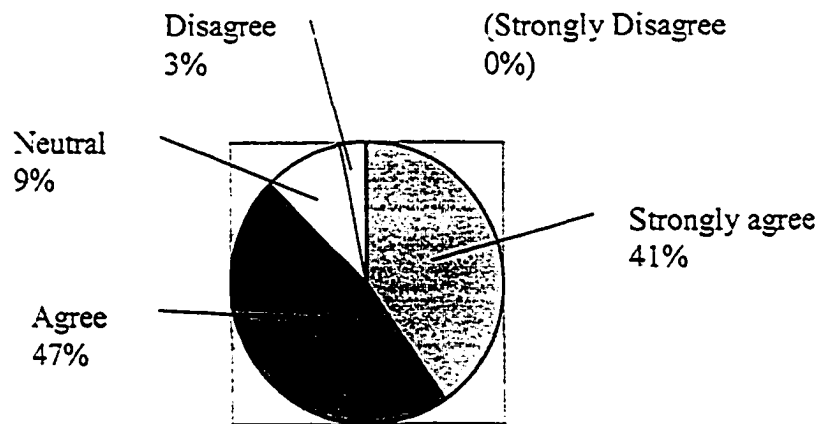


Figure 7
Participants' Responses for Item No. 6:
"The accompaniments help my continuity."

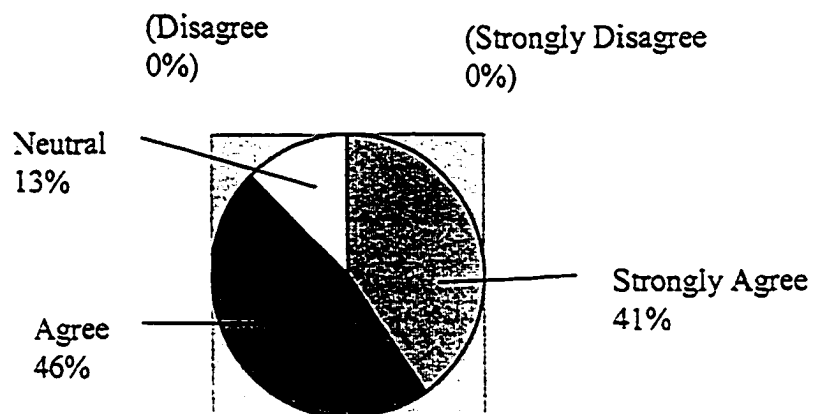


Figure 8
Participants' Responses for Item No. 7:
"The accompaniments help my note accuracy."

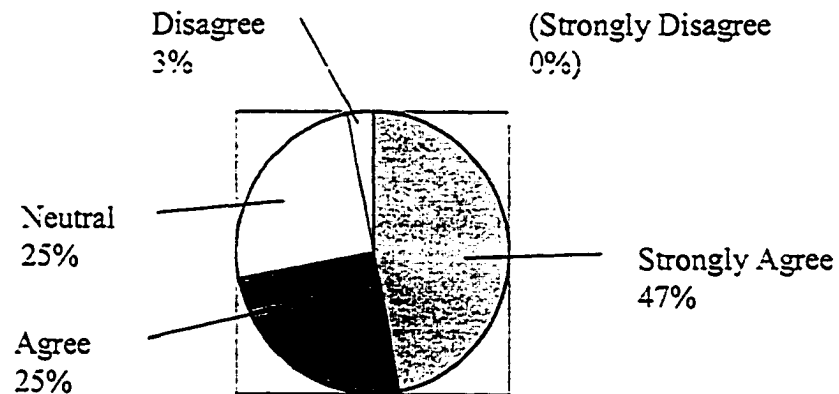
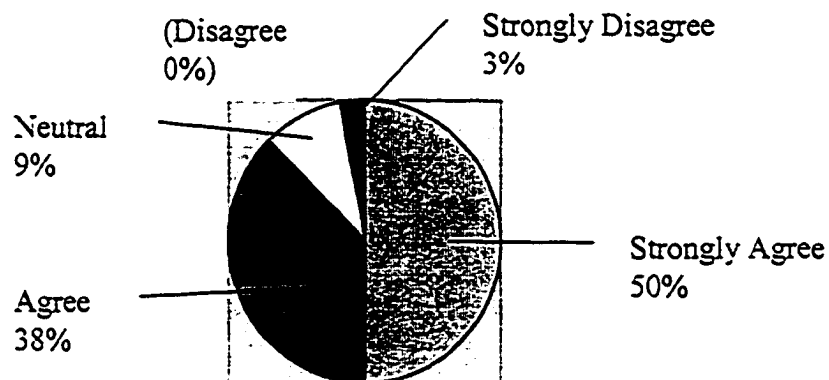


Figure 9
Participants' Responses for Item No. 9:
"The accompaniments make practice more interesting."



Except for response item number four, “I enjoy listening to MIDI accompaniments without playing along,” the overwhelming majority of responses are positive. Only a handful of “Neutral” responses appear in the other response items, the largest number of which arose in the question about the accompaniments’ help in the area of note accuracy. The “Disagree” or “Strongly disagree” responses for all response items were even more scarce. No more than one “Disagree” or “Strongly disagree” response occurred in any of the items about practicing with MIDI accompaniments.

Whereas Research Question No. 5 explored participants’ general attitudes toward practicing with MIDI accompaniments as revealed by six response items, the next research question narrows to a concern with only one of those six response items—the item that surveyed whether participants believed the accompaniments helped their dynamic accuracy. Although the items on the survey asked participants their perception of the accompaniments’ beneficial effects in three areas—continuity, dynamic accuracy, and note accuracy—only the area of dynamic accuracy was evaluated in the pretesting and posttesting aspects of this study. The raters who evaluated the pretest and posttest recordings gave no consideration to the note accuracy or continuity of the performances. The items about continuity and note accuracy were nonetheless explored by the survey in this study in order to gain a broader idea of participants’ attitudes toward the accompaniments. It is plausible that participants’ disposition toward the accompaniments may have been more favorable because of the accompaniments’ perceived value in another area of musicianship,

such as continuity for example. This perceived value could have in turn contributed to the accompaniment's potential to aid participants in other areas, such as dynamic accuracy.

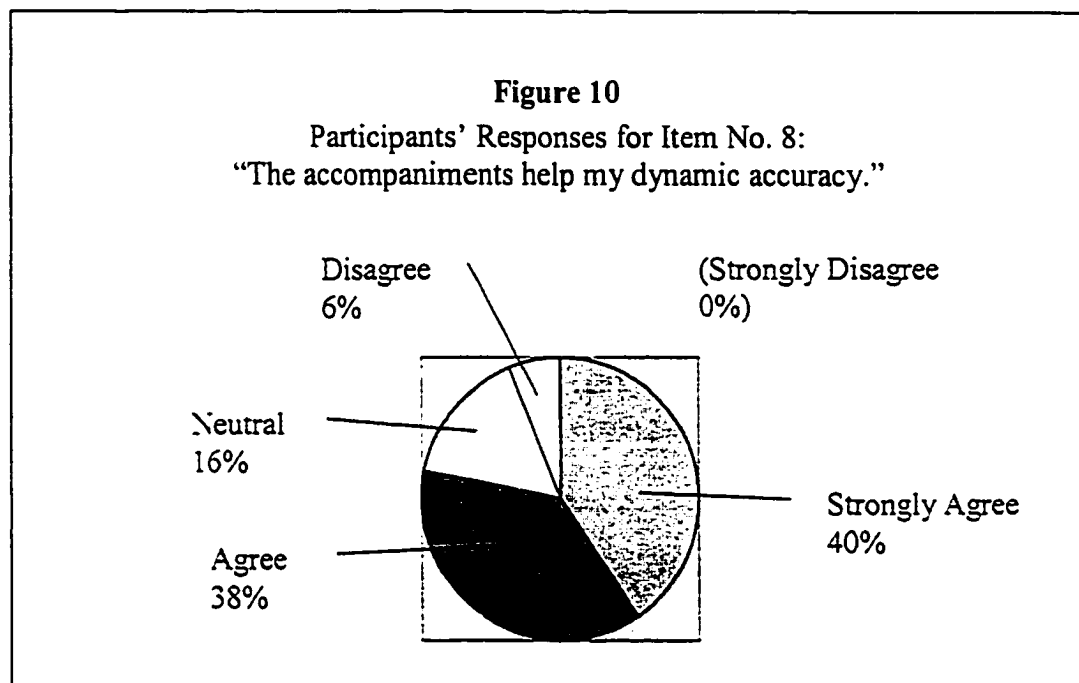
Research Question No. 6

Research Question No. 6 read as follows: *Do participants who practice with MIDI accompaniments feel that the accompaniments aid them in achieving dynamic accuracy?*

This issue was addressed in response item number eight, which read, "The accompaniments help my dynamic accuracy." The responses to this question are summarized in Figure 10. All 32 participants from the accompaniment groups are represented, including the three pretest outliers. The three accompaniment groups are combined together. This is appropriate because the group mean ratings for this question showed only small differences [see Table 8].

As can be seen in Figure 10, the large majority of participants felt that the accompaniments were of benefit in increasing dynamic accuracy. Of the 32 accompaniment group participants, 38% responded that they agreed and 40% that they *strongly* agreed the accompaniments were an aid in this area of musicianship. There were five accompaniment group participants, or 16% of the total, who marked "Neutral" to the response item about aid to dynamic accuracy. All five of these participants were in the exaggerated dynamic contrast/simple MIDI orchestration accompaniment group. There is no known explanation for why five of the 13 participants in this particular group would not mark a positive response to this item,

especially in light of the fact that this group achieved greater gains in dynamic accuracy than any other group. For the 32 accompaniment group participants, only 6%, or 2 of the participants disagreed with the response item statement that the accompaniments helped their dynamic accuracy.⁴



⁴ It is interesting to note that one of these two negative responses was from a participant who was a "pretest outlier." It is possible that this participant interpreted the response item as asking about the participant's *own* improvement in this area, not about the value of the accompaniments for pianists in general in the area of dynamic accuracy. This participant on the pretest had achieved an extremely high score. Even though he had not previously heard or played the pretest piece, *Free At Last*, he performed 82% of the printed dynamic marks accurately. This pianist obviously had strong dynamic accuracy skills prior to the experiment and possessed little room for improvement at his present level of technical control. Consequently, throughout the study his posttest recordings of *Free At Last* showed no improvement. The lack of improvement that this pretest outlier achieved throughout the study was also true of the two other pretest outliers. Their lack of improvement should therefore be attributed to a ceiling effect, not to some lack of aptitude in the participants or to a lack of potential in the accompaniments to assist pianists in the area of dynamic accuracy.

The first four research questions were discussed in Chapter Four and dealt with the quantitative analyses of the participants' test scores in the area of dynamic accuracy. The fifth and sixth research questions have been discussed in this chapter and have concentrated on the qualitative elements of the participants' attitudes and perceptions concerning the MIDI accompaniments with which they had practiced. The seventh and final research question combines the quantitative and qualitative aspects to examine whether participants' dynamic accuracy progress while practicing with MIDI accompaniments is related in any way with participants' attitudes toward MIDI accompaniments.

Research Question No. 7

Research Question No. 7 read as follows: *Is there any correlation between an individual participant's adjusted gain scores for dynamic accuracy and that individual participant's accompaniment attitude rating?*

This research question sought to see if a participant's general attitude toward the use of MIDI accompaniments influenced whatever effect the accompaniments might have on the participant in the area of dynamic accuracy. It is conceivable, for example, that a negative attitude toward hearing an accompaniment while practicing might hinder a participant's being predisposed to learn, which would in turn hinder the potential benefit of the accompaniments as an aid to dynamic accuracy.

A rank-order correlation was run (Spearman's *rho*) to see whether any association existed between participants' attitudes toward MIDI accompaniments and

participants' dynamic accuracy after practicing with MIDI accompaniments. Because all three types of accompaniments possessed some degree of dynamic contrast that could serve as an aural cue for dynamic accuracy, participants from all three accompaniment groups were included in this correlation. The four-posttest grand total of each of the 29 accompaniment group participants was ranked in order and paired with that participant's ranking on the accompaniment attitude rating. A significant, positive correlation ($r_s = .39, p < .05$) was found. This indicates that participants with more positive attitudes toward MIDI accompaniments tended to play with better dynamic accuracy after practicing with them than did participants with less positive attitudes.

Because the treatment groups began with initial difference in dynamic accuracy, however, it was deemed best to investigate this question further by pairing accompaniment attitude rankings with gain scores. Raw (unadjusted) gain scores, however, do not provide the most appropriate comparisons, due in part to the different ways in which students progress at different points along a continuum of performance ability. As a hypothetical example, the accomplishment of a participant who scored only 3% on the pretest and achieved a raw gain of 20 percentage points on the first posttest would not be equivalent to the accomplishment of a participant who scored 75% on the pretest and achieved a raw gain of 20 percentage points on the first posttest.

It was therefore necessary to calculate a measurement of gain that was indexed against the participant's pretest score and that score's position along a

continuum of weak to strong dynamic accuracy. This measurement is labeled here as an “adjusted gain score.” This adjusted gain score would be a means of measuring what percentage of a participant’s *potential* gain was actually achieved between the time of the pretest and posttest recordings.

Adjusted gain scores were computed in this manner. The potential gain sum for each participant was obtained by subtracting the pretest percentage score for dynamic accuracy from a “perfect” score of 100 percent. This sum was the maximum number of percentage points that a participant could have improved if the participant had played all printed dynamic marks accurately after practicing with the accompaniment. Raw (actual) gain scores were also computed by simply subtracting the pretest score from the first posttest score (*Free At Last* performed with accompaniment) and making no statistical adjustments. The raw gain was then divided by the potential gain value to obtain the percentage of potential gain that was actually achieved. This percentage then comprised the participant’s “adjusted gain score.”

This adjusted gain score for each participant was then paired with the participant’s accompaniment attitude rating. A rank-order correlation of these two factors was computed (Spearman’s *rho*) that yielded a statistically significant positive correlation ($r_s = .43, p < .05$). Whether attitude ratings were paired with raw dynamic accuracy scores or paired with adjusted gain scores, a definite association emerged. Examination of the raw data further revealed that this association was more marked in both the extreme ends of the spectrum of attitude ratings. Participants with more

positive attitudes toward the use of MIDI accompaniments tended to improve more in dynamic accuracy after practicing with MIDI accompaniments than did participants with less positive attitudes. It should be emphasized, however, that this correlation is merely an assessment of *association* between two factors, not necessarily an implication of cause and effect by one factor on the other. This association, furthermore, was not manifested among all participants.

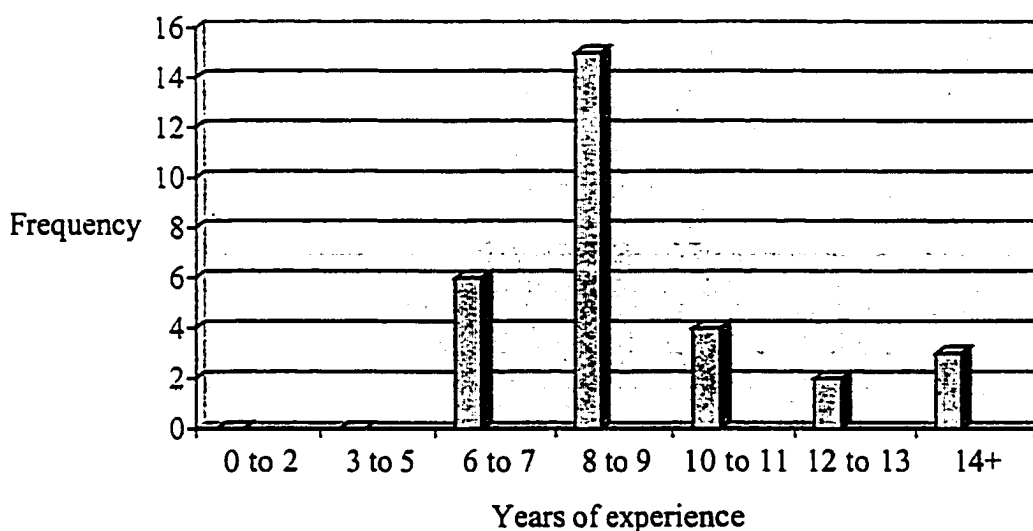
Correlation of Music Ensemble Experience and Gain Scores

The attitudinal questionnaire also asked the number of years that participants had been involved in any kind of music ensemble experience. Because practicing with an accompaniment transforms the practice experience into an ensemble experience, it was feasible that a participant's initial level of comfort with ensemble situations might be a factor in the success of practicing with an accompaniment. In order to gain anything from an accompaniment, a pianist must listen to it *while* also playing, a situation similar to an ensemble situation. Theoretically, ensemble listening could be viewed as a skill that would increase with experience and over time, enabling greater benefit from practicing with a MIDI accompaniment.

Figure 11 shows the responses to this item. There was only slight variability, however, in the number of years of music ensemble experience. None marked 0-1 years, 2-3 years or 4-5 years. Two thirds of all participants in the accompaniment groups had 6-7 years' experience or 8-9 years' experience. In light of the fact that all participants were in non-keyboard music degree programs, this was not in the end

surprising. Such degree programs are typically entered by students whose musical environment centers on music ensemble experience. Because most participants were freshmen, they were approximately the same age. Most apparently started participating in a school band, orchestra, or choir during their sixth grade year of school or close to that time. This fact explains the lack of variability in the response to this item.

Figure 11
Participants' Years of Music Ensemble Experience



What little variability there was in participants' years of ensemble experience was not associated with any variability of their gain in dynamic accuracy posttest scores after practicing with MIDI accompaniments. Table 11 displays the results of the statistical correlation that was run concerning these two factors. The amount of

variability of participants' gain in dynamic accuracy scores that could be explained by their previous music ensemble experience (r square) was only 2%. When factoring in the statistical adjustment for the degrees of freedom, the association was zero (adjusted r square). For either the value of r square or adjusted r square, statistically this means that there was no association between music ensemble experience and gain in dynamic accuracy.

Table 11
Correlation of Gain in Dynamic Accuracy
With Participants' Prior Music Ensemble Experience

Source	Value
Multiple R	.13
R Square	.02
Adjusted R Square	.00
Standard Error	2.63
Observations	32*

*This table includes the three pretest outliers.

Additional Attitudinal Comments from Participants

After all posttesting had been completed, participants also made a number of comments about the experience of practicing with MIDI accompaniments. At the researcher's invitation, these were made either in writing at the bottom of the attitudinal questionnaire or made orally to the researcher who then wrote them down.

Because these comments were made after the survey had been completed, the survey may have sensitized them to certain ideas about the accompaniments and prompted some of the comments. In some cases the comments merely reinforced

responses that had been given on the Likert-type scale in the survey. In other words, comments similar in content to the survey do not necessarily carry as much evidential weight as if they had been spontaneous comments made independently of the survey. Many of the comments did, nonetheless, shed further light on the experiential or psychological aspects of practicing with MIDI accompaniments.

The comments fell into three general categories: positive comments, negative comments, and comments mixed with negative and positive sentiment. The only purely negative comment was that one participant was made more nervous by the accompaniments. Comments favorable to the value of practicing with MIDI accompaniments were grouped together as follows: Three participants said the accompaniments highlighted the expression of the piece. This sentiment would not be surprising coming from a participant in one of the groups that played with accompaniments having exaggerated dynamic contrast. Interestingly though, one of the three participants who expressed this idea was from the subtle dynamic contrast/complex MIDI orchestration accompaniment group.

Two participants felt that the accompaniments helped general enjoyment of the practice experience, and two participants stated that the accompaniments assisted in performance continuity. These comments were simply restatements of Likert-type response items. One participant said that practicing with an accompaniment provided a performance goal for which to strive. Another participant suggested that the accompaniments even helped him learn the notes by aural recognition, and another believed that this kind of practice format decreased mistakes. One final positive

comment was from a participant who felt the accompaniments increased confidence in playing.

Comments mixed with negative and positive sentiment were as follows. One participant regretted the fact that the several repetitions of each accompaniment on the researcher-designed MIDI disks followed one immediately after another. This participant suggested that the practice with accompaniments would have been better if participants had been allowed time between repetitions to engage in free practice. The fact that this same participant had an accompaniment attitude rating of .25 suggests that his overall attitude toward the accompaniments was nevertheless not negative, although his positive attitudinal responses were mixed with some neutral and one negative response.

Another participant stated that he did not feel he gained from merely listening to the accompaniments; rather, he found himself wanting to play along. A final mixed comment was contributed by a participant who felt that the MIDI accompaniments would be a better tool if they were “less cheesy.” Despite this comment, this participant’s accompaniment attitude rating was still slightly positive at .25.

When individually asked by the researcher whether they were thinking about dynamic expression while practicing, three participants confirmed what the researcher suspected after hearing the pretests and posttests: some participants did not concern themselves with dynamics until the notes were well-learned. A miscellaneous statement that may correspond with this idea was made by one participant who felt that *Free At Last* was the easiest piece in which to focus on dynamics. It is not

known whether this participant said this because the notes were easier and therefore participants were able to concentrate on dynamics better, or whether something about the accompaniment for *Free At Last* prompted this statement. One participant in the subtle dynamic contrast/complex MIDI orchestration accompaniment group said that the dynamic contrasts were more noticeable in the accompaniment for *Free At Last* than in the other pieces' accompaniments.

Summary

This chapter has presented the results of the qualitative aspect of this research project, comprised of an attitudinal questionnaire consisting of ten items. Participants overall exhibited positive attitudes toward the use of MIDI accompaniments in group piano classes. No participants responded with an overall negative disposition toward using the accompaniments. Participants had more positive attitudes toward practicing with the accompaniments than they did toward merely listening to them as aural models without playing along.

When the responses of participants were organized according to the different kinds of accompaniments with which they practiced, no significant differences appeared. There also emerged no association between participants' prior music ensemble experiences and their gain in dynamic accuracy while using the accompaniments. A significant, positive association did emerge, however, between participants' accompaniment attitude ratings and their achievement in dynamic accuracy after practicing with the accompaniments. Participants with more positive

attitudes toward MIDI accompaniments tended to play with better dynamic accuracy after practicing with them than did participants with less positive attitudes.

CHAPTER VI

SUMMARY, DISCUSSION, AND RECOMMENDATIONS

The Purpose of the Study

The emergence of MIDI technology has provided a potential means of teaching pianists how to play with dynamic (loudness) expression—MIDI accompaniments with which students may play along. Accompaniments can provide an aural cue for dynamic accuracy. Piano teachers need to know how much dynamic accuracy students have who practice with MIDI accompaniments, and whether the kind of accompaniment makes any difference in a student's gain in dynamic accuracy. The purpose of this study was to give an experimental, descriptive analysis of dynamic accuracy test scores of college non-keyboard music majors in group piano classes who practiced with three types of MIDI accompaniments.

Limitations

1. The focus of this study was on dynamic accuracy, rather than on rhythmic accuracy, note accuracy, or performance continuity.
2. Dynamic accuracy was considered a different concept than dynamic *artistry*, which was not evaluated in this study. Dynamic artistry could have

included the evenness and range of a *crescendo*, for example. However, only dynamic accuracy, whether the correct dynamic was played in the correct place, was evaluated in this study.

3. This study described dynamic accuracy scores of college non-keyboard music majors in group piano classes. It did not investigate dynamic accuracy of students in group piano classes who were not music majors. The musical aptitude and sight-reading abilities of a non-keyboard music major at the piano would be different than those of a beginning musician at the piano, even if the two were playing piano literature of the same difficulty level. The ensemble ability, or the capacity to listen to an accompaniment while playing, would also be different.

4. Participants were in their second semester of group piano study and had arrived at the upper elementary stage of piano literature. These intact classes were accustomed to working on functional keyboard skills in a digital piano laboratory. Such students may not have had a great deal of feedback on dynamic contrast and refinements of touch control such as are necessary for dynamic accuracy. Pianists who always practice and have lessons on an acoustic piano in a private setting may have different sensitivities to the area of dynamic accuracy.

5. The study incorporated non-interactive MIDI accompaniments. Phenomena surrounding the use of interactive accompaniment software are entirely different from those of the non-interactive accompaniment market. A whole different array of musical issues and educational considerations would be involved in a research focus on interactive software. The accompaniments used in this research were not live accompaniments. They were computer generated by

means of MIDI technology and were transmitted to participants through headphones in an electronic piano laboratory.

6. Only short-term advantages of practicing a given piece with an accompaniment were investigated. The study did not explore long-term retention of dynamic accuracy or transference of dynamic accuracy habits to other pieces that were not practiced with MIDI accompaniments.

Methodology

Participants were 39 college non-keyboard music majors in five intact classes at the University of Oklahoma. Two of the five intact classes were combined into one group to form four groups with the greatest equivalence of size and initial pretest ability. Of the four resulting groups, one group was randomly assigned to practice with no accompaniment, and the other three groups were randomly assigned to practice with MIDI accompaniments. Each accompaniment group had a different kind of accompaniment. The researcher designed the accompaniments in response to current market trends and pedagogical theory found in the literature review. The first type of accompaniment was “exaggerated dynamic contrast/complex MIDI orchestration” accompaniments. The other two types were variants of this first type. One type of accompaniment varied the degree of dynamics and was called “subtle dynamic contrast/complex MIDI orchestration” accompaniment. The other type of accompaniment varied the complexity of instrumentation and was called “exaggerated dynamic contrast/simple MIDI orchestration” accompaniment.

All participants were pretested on a sight-reading exercise. This was done to determine the initial level of natural ability participants had in the area of dynamic accuracy. Because complete randomization was not possible, this step was necessary to check for initial differences in groups. This also made it later possible to check for gain scores between pretest and posttest recordings.

Participants then practiced the pretest piece, *Free At Last*, and two other pieces, *Russian Dance* and *Hymn*, for three class periods with their respective accompaniments. The control group practiced with no accompaniment. To keep the control group at roughly the same tempi as the accompaniment groups, the control group heard a two-measure metronome count-in before each repetition of a piece.

Participants were then posttested. Two posttest recordings of *Free At Last* were made. The first time participants played *with* the accompaniment and the second time *without* accompaniment two days later. *Russian Dance* and *Hymn* were recorded only once, making a total of four posttests for each participant. Posttest recordings were evaluated for dynamic accuracy alone. After all posttests had been performed, participants completed an attitudinal questionnaire to determine their perception of the effects of practicing with MIDI accompaniments and their level of enjoyment in the process.

Discussion of Test Score Results

First, findings from the test scores are summarized. Second, findings from the posttest scores of the main study are compared to the results of the pilot study.

Then findings from the attitudinal questionnaire are summarized. Where appropriate, findings are analyzed in their relationship to information found in the literature review. Any such analysis should not be construed as proof in support of or not in support of other empirically based studies. Trends that emerged in the present study will be described, but no definite inferences can or should be made from this data. The available sample size was too small to support rigorous statistical procedures or hypothesis testing based on group means and variances. Group means will be reported for their value in summarizing data and tracing trends. The best understanding of the results of this study, however, may be gained from examination of the raw data of individual participants.

Findings concerning the dynamic accuracy test scores were presented in reference to four research questions. The first research question compared the dynamic accuracy of participants practicing with MIDI accompaniments against the dynamic accuracy of participants practicing with no accompaniment. All participants, regardless of whether they practiced with an accompaniment, increased significantly in dynamic accuracy after practicing the pieces. This improvement came with no instructor feedback. The only cues for dynamic accuracy given to the control group were the dynamic marks on the page and the verbal instructions to “strive for correct notes, rhythm, continuity, and expression.” These cues, of course, were also given identically to the accompaniment groups.

Participants in the accompaniment groups in general played with slightly better dynamic accuracy than participants in the control group. This was

especially true on the first posttest, in which the accompaniment group participants were recorded while playing with an accompaniment and the control group participants performed without any accompaniment. Furthermore, group means were not the only manifestation of this trend. It also appeared in the frequency of participants whose test scores increased from the pretest to the first posttest. Excluding the three participants who experienced ceiling effects, the dynamic accuracy scores of 83% of the accompaniment group participants increased from the pretest to the first posttest. In contrast, only 43% of the participants in the control group increased from the pretest to the first posttest.

The slight trend that accompaniment group participants played with better dynamic accuracy on the posttests occurred in spite of the fact that the participants in the control group on the average began the experiments with slightly better dynamic accuracy ability. Though not an exaggerated phenomenon, this trend was in agreement with the finding of Folts (1973) that accompaniments in general can help in the area of expression. It was also in agreement with the statements of Cole (1991), Sheftel (1990), and Davis (1997b) that MIDI accompaniments can help students learn dynamics specifically.

These results, however, should not be interpreted as giving conclusive evidence that using MIDI accompaniments will ensure significantly greater progress in dynamic accuracy. In addition to the fact that the number of participants used was too small to support hypothesis testing, there are four other reasons these results remain inconclusive.

First, the margin by which the accompaniment group participants excelled the control group on the other three posttests was not large. Second, dynamic accuracy test scores within all groups were quite inconsistent as measured by the groups' standard deviations. Third, dynamic accuracy test scores within individual participants on the four posttests was also quite inconsistent as measured by the individual participants' standard deviations. These second and third points were directly addressed by the fourth research question and have some implications for teachers especially of group piano classes. Due to the nature of group piano study, dynamic expression is not an area of musicianship that is typically emphasized to the point that students would habitually play with strong dynamic accuracy. It seemed that participants' attention while performing may have shifted from one area of musicianship to another—such as notational accuracy, articulation, dynamics, or rhythm—but not have been constant in all areas. Participants were read instructions each treatment day that reminded them to play with good notational accuracy, rhythm, articulation, and “expression.” Participants were not told, though, that dynamic accuracy was the focus of the research. Thus, simple lack of habitual concentration on dynamic accuracy may explain why posttest scores were so inconsistent. In any event, the degree of inconsistency in dynamic accuracy among all groups prevented the emergence of any statistically significant differences between the accompaniment groups and the control group.

Finally, there is a fourth reason the data cannot be interpreted conclusively. Although accompaniment group participants played with greater

dynamic accuracy on most posttests, this was not true in all cases. On the fourth posttest, the performance of *Hymn*, the control group participants played with slightly better dynamic accuracy than the accompaniment group participants. This piece was clearly the most difficult of the three pieces used in the experiments. It is possible that the MIDI accompaniments for some participants were actually a hindrance to learning the notes of this piece by forcing them to go at the pre-recorded tempo of the sequence. Whenever participants were unable to read the piece at the preset tempo of the MIDI accompaniment, they suffered the frustration of having to omit one or both hands at times. In fact, the attitudinal questionnaire confirmed that *Hymn* was the least favorite of the three among the accompaniment group participants.

This potential hindrance to the accompaniment groups would not have occurred with the control group. Although the control group heard a metronome count-in at the same tempo of the MIDI accompaniments, the metronome stopped when the control group began playing. In effect this count-in gave the control group a “suggested tempo” but permitted them a degree of freedom both in tempo and continuity. This may have naturally led to less frustration with the difficulty of the piece, greater notational accuracy, and also greater dynamic accuracy as a result. This possible explanation for the greater success of the control group on *Hymn* is congruent with the comment of one participant who said that he did not even think about dynamics until the notes were learned. Although notational accuracy was not evaluated by the raters in this research, it was nonetheless seen to be a natural prerequisite to dynamic accuracy. It was observable during the

rating sessions that it was rare to have a performance with strong dynamic expression that was not also fluent and notationally accurate.

For these four reasons, teachers should not necessarily assume MIDI accompaniments will aid dynamic accuracy in every situation and with every student. Although the posttest scores revealed a slight trend of evidence in the direction of this assumption, further research is needed in order to illumine this issue. The data presented here, nonetheless, can serve to alert piano teachers to be sensitive to several factors.

Teachers should, for example, consider the student's notational readiness to play along with an accompaniment and set a conservative tempo on the MIDI device that plays the accompaniment for the student. The comment of one participant who desired that time be allowed for free practice between repetitions of the MIDI accompaniment is also worthy of consideration. To be able to devote one's full attention to fixing one measure at a slow tempo or to incorporating an adequate fingering is a valuable opportunity that a pianist does not have when his tempo and continuity are constricted by the ensemble situation. Any practice procedure that is a help to a pianist in learning the notes of a piece will indirectly be a help to dynamic accuracy eventually.

Finally, the inconsistency of the test scores discussed above suggests that teachers of group piano classes could give special effort to instilling the habit of dynamic expression in their students even though they may be teaching in an electronic piano laboratory. The fact that the pretest distribution of dynamic accuracy was not normal among these 39 participants, however, cautions teachers

to realize that a wide range of ability in the area of expression may exist in group piano classes. Pianists are typically auditioned into these classes by criteria that include literature level, sight-reading ability, and proficiency in technical exercises, but do not include the area of dynamic expression. Furthermore, a non-keyboard music major in group piano study may have strong musical aptitude in expression but not have the fine tactile control necessary on the keyboard to produce the dynamic expression intended. This point was confirmed when the pretest and posttest recordings for this research project were evaluated. It was occasionally apparent to the raters that a participant had intended to perform a *crescendo* printed in the score, for example, but for whatever reason failed to achieve a clear and gradual increase in volume.

Tseng (1996) had found that practicing with MIDI accompaniments at times frustrated the expressive intentions of flutists. Tseng's participants, however, were advanced students who may not have needed the aural cue for dynamics. Most of their frustration was with the element of rhythmic expression rather than dynamic expression. Furthermore, the accompaniments in Tseng's study were interactive accompaniments designed to permit the soloist to lead with rhythmic liberty. The software's ability to follow a soloist apparently was not fully refined at the time of that study. The present study used non-interactive accompaniments, with which the pianists made no attempt to have freedom of rhythmic expression and thus did not experience this same kind of frustration.

In light of the findings of Deihl and Zeigler (1973) and Rosenthal, et al. (1988), it is surprising that the accompaniments in this research project did not

produce more marked differences in dynamic accuracy. Deihl and Zeigler found that computer-generated aural demonstrations that participants listened to before practicing were dramatically effective in improving phrasing. Rosenthal, et al. found that the use of a recording as an aural model was equally as effective in improving phrasing and dynamics as free practice of the piece proved to be. Because of the similarities between using recordings as aural models and using MIDI accompaniments as simultaneously sounding aural models, it was feasible that the accompaniment groups could have improved more significantly.

One explanation for the discrepancy in effectiveness between the use of aural models and the use of MIDI accompaniments is that the participants practicing with accompaniments had their attention divided between playing and listening during the treatment. It is possible that the usage of recordings in the study by Rosenthal, et al., was more effective because the participants were not mentally occupied with playing while they were listening to the recording. This explanation is in accordance with the beliefs of Neuhaus (1973) and Wheeler (1999) that expression is inseparably linked to self-listening.

Woody (1998) concurs with this explanation in his statement that “*interaction* with the sound representation is perhaps the fundamental determinant of musical practice efficiency” (p. 40, italics added). He continues by stating that “in order to *correct* an identified performance deficiency” this interaction must “allow continuous monitoring of concurrent performance” (p. 40, italics original) and that “the ability to accurately self-monitor performance largely determines a developing musician’s improvements in performance skill” (p. 41).

The second research question investigated the possibility that various kinds of accompaniments would produce different test scores in dynamic accuracy. As in conjunction with the first research question, again a slight trend emerged that was nonetheless inconclusive about the value of the stylistic qualities inherent in the researcher-designed MIDI accompaniments.

This research question was explored in part by viewing the rank order of group means of the various accompaniment groups. There was considerable variability in the rank order of these group means. Some groups would play with greater dynamic accuracy than another group on one posttest, only to have the order reversed on the next posttest. It is not surprising that the exaggerated dynamic contrast/complex MIDI orchestration accompaniment group ranked first more often than any other group, due to the fact that this group began the experiments with the greatest ability in dynamic accuracy as measured by the pretest. What was more notable was that the exaggerated dynamic contrast/simple MIDI orchestration accompaniment group, which began with the lowest pretest scores for dynamic accuracy, rose to the rank of second place on the Three Posttest Mean.

Because there were these initial differences in ability levels of groups, a comparison of gain scores was also done. In comparison to the pretest, the exaggerated dynamic contrast/simple MIDI orchestration accompaniment group gained slightly more overall than the exaggerated dynamic contrast/complex MIDI orchestration accompaniment group, which in turn gained slightly more than the subtle dynamic contrast/complex MIDI orchestration accompaniment

group. Though not consistent for every piece, this overall trend was in agreement with the comments of Goldberg-Shapiro (1995) that simple, less distracting accompaniments are better. It also concurs with the suggestion of Hilley (1992) and Woody (1998) that dynamics need to be exaggerated in order to be clearly perceived and thus produce an effect in the listener.

These trends may have implications for the commercial producers of MIDI accompaniments as well as for teachers. If instructors desire to teach elements of expression with the accompaniments, a more exaggerated dynamic effect may be preferable. Additionally, while more complex MIDI orchestrations may seem to have more initial appeal to the student when used as a sound model, this feature may actually detract from educational purposes when used as an accompaniment. Furthermore, the more complex MIDI orchestrations were not liked by the participants significantly more than the simple MIDI orchestration accompaniments were liked by those who played with them. Astute teachers may utilize more fully orchestrated MIDI disks to best advantage by setting the MIDI playing device to play all the tracks during demonstrations but muting one or more tracks during accompanimental activities.

The third research question concentrated on whether there would be any difference in dynamic accuracy in a posttest for *Free At Last* played with the accompaniment and a posttest played without the accompaniment. All other things being equal, scores would be expected to increase on the second posttest of *Free At Last*, due to the greater amount of practice and greater familiarity with the posttest experience of being recorded by computer software. However, scores in

the accompaniment groups decreased overall. Of the 32 participants in the accompaniment groups, the majority (59%) decreased or stayed the same. Of these 19 participants, 10 decreased by a large margin (20 percentage points or more).

The most logical explanation for these decreases is that any effect the accompaniments might have had on dynamic accuracy was not well retained in the absence of the accompaniment, even over a short term. The performances of the control group further support this idea. Of the seven participants in the control group, six increased or retained the same score on the second posttest of *Free At Last*. The control group perhaps did not decrease as the accompaniment groups did because they had never enjoyed the advantage of the accompaniment's aural cue for dynamic accuracy and then had this advantage taken away.

This apparent lack of retention of the effects of the accompaniment is congruent with findings related to the first research question. Without at least short-term retention of the aural impression made by the accompaniments, it would have been very unlikely that the accompaniment groups would have played with notably better dynamic accuracy than the control group.

This may have implication for teachers who use MIDI accompaniments. During the treatment it was not appropriate to reveal to participants that dynamic accuracy was the focus of the study. In normal teaching settings, however, students could benefit from a repeated emphasis on the expressive dynamic qualities of the accompaniments they hear. Reminders to retain the expression of

the accompaniment even when no longer playing with it would also be essential to the development of habitual dynamic accuracy.

The fourth research question attempted to measure the degree of within-participant consistency in dynamic accuracy test scores. As can be surmised from the above summaries to research questions, a considerable amount of inconsistency was present in the entire distribution of scores throughout the study. Of all 39 participants, 49% had a within-participant range of at least 25 percentage points when comparing the three posttests performed without accompaniment. Inconsistency of individuals naturally led to inconsistency within groups. Group standard deviations were often high. There were also constant shifts in the rank order of groups from posttest to posttest.

Another possible explanation for the inconsistency from posttest to posttest is the differences in the pieces themselves. The pieces were at slightly differing levels. The kind of dynamic contrasts called for in the pieces also varied. The printed dynamic marks in *Free At Last* were gradual dynamic marks, including the phrase tapering of only two notes in some cases. The printed dynamic marks in *Hymn* and *Russian Dance* were primarily block dynamic contrasts. Participants also may have enjoyed one piece more than another, or may have become weary of a certain piece, which may have affected their dynamic expression. Each piece also had a different keyboard texture, and participants may have been better at one texture than another. Because some pieces had more movement in either the treble or bass clef, differences in clef-reading abilities may have affected fluency and indirectly affected dynamic

accuracy scores. Participants were music majors whose main instrument may have been a treble-, bass-, or alto-clef instrument.

Discussion of the Pilot Study

In the pilot study the accompaniment group participants who played with MIDI accompaniments incorporating exaggerated dynamic contrast achieved significantly better dynamic accuracy than did participants who played with no accompaniment. They also played with better dynamic accuracy than participants in a group with “flat” dynamic accompaniments (no contrast). It is not certain why the pilot study yielded more distinct patterns in dynamic accuracy test scores than the main study did.

One possible explanation is that the pilot study involved only one day of treatment. The aid the accompaniments gave as an aural cue for dynamic accuracy might have given the greatest advantage early in the treatment. In the main study, because posttesting was not done until after three days of treatment, the other cues for dynamic accuracy (printed dynamic marks and verbal instructions read by the researcher) may have had more time to make an effect. This could have resulted in the various groups’ scores being closer together at the end of the treatment.

Another explanation for the pilot study having had more distinct results is that the participants used were Level 4 pianists (in their fourth semester of piano study as college non-keyboard music majors in group piano classes). Most were sophomores in college. Because they had had more experience as pianists and as

college music majors, exaggerated dynamic contrast accompaniment group participants may have had better aptitude for imitating the expressive qualities they heard in their accompaniments.

The most plausible explanation though is that the two types of accompaniments in the pilot study had greater differences themselves. The exaggerated dynamic contrast accompaniments practiced with by one group in the pilot study were a strong contrast to the flat dynamic contrast (no contrast) accompaniments used by the other accompaniment group. The flat dynamic contrast accompaniments were digitally prevented from having any dynamic contrast whatsoever.

In contrast though, for the main study a subtle dynamic contrast/complex MIDI orchestration accompaniment was substituted in the place of the pilot study's Flat Dynamics (no contrast) accompaniment. This was done because a subtle dynamic contrast/complex MIDI orchestration accompaniment was deemed more representative of the current market than a dynamically deadpan accompaniment would have been. The other type of accompaniment used in the main study, the exaggerated dynamic contrast/simple MIDI orchestration accompaniments, also did not possess as much contrast with the exaggerated dynamic contrast/complex MIDI orchestration accompaniments as did the two types of accompaniments in the pilot study.

Discussion of the Attitudinal Questionnaire

The purpose of the attitudinal questionnaire [Appendix B] was to examine participants' attitudes toward practicing with MIDI accompaniments and to check for any possible correlation between participants' attitudes and dynamic accuracy test scores. The fifth and sixth research questions involved information from the attitudinal questionnaire alone. The seventh research question involved a combination of information from the attitudinal questionnaire and the posttest data. The control group participants did not complete the survey because they did not practice with the accompaniments at any time.

The fifth research question surveyed participants' general attitudes toward the enjoyment and value of practicing with MIDI accompaniments. The accompaniment attitude rating was calculated to answer this research question. The accompaniment attitude rating was comprised of all six response items that pertained to the accompaniments themselves. Attitudes as revealed in these ratings were generally quite positive, regardless of the type of accompaniment with which the participants practiced. All groups were close to .50 on a scale from -1.0 to 1.0. In this scale, 0 represents a "Neutral" attitude, anything below "0" represents a negative attitude, and anything above "0" represents a positive attitude. Scores were centered, then, in the clearly positive end of the spectrum, especially when factoring in only the questions about *practicing* with the accompaniments. It was interesting to note that participants' answers were much less positive on response item number five, "I enjoy listening to the MIDI accompaniments without playing along." There were also many more neutral or

negative responses on the items about the pieces themselves than there were on the items about practicing with the accompaniments.

The sixth research question focused on whether participants who practiced with MIDI accompaniments felt that the accompaniments aided them in achieving dynamic accuracy. This research question was addressed directly by response item number eight, which read, “The accompaniments helped my dynamic expression.” The mean response for each group on this item was quite positive, regardless of the type of accompaniment with which they practiced. The three accompaniment groups were .54, .55, and .56, all within one point of the combined mean, .55. It was interesting to note that participants in the subtle dynamic contrast/complex MIDI orchestration accompaniment group on the average did not feel that they were helped by their accompaniments any less than participants in the exaggerated dynamic contrast/complex MIDI orchestration accompaniment group felt they were helped by theirs.

As mentioned above, a trend emerged that the exaggerated dynamic contrast/simple MIDI orchestration accompaniment group gained the most in dynamic accuracy of all three accompaniment groups [see Research Question No. 2]. Theoretically then it could be expected that this group should have believed more strongly that the accompaniments had helped them, if they were fully aware of their own growth in dynamic accuracy. This expectation was not fulfilled in the attitudinal questionnaire. Participants in the exaggerated dynamic contrast/simple MIDI orchestration accompaniment group did not answer

response item number eight (“The accompaniments help my dynamic accuracy”) any more positively than participants in the other accompaniment groups.

One possible explanation is that the five-point Likert-type scale used was not nearly as sensitive an instrument as the posttesting evaluation process. With only two positive responses available (“Agree” and “Strongly agree”), the response item could not have been answered with fine gradations of differences according to their perception of their own dynamic accuracy improvement. The three posttests, on the other hand, did have the potential of fine gradations of outcome. When counting evaluations from all three raters, the posttest for *Free At Last* had 27 possible points, the posttest for *Russian Dance* had 18 possible points, and the posttest for *Hymn* had 21 points possible. This made possible the distinction of slight trends in gain scores mentioned in connection with Research Question No. 2.

Many participants answered more positively on response item number six, “Accompaniments help my continuity,” than they did on number eight, “Accompaniments help my dynamic expression.” Two of the group means estimated the accompaniments’ aid to be greater in continuity than in dynamics. This is not surprising, because continuity is in a sense enforced by practicing with an accompaniment. A pianist may inadvertently ignore dynamics while practicing with an accompaniment, but may not as easily ignore continuity or tempo factors.

It is surprising that participants gave the accompaniments as much credit overall for help in note accuracy as for dynamic accuracy. While an

accompaniment can easily be an aural cue for dynamics by modeling dynamics, effecting note accuracy by modeling the notes would seem less feasible. To learn notes from an accompaniment while playing along with it would require outstanding pitch recognition. It may be that participants felt the accompaniments helped them in continuity and that this indirectly helped them learn notes more quickly. On the other hand, participants may have merely been saying that the accompaniments provided an aural checkpoint for any misread notes, which is quite feasible.

The seventh and final research question investigated whether there existed any correlation between adjusted gain scores and a positive attitude toward MIDI accompaniments. A significant, positive association was found. Closer examination of the raw data further revealed that this association was stronger in the extreme ends of the attitudinal spectrum. Participants with a less positive attitude toward MIDI accompaniments had noticeably less improvement in dynamic accuracy throughout the study. Participants with the most positive attitudes improved the most on average. This fact suggests that teachers who employ MIDI accompaniments be sensitive to student attitudes. It may be expedient to select commercially produced accompaniments with stylistic characteristics that are pleasing to the student. MIDI accompaniments and MIDI playing devices that produce the most authentic instrumental sounds may also be a key to student morale. It may also be worthwhile for the teacher to invest some instructional time in persuading students of the potential benefits of practicing

with MIDI accompaniments so that student attitudes toward the accompaniments will be conducive to progress.

It should be emphasized here that to acknowledge an association between two factors does not necessarily imply direct causation of one factor by the other. Rather, it is merely stating that the two variables occur in connection with one another to some degree. While it *may* reflect a causative factor, the real causative factor may lie more deeply somewhere behind both of the variables. For example, a generally negative attitude toward participation in the research project, toward piano practice, or toward piano study in general may have been part of the ultimate cause of low accompaniment attitude ratings or low dynamic accuracy test scores. Another possible explanation of the association between weak dynamic accuracy and less positive attitudes is that a perceived lack of success during the research project was conversely reflected back into the attitudes toward the accompaniments themselves.

It was somewhat surprising that no correlation emerged between participants' years of music ensemble experience and participants' progress in dynamic accuracy while practicing with the accompaniments. There was little variation, however, in the number of years of ensemble experience listed by participants. It is possible that these participants, being music majors with many years of experience in ensemble settings, were all fairly adequate in their ability to listen while playing an instrument. If this study had been conducted with a sample of participants having a wider distribution of ensemble experience, then

the ensemble aptitude issue may have been more of a factor, especially with participants having very little ensemble experience.

It is also possible that the nature of the music ensemble settings the participants had experienced was fundamentally different than the kind of ensemble setting created by this research project. Playing one's principal instrument as a member of an orchestra, for example, is somewhat different than performing on an unfamiliar instrument as a soloist being accompanied by a MIDI disk. In any event, the lack of correlation found here between years of ensemble experience and dynamic accuracy scores may not necessarily mean that a pianist's aptitude in ensemble settings is not a significant factor for teachers to consider.

The question of dynamic accuracy and its causes is not a simple one. This is suggested by the within-participant inconsistencies and the shifts in group ranking from posttest to posttest. MIDI accompaniments, if used, are apparently only one of many factors affecting dynamic accuracy. Other contributing factors may include participants' musical aptitudes, self-listening habits, ensemble abilities, levels of tactile control, previous musical training, attitudes toward MIDI accompaniments, and even attitudes toward group piano study.

Available sample sizes were too small and intact groups were too heterogeneous to permit rigorous statistical procedures concerning the test score results. In spite of the trends that emerged, no significant inferences can be made from the present quantitative data. The only statistical significance that emerged was in the positive correlation between positive attitudes and achievement in dynamic accuracy. More research is needed before other conclusions can be

drawn. Hopefully, the descriptive analysis presented here will form groundwork from which further research may begin.

Recommendations for Teachers

1. When possible piano teachers may want to select instructional materials that have MIDI accompaniments correlated with them. In addition to the previously mentioned advantages of using MIDI accompaniments, the simple fact that most students enjoy practicing with them could make them worthwhile in terms of student morale and student retention.

2. Teachers of piano may want to give preference to MIDI accompaniments incorporating obvious dynamic contrasts, less complex MIDI orchestrations, and authentic-sounding instrumentation. Teachers may also consider muting one or more tracks of MIDI accompaniments that feature more complicated orchestrations if they feel students are distracted from listening to their own playing.

3. Teachers should not view MIDI accompaniments as an automatic means to improvement in dynamic accuracy. When deciding whether to use MIDI accompaniments, teachers should give consideration to a given student's attitude toward playing with MIDI accompaniments. Other factors such as tactile control and the notational difficulty of the piece at hand may also determine whether MIDI accompaniments benefit dynamic accuracy.

4. If attempting to use MIDI accompaniments specifically as an aural cue for dynamic expression, teachers may want first to have the student learn the

notes of the piece to be accompanied. This will prevent the frustration of the pianist's attention being severely divided between listening to the accompaniment, sight-reading notes, and endeavoring to follow expression markings simultaneously.

5. After students have practiced with a MIDI accompaniment, they may need to be trained to retain the aural impression of the accompaniment as they strive for habitual dynamic accuracy when no longer hearing the accompaniment.

Recommendations for Further Research

Any replication of the present study could benefit first of all from a setting where total randomization is possible. This could be done in a laboratory that has a disk drive at each keyboard, so that participants in the same intact class could have different kinds of accompaniments. Also, having more participants would allow for hypothesis testing by analysis of covariance, using the pretest as a covariate. If more participants could not be available, fewer levels of the independent variable would also increase the statistical possibilities. Another option that could be considered in a replication is having the control group engage in free practice or metronome practice, rather than metronome count-in practice as used in this study. The pretest also could be performed with metronome in order to control for tempo differences.

If the replication could be conducted in a piano laboratory with sequencing software at each keyboard, MIDI data could be collected during the participants' practice sessions. If this could be done without the participant's

awareness, the “Hawthorne effect” would be avoided. Another possible variation would be to conduct the replication with elementary age private piano students, which would provide a more homogeneous population.

In addition to these ideas for a possible replication of this study, other research is recommended. The *artistry* of dynamics rather than the *accuracy* of dynamics could be researched, including elements such as the evenness or range of a *crescendo*, for example. This would yield more variation in posttest scores, although it would make interrater reliability more difficult to achieve. A pilot study would definitely be valuable toward refining the evaluation instrument in such a case. Such a study would be useful with more advanced pianists, and would demand that the MIDI accompaniments used be artistic sound models themselves.

A survey study could be conducted, surveying teachers’ observations of the effects of MIDI accompaniments. Teachers who use MIDI accompaniments in private or group teaching could report on the ways in which they use the accompaniments. They also could report their perception of student attitudes and progress with MIDI accompaniments. A qualitative study could inquire into the experiences of participants practicing with MIDI accompaniments. This could incorporate a longer period of time and include surveys, interviews, and videotaped practiced sessions. A factorial design could probe the interactions between years of private piano study, ensemble experience, test anxiety, attitudes toward MIDI accompaniments, musical aptitude, and posttest scores. If a study were done for a semester or a year, it could focus on the retained habits of

dynamic accuracy. Such a study would need to be indexed according to the musical development that would naturally occur over such a period without the treatment.

A powerful research design could be achieved in a study using different types of accompaniments on the same participant, rather than having several groups, each with a different accompaniment. This would control for the complex differences in participants' attitudes, dynamic habits, and musical aptitudes. Such a study would need to be executed in a way that an accompaniment with exaggerated dynamics would not sensitize the participant to the focus of the research. To prevent this, it would be advisable to schedule exaggerated dynamics accompaniment treatment only after all other treatment and posttesting had been completed.

As MIDI technology continues to flourish, the demand for research in this field certainly will increase. Such research could help teachers understand how pianists think about dynamics, how to teach expressive dynamics, and how to use MIDI accompaniments. It may even guide the industry as it endeavors to improve MIDI disks in line with the goals of music educators.

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APPENDIX A

INFORMED CONSENT FORM

**Informed Consent Form For Research Being Conducted Under the Auspices of
the University of Oklahoma-Norman Campus**

This document provides an individual's consent to participating in a research project.

Peter Davis is conducting research into the effects of practicing with MIDI accompaniments. This project is sponsored by the University of Oklahoma Graduate College. The research will be the basis of a Ph.D. dissertation concerning "The Relative Effects of Three Kinds of MIDI Accompaniments On College Non-keyboard Music Major Pianists."

The purpose of the research is to find out the effects that practicing with MIDI accompaniments has upon pianists. Subjects in this study will be pre-tested recording a piano piece on a MIDI sequencer. Then they will practice either with accompaniment or without accompaniment, depending on which treatment group their class is randomly assigned to. This will occur in twenty-minute segments in four successive class periods. Then all subjects will be post-tested by recording three piano pieces on a MIDI sequencer. Then all subjects will complete a brief exit survey concerning their feelings toward practicing with MIDI accompaniments. Recordings will later be confidentially evaluated and compared for variance between groups. All recordings and exit surveys will be kept confidential at all times.

There are no foreseeable risks or discomforts to the subjects as a result of participation in the study. Possible benefits include the experience of playing with MIDI accompaniments and the opportunity to improve as a pianist by practicing. The research hopefully will lead to information about how to make piano study more beneficial and more enjoyable. Participants must be at least 18 years old.

Participation in this research is voluntary. Refusal to participate will involve no penalty or loss of benefits. You may discontinue participation at any time without penalty or loss of benefits. Absolute confidentiality will be maintained at all times in the study. Questions about the research may be directed to Peter Davis (573-6948) or to the Office of Research Administration for questions regarding participants' rights (325-4757).

By signing, I hereby give my consent to participating in this research study.

_____ Date _____

APPENDIX B

ATTITUDINAL QUESTIONNAIRE FOR RESEARCH INTO THE EFFECTS OF MIDI ACCOMPANIMENTS

Attitudinal Questionnaire for Research into the Effects of MIDI Accompaniments

Please answer the following questions. All published results will be kept completely anonymous.

Name _____

Give the one best answer: Strongly agree Agree Neutral Dis-agree Strongly disagree

About the pieces:

- | | | | | | |
|---|---|---|---|---|---|
| 1. I enjoy playing <i>Free at Last</i> . | 5 | 4 | 3 | 2 | 1 |
| 2. I enjoy playing <i>Russian Dance</i> . | 5 | 4 | 3 | 2 | 1 |
| 3. I enjoy playing <i>Hymn</i> . | 5 | 4 | 3 | 2 | 1 |

About the MIDI accompaniments:

- | | | | | | |
|---|---|---|---|---|---|
| 4. I enjoy listening to them without playing along. | 5 | 4 | 3 | 2 | 1 |
| 5. I enjoy playing with them. | 5 | 4 | 3 | 2 | 1 |
| 6. They help my continuity. | 5 | 4 | 3 | 2 | 1 |
| 7. They help my note accuracy. | 5 | 4 | 3 | 2 | 1 |
| 8. They help my dynamic expression. | 5 | 4 | 3 | 2 | 1 |
| 9. They make practicing more interesting. | 5 | 4 | 3 | 2 | 1 |

10. How many years of experience have you had in music ensembles? _____

APPENDIX C

FREE AT LAST PIANO SCORE

Free At Last
Piano Score

Magrath

The piano score for "Free At Last" is presented in two systems. Each system contains a treble and a bass staff. The music is written in 2/4 time. The right hand part features a repeating eighth-note pattern, while the left hand part provides a bass line. The first system consists of four measures, and the second system also consists of four measures. The score is marked with a repeat sign at the end of the first system and a double bar line at the end of the second system. The name "Magrath" is printed in the upper right corner of the first system.

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APPENDIX D

RUSSIAN DANCE PIANO SCORE

Russian Dance
Piano Score

Allegro moderato Goedicke

Piano

mf

5

p

9

f

13

mp

p

pp

The image displays a piano score for a piece titled "Russian Dance" by Goedicke. The tempo is marked "Allegro moderato". The score is written for piano and consists of four systems of music. The first system begins with a treble and bass clef, a key signature of one sharp (F#), and a common time signature (C). The first staff of the first system has a dynamic marking of *mf*. The second system starts with a treble and bass clef, a key signature of one sharp, and a common time signature. The first staff of the second system has a dynamic marking of *p*. The third system starts with a treble and bass clef, a key signature of one sharp, and a common time signature. The first staff of the third system has a dynamic marking of *f*. The fourth system starts with a treble and bass clef, a key signature of one sharp, and a common time signature. The first staff of the fourth system has a dynamic marking of *mp*. The score includes various musical notations such as notes, rests, and slurs, as well as dynamic markings (*mf*, *p*, *f*, *mp*, *p*, *pp*) and fingerings (5, 9, 13). The piece concludes with a double bar line.

APPENDIX E

HYMN PIANO SCORE

Hymn
Piano Score

Piano

Andantino

Schytte

p

5

5

9

p

9

13

mf

13

p

APPENDIX F

FREE AT LAST

SUBTLE DYNAMIC CONTRAST/COMPLEX MIDI ORCHESTRATION
ACCOMPANIMENT SCORE

Free At Last
Subtle Dynamic Contrast/Complex MIDI Orchestration Accompaniment Score

Magrath

The musical score is arranged in five staves. The top staff is for Piano*, with a bracket indicating that the piano part is included on the accompaniment track. The second staff is for Flute, the third for Oboe, the fourth for Guitar, and the fifth for Bass Guitar. The key signature is one flat (Bb) and the time signature is common time (C). The score includes various musical notations such as eighth notes, sixteenth notes, and rests. Dynamic markings include piano (p) and hairpin symbols (< and >) indicating dynamic changes. The score is attributed to Magrath.

Note: This accompaniment score is identical to the Exaggerated Dynamic Contrast/Complex MIDI Orchestration Accompaniment score, except that the hairpin dynamic marks have narrower angles, reflecting the less obvious dynamic contrasts in the recorded accompaniment.

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This musical score is for a piano piece, consisting of six staves. The first two staves are grouped by a brace on the left, indicating they are the right and left hands of the piano. The first staff is in treble clef, and the second is in bass clef. Both are marked with a '4' at the beginning, indicating a 4/4 time signature. The first staff contains three measures of music, each with a dynamic marking of *mf* (mezzo-forte) and a crescendo or decrescendo hairpin. The second staff contains three measures of music, each with a dynamic marking of *mf* and a crescendo or decrescendo hairpin. The third staff is in treble clef and contains three measures of music, each with a dynamic marking of *mf* and a crescendo or decrescendo hairpin. The fourth staff is in bass clef and contains three measures of music, each with a dynamic marking of *mf* and a crescendo or decrescendo hairpin. The fifth staff is in bass clef and contains three measures of music, each with a dynamic marking of *mf* and a crescendo or decrescendo hairpin. The sixth staff is in bass clef and contains three measures of music, each with a dynamic marking of *mf* and a crescendo or decrescendo hairpin. The music is written in a style that suggests a 20th-century composition, with a focus on rhythmic patterns and dynamic contrast.

Musical score for piano, measures 153-158. The score is written for two staves (treble and bass clef) and includes dynamic markings (*p*) and articulation marks (< >).

Measure 153: Treble clef, 7/8 time signature. Bass clef, 7/8 time signature. Both staves start with a 7-measure rest.

Measure 154: Treble clef, 7/8 time signature. Bass clef, 7/8 time signature. Both staves start with a 7-measure rest.

Measure 155: Treble clef, 7/8 time signature. Bass clef, 7/8 time signature. Both staves start with a 7-measure rest.

Measure 156: Treble clef, 7/8 time signature. Bass clef, 7/8 time signature. Both staves start with a 7-measure rest.

Measure 157: Treble clef, 7/8 time signature. Bass clef, 7/8 time signature. Both staves start with a 7-measure rest.

Measure 158: Treble clef, 7/8 time signature. Bass clef, 7/8 time signature. Both staves start with a 7-measure rest.

APPENDIX G

FREE AT LAST

EXAGGERATED DYNAMIC CONTRAST/COMPLEX MIDI
ORCHESTRATION ACCOMPANIMENT SCORE

Free At Last
Exaggerated Dynamic Contrast/Complex MIDI Orchestration Accompaniment

Magrath

Piano* (Piano part included on accompaniment track)

Flute *p*

Guitar

Oboe

Bass Guitar

Note: This accompaniment score is identical to the Subtle Dynamic Contrast/Complex MIDI Orchestration Accompaniment score except that the hairpin dynamic marks have wider angles, reflecting the more obvious dynamic contrasts in the recorded accompaniment.

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Musical score for piano, measures 154-157. The score is in 3/4 time and features a complex rhythmic pattern with triplets and sixteenth notes. Dynamics include *p* (piano), *mf* (mezzo-forte), and *f* (forte). The key signature has one sharp (F#).

Measure 154: Treble and bass staves. Treble staff has a triplet of eighth notes (F4, G4, A4) followed by a quarter note (B4). Bass staff has a triplet of eighth notes (F3, G3, A3) followed by a quarter note (B3). Dynamics: *p*.

Measure 155: Treble and bass staves. Treble staff has a triplet of eighth notes (F4, G4, A4) followed by a quarter note (B4). Bass staff has a triplet of eighth notes (F3, G3, A3) followed by a quarter note (B3). Dynamics: *p*.

Measure 156: Treble and bass staves. Treble staff has a triplet of eighth notes (F4, G4, A4) followed by a quarter note (B4). Bass staff has a triplet of eighth notes (F3, G3, A3) followed by a quarter note (B3). Dynamics: *mf*.

Measure 157: Treble and bass staves. Treble staff has a triplet of eighth notes (F4, G4, A4) followed by a quarter note (B4). Bass staff has a triplet of eighth notes (F3, G3, A3) followed by a quarter note (B3). Dynamics: *f*.

The image shows a musical score for 'The Swan' by Camille Saint-Saëns, featuring a piano and a six-string guitar. The score is in 3/4 time and consists of 12 measures. The piano part is in treble clef, and the guitar part is in bass clef. The music is in G major and 3/4 time. The score includes various musical notations such as notes, rests, and dynamic markings like 'p' (piano). The guitar part is written for a six-string guitar, with a capo indicated by a bracket and the number '3' over the first three measures. The piano part is written for a piano, with a dynamic marking of 'p' (piano) in the first measure. The score is a transcription of the original piece, with the guitar part adapted for a six-string guitar.

A musical score for the song "The Rose Tree". The score is written for four voices: Soprano, Alto, Tenor, and Bass. The music is in 3/4 time and G major. The Soprano part begins with a treble clef and a key signature of one sharp (F#). The Alto part begins with a treble clef and a key signature of one sharp. The Tenor part begins with a bass clef and a key signature of one sharp. The Bass part begins with a bass clef and a key signature of one sharp. The score is divided into two systems. The first system contains the first two staves (Soprano and Alto), and the second system contains the last two staves (Tenor and Bass). The music is written in a simple, clear style, with notes and rests clearly visible. The lyrics are written below the staves, and the title "The Rose Tree" is written at the top of the page.

APPENDIX H

FREE AT LAST

EXAGGERATED DYNAMIC CONTRAST/SIMPLE MIDI ORCHESTRATION
ACCOMPANIMENT SCORE

Free At Last
Exaggerated Dynamic Contrast/Simple MIDI Orchestration Accompaniment

Magrath

Piano* (Piano part included on accompaniment track)

Flute

Guitar

The musical score is written for three instruments: Piano, Flute, and Guitar. The Piano part is indicated by a bracket and the text "(Piano part included on accompaniment track)". The Flute part begins with a piano (*p*) dynamic and features a crescendo hairpin. The Guitar part provides a continuous eighth-note accompaniment.

Note: This accompaniment score is identical to the Exaggerated Dynamic Contrast/Complex MIDI Orchestration Accompaniment score except that the oboe and bass guitar part have been deleted.

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Measures 3-5 of a musical score. The score is written for four staves. The first two staves are grouped by a brace on the left. The first staff is in treble clef, and the second is in bass clef. Both have a '3' above them, indicating a triplet. The third staff is in treble clef, and the fourth is in bass clef. The third staff has a 'p' (piano) dynamic marking at the start and an 'mf' (mezzo-forte) dynamic marking later. The music consists of eighth and sixteenth notes, with some beamed sixteenth notes. There are also some rests and a half note. The key signature has one sharp (F#).

Measures 6-8 of a musical score. The score is written for four staves. The first two staves are grouped by a brace on the left. The first staff is in treble clef, and the second is in bass clef. Both have a '6' above them, indicating a sextuplet. The third staff is in treble clef, and the fourth is in bass clef. The third staff has a 'p' (piano) dynamic marking. The music consists of eighth and sixteenth notes, with some beamed sixteenth notes. There are also some rests and a half note. The key signature has one sharp (F#).

A musical score for four staves, likely for a piano and violin duo. The first two staves are grouped by a brace on the left. The first staff is in treble clef, and the second is in bass clef. The third staff is in treble clef, and the fourth is in bass clef. The music is in 2/4 time. Measure 9 is marked with a '9' above the first staff. Measure 10 is marked with a '9' above the first staff. The score ends with a double bar line.

Measure 9: The first staff has a half note G4, a quarter note A4, a quarter note B4, and a quarter note C5. The second staff has a half note G3, a quarter note A3, a quarter note B3, and a quarter note C4. The third staff has a half note G4, a quarter note A4, a quarter note B4, and a quarter note C5. The fourth staff has a half note G3, a quarter note A3, a quarter note B3, and a quarter note C4.

Measure 10: The first staff has a half note G4. The second staff has a half note G3. The third staff has a half note G4. The fourth staff has a half note G3.

APPENDIX I

RUSSIAN DANCE

SUBTLE DYNAMIC CONTRAST/COMPLEX MIDI ORCHESTRATION
ACCOMPANIMENT SCORE

Russian Dance
Subtle Dynamic Contrast/Complex MIDI Orchestration Accompaniment Score

Allegro moderato Goedicke

Marimba

Bass Guitar

Percussion

Piano
(Piano part included on accompaniment track)

Trumpet

Note: This accompaniment score is the same as the Exaggerated Dynamic Contrast/Complex MIDI Orchestration Accompaniment score, except that the hairpin dynamic marks have narrower angles, reflecting the less obvious dynamic contrasts in the recorded accompaniment.

The musical score for 'The Rose Tree' is presented in a system of seven staves. The first three staves are for the vocal parts, and the last four are for the piano accompaniment. The key signature is one sharp (F#), and the time signature is 4/4. The vocal parts consist of a Soprano line (top staff), an Alto line (second staff), and a Bass line (third staff). The piano accompaniment is divided into a Right Hand (fourth staff) and a Left Hand (fifth staff). The score includes various musical notations such as notes, rests, and dynamic markings like *mf* (mezzo-forte). The lyrics 'The Rose Tree' are written below the vocal staves, and the lyrics 'The Rose Tree' are written below the piano accompaniment staves.

This musical score page contains measures 9 through 12 of a piece in G major. The notation is arranged in three systems. The first system (measures 9-10) features a treble and bass staff with a piano (p) dynamic marking. The second system (measures 11-12) includes a grand staff (treble and bass) and a single bass staff, with a piano (p) dynamic marking. The music consists of arpeggiated chords and melodic lines. Measure 9 has a treble staff with a whole note chord and a bass staff with a half note chord. Measure 10 has a treble staff with a whole note chord and a bass staff with a half note chord. Measure 11 has a treble staff with a whole note chord and a bass staff with a half note chord. Measure 12 has a treble staff with a whole note chord and a bass staff with a half note chord. The piano (p) dynamic marking is present in measures 9, 10, 11, and 12.

Musical score for piano, measures 13-17. The score is written for a grand piano (treble and bass clefs) and a single melodic line (treble clef). The key signature is one sharp (F#). The tempo/meter is not explicitly stated.

Measure 13: The grand piano part begins with a treble clef staff containing a half note chord (F#4, A4) and a bass clef staff containing a whole note chord (F#2, A2). The single melodic line starts with a half note (F#4).

Measure 14: The grand piano part continues with a treble clef staff containing a half note chord (F#4, A4) and a bass clef staff containing a half note (F#2). The single melodic line continues with a half note (F#4).

Measure 15: The grand piano part continues with a treble clef staff containing a half note chord (F#4, A4) and a bass clef staff containing a half note (F#2). The single melodic line continues with a half note (F#4).

Measure 16: The grand piano part continues with a treble clef staff containing a half note chord (F#4, A4) and a bass clef staff containing a half note (F#2). The single melodic line continues with a half note (F#4).

Measure 17: The grand piano part continues with a treble clef staff containing a half note chord (F#4, A4) and a bass clef staff containing a half note (F#2). The single melodic line continues with a half note (F#4).

Dynamics: *f* (forte) is indicated in measures 14, 15, 16, and 17.

18

mp

18

p

pp

18

mp

p

pp

18

mp

p

pp

18

mp

p

pp

18

mp

p

pp

18

mp

p

pp

APPENDIX J

RUSSIAN DANCE
EXAGGERATED DYNAMIC CONTRAST/COMPLEX MIDI
ORCHESTRATION ACCOMPANIMENT SCORE

Russian Dance
Exaggerated Dynamic Contrast/Complex MIDI Orchestration Accompaniment Score

Allegro moderato Goedicke

Marimba

Bass

Percussion

Piano
(Piano part included on accompaniment track)

Trumpet

Note: This accompaniment score is identical to the Subtle Dynamic Contrast/Complex MIDI Accompaniment score, except that the hairpin dynamic marks have wider angles, reflecting the more obvious dynamic contrasts in the recorded accompaniment.

171

Musical score for piano, measures 9-12. The score is written for multiple staves, including a grand staff (treble and bass clefs) and individual staves for other instruments. The key signature is one sharp (F#). The score includes various musical notations such as notes, rests, and dynamic markings.

Measure 9: The grand staff begins with a treble clef and a key signature of one sharp. The bass clef part starts with a quarter note G2, followed by a quarter rest, and then a quarter note F#2. The treble clef part has a quarter rest, followed by a quarter note G4, and then a quarter note F#4. The dynamic marking *p* is present.

Measure 10: The grand staff continues with a treble clef and a key signature of one sharp. The bass clef part has a quarter note G2, followed by a quarter note F#2, and then a quarter note E2. The treble clef part has a quarter note G4, followed by a quarter note F#4, and then a quarter note E4. The dynamic marking *p* is present.

Measure 11: The grand staff continues with a treble clef and a key signature of one sharp. The bass clef part has a quarter note G2, followed by a quarter note F#2, and then a quarter note E2. The treble clef part has a quarter note G4, followed by a quarter note F#4, and then a quarter note E4. The dynamic marking *p* is present.

Measure 12: The grand staff continues with a treble clef and a key signature of one sharp. The bass clef part has a quarter note G2, followed by a quarter note F#2, and then a quarter note E2. The treble clef part has a quarter note G4, followed by a quarter note F#4, and then a quarter note E4. The dynamic marking *p* is present.

Musical score for piano, measures 13-17. The score is written for multiple staves, including treble and bass clefs. The key signature is one sharp (F#). The music features various rhythmic patterns, including eighth and sixteenth notes, and rests. Dynamic markings include *f* (forte). Articulation symbols (*>*) are used to indicate accents. The score is organized into systems, with measures 13-17 shown.

dd *d* *du*

dd *d* *du*

dd *d* *du*

dd *d* *du*

dd *d* *du*

APPENDIX K

RUSSIAN DANCE

EXAGGERATED DYNAMIC CONTRAST/SIMPLE MIDI ORCHESTRATION
ACCOMPANIMENT SCORE

Russian Dance
Exaggerated Dynamic Contrast/Simple MIDI Orchestration Accompaniment Score

Allegro moderato Goedicke

Marimba

Bass Guitar

Piano

(Piano part included on accompaniment track)

Note: This accompaniment score is identical to the Exaggerated Dynamic Contrast/Complex MIDI Orchestration Accompaniment score, except that the percussion and trumpet parts have been deleted.

Measures 5-8 of a musical score. The score is written for three systems of staves. The first system consists of a treble and bass staff. The second system consists of a single bass staff. The third system consists of a grand staff (treble and bass). The key signature is one sharp (F#). Measure 5 is marked with a finger number '5' above the treble staff. Measure 6 is marked with a finger number '5' above the bass staff. Measure 7 is marked with a finger number '5' above the bass staff. Measure 8 is marked with a finger number '5' above the bass staff. The dynamics *p* (piano) and *mf* (mezzo-forte) are indicated. The notation includes various note values, rests, and articulation marks.

Measures 9-12 of a musical score. The score is written for three systems of staves. The first system consists of a treble and bass staff. The second system consists of a single bass staff. The third system consists of a grand staff (treble and bass). The key signature is one sharp (F#). Measure 9 is marked with a finger number '9' above the treble staff. Measure 10 is marked with a finger number '9' above the bass staff. Measure 11 is marked with a finger number '9' above the bass staff. Measure 12 is marked with a finger number '9' above the bass staff. The dynamics *p* (piano) and *mf* (mezzo-forte) are indicated. The notation includes various note values, rests, and articulation marks, including crescendo and decrescendo markings.

The musical score for 'The Rose Tree' is presented in three systems, each with a treble and bass staff. The key signature is one sharp (F#), and the time signature is 6/8. The first system includes lyrics 'The Rose Tree' and 'The Rose Tree' under the treble staff, and 'The Rose Tree' under the bass staff. The second system includes lyrics 'The Rose Tree' and 'The Rose Tree' under the treble staff, and 'The Rose Tree' under the bass staff. The third system includes lyrics 'The Rose Tree' and 'The Rose Tree' under the treble staff, and 'The Rose Tree' under the bass staff. The score is marked with '18' at the end of each system, indicating the page number.

The musical score for 'The Rose Tree' is presented in two systems. Each system consists of two staves. The top staff of each system is in bass clef, and the bottom staff is in treble clef. Both staves have a key signature of one sharp (F#) and a common time signature (C). The music is written in a simple, folk-like style. The first system begins with a treble clef staff containing a whole note chord (F#4, A4, C5) and a bass clef staff containing a whole note chord (F#2, A2, C3). The second system begins with a treble clef staff containing a whole note chord (F#4, A4, C5) and a bass clef staff containing a whole note chord (F#2, A2, C3). The music continues with various chords and melodic lines, including a section with a forte (f) dynamic marking. The score concludes with a final chord in both staves.

APPENDIX L

HYMN

SUBTLE DYNAMIC CONTRAST/COMPLEX MIDI ORCHESTRATION
ACCOMPANIMENT SCORE

Hymn
Subtle Dynamic Contrast/Complex MIDI Orchestration Accompaniment Score

Andantino Schytte

The musical score is for a hymn by Schytte, marked 'Andantino'. It features six instruments: Piano, Celeste, Guitar, Bass guitar, Strings, and Flute. The key signature is one sharp (F#) and the time signature is 3/4. The Piano part consists of whole rests in both staves. The Celeste part has a single note in the first measure, followed by a half note in the second, and a quarter note in the third. The Guitar part has a melody in the treble staff and a bass line in the bass staff, both starting with a piano (p) dynamic. The Bass guitar part has a single note in the first measure, followed by a half note in the second, and a quarter note in the third. The Strings part has a melody in the treble staff and a bass line in the bass staff, both starting with a piano (p) dynamic. The Flute part has a melody in the treble staff, starting with a piano (p) dynamic. The score is written for four measures.

Piano

Celeste

Guitar

Bass guitar

Strings

Flute

Note: This accompaniment score is identical to the Exaggerated Dyanmic Contrast/Complex MIDI Orchestration Accompaniment score, except that the hairpin dynamic marks have narrower angles, reflecting the less obvious dynamic contrasts in the recorded accompaniment.

This musical score is for piano, spanning measures 180 to 184. The key signature is D major (two sharps). The score is written for a grand piano with a treble and bass staff joined by a brace on the left.

- Measure 180:** Treble staff has a half note D5 and a half note E5. Bass staff has a half note D4 and a half note E4. Dynamics: *p*.
- Measure 181:** Treble staff has a half note F#5 and a half note G5. Bass staff has a half note F#4 and a half note G4.
- Measure 182:** Treble staff has a half note A5 and a half note B5. Bass staff has a half note A4 and a half note B4.
- Measure 183:** Treble staff has a half note C#6 and a half note D6. Bass staff has a half note C#5 and a half note D5.
- Measure 184:** Treble staff has a half note E6 and a half note D6. Bass staff has a half note E5 and a half note D5.

The score includes various musical notations such as notes, rests, and dynamic markings. The piano part features a consistent harmonic accompaniment in the bass and a more active melody in the treble.

This page of musical notation is for a piano piece, likely in the key of D major (one sharp, F#). It consists of six systems of staves, each with a treble and bass clef. The notation includes various musical elements:

- System 1:** Features a complex texture with many beamed sixteenth notes in both hands, suggesting a fast, rhythmic passage. A crescendo hairpin is visible in the bass staff.
- System 2:** Shows a more sparse texture with single notes and small chords. A crescendo hairpin is present in the bass staff.
- System 3:** Contains melodic lines with eighth and sixteenth notes, often beamed together. A crescendo hairpin is present in the bass staff.
- System 4:** Features a mix of single notes and small chords. A crescendo hairpin is present in the bass staff.
- System 5:** Shows a mix of single notes and small chords. A crescendo hairpin is present in the bass staff.
- System 6:** Features a mix of single notes and small chords. A crescendo hairpin is present in the bass staff.

The notation is written in a standard musical style, with a key signature of one sharp (F#) and a common time signature (C). The page number 182 is centered at the bottom.

This musical score page contains measures 13 through 16. It is written for piano and includes several systems of staves. The key signature has one sharp (F#), and the time signature is 4/4.

- Measure 13:** The first system features a grand staff (treble and bass clef) with a piano (*p*) dynamic. The bass line has a complex arpeggiated figure. The second system shows a single treble staff with a half note and a single bass staff with a half note.
- Measure 14:** The first system continues the grand staff with piano (*p*) dynamics and includes a slur over the bass line. The second system shows a treble staff with eighth notes and a bass staff with a half note.
- Measure 15:** The first system continues the grand staff. The second system shows a single bass staff with a half note.
- Measure 16:** The first system continues the grand staff. The second system shows a treble staff with a half note and a bass staff with a half note.

The score includes various musical notations such as chords, arpeggios, slurs, and dynamic markings (*p*, *p.*). The page number 183 is centered at the bottom.

Musical score for piano, measures 17-20. The score is written for multiple staves, likely representing different voices or instruments. The key signature is one sharp (F#). The dynamics range from *mf* (mezzo-forte) to *p* (piano).

Measures 17-20 show a complex texture with multiple staves. The first system includes a grand staff (treble and bass clef) with a *mf* dynamic. The second system features a single staff with a *mf* dynamic. The third system includes a grand staff with a *mf* dynamic. The fourth system features a single staff with a *mf* dynamic. The fifth system includes a grand staff with a *mf* dynamic. The sixth system features a single staff with a *mf* dynamic. The seventh system includes a grand staff with a *mf* dynamic. The eighth system features a single staff with a *mf* dynamic.

The score concludes with a double bar line at the end of measure 20.

APPENDIX M

HYMN

EXAGGERATED DYNAMIC CONTRAST/COMPLEX MIDI
ORCHESTRATION ACCOMPANIMENT SCORE

Hymn
Exaggerated Dynamic Contrast/Complex MIDI Orchestration Accompaniment Score

Andantino Schytte

The musical score is for a hymn accompaniment in 3/4 time, key of D major (one sharp). It features six instruments: Piano, Celeste, Guitar, Bass guitar, Strings, and Flute. The tempo is marked 'Andantino' and the composer is 'Schytte'. The score consists of four measures. The Piano part has whole rests in all measures. The Celeste part plays a sequence of dotted half notes: D4, E4, F#4, G4. The Guitar part features a melodic line in the treble clef and a bass line in the bass clef, both starting with a piano (p) dynamic and marked with hairpin crescendos and decrescendos. The Bass guitar part plays a sequence of dotted half notes: D3, E3, F#3, G3. The Strings part plays a sequence of dotted half notes: D2, E2, F#2, G2, with a piano (p) dynamic and hairpin markings. The Flute part plays a sequence of dotted half notes: D4, E4, F#4, G4, also with a piano (p) dynamic and hairpin markings.

Piano

Celeste

Guitar

Bass guitar

Strings

Flute

Note: This score is identical to the Subtle Dynamic Contrast/Complex MIDI Orchestration Accompaniment score, except that the hairpin dynamic marks have wider angles, reflecting the more obvious dynamic contrasts in the recorded accompaniment.

5

p

5

5

p

5

p

5

p

5

p

5

p

This musical score is for a piano and voice piece, page 188. It features a grand staff with a treble and bass clef for the piano, and a single staff for the voice. The key signature is one sharp (F#), and the time signature is 4/4. The score is divided into four systems, each containing a piano part and a voice part. The piano part consists of a treble and bass staff, while the voice part is a single staff. The score includes various musical notations such as notes, rests, and dynamic markings. The first system shows a piano introduction with a treble staff playing a series of chords and a bass staff playing a rhythmic pattern. The second system introduces the voice part with a single note. The third system continues the piano part with a treble staff playing a series of chords and a bass staff playing a rhythmic pattern. The fourth system concludes the piece with a piano part and a voice part. The score is written in a clear, professional style with standard musical notation.

This musical score page contains measures 13 through 16. It is written for piano and includes several systems of staves. The key signature is one sharp (F#). The score features a variety of musical textures, including chords, arpeggiated figures, and melodic lines. Dynamic markings of *p* (piano) are present throughout. Articulation symbols, such as slurs and accents, are used to indicate phrasing and emphasis. The notation includes treble and bass clefs, with some staves grouped by a brace. The measures are numbered 13, 13, 13, 13, 13, and 13 at the beginning of their respective systems.

Musical score for piano, measures 17-20. The score is written for multiple staves, likely representing different voices or instruments. The key signature is one sharp (F#). The dynamics range from *mf* (mezzo-forte) to *p* (piano).

The score is organized into systems. The first system (measures 17-18) shows a grand staff with a treble and bass clef, marked *mf*. The second system (measures 19-20) shows a single treble staff marked *mf* and a grand staff marked *p*. The third system (measures 21-22) shows a grand staff marked *mf* and a single bass staff marked *p*. The fourth system (measures 23-24) shows a grand staff marked *mf* and a single treble staff marked *p*. The fifth system (measures 25-26) shows a single treble staff marked *p*.

The notation includes various musical symbols such as notes, rests, and dynamic markings. The score is written in a standard musical notation style.

APPENDIX N

HYMN

EXAGGERATED DYNAMIC CONTRAST/SIMPLE MIDI ORCHESTRATION
ACCOMPANIMENT SCORE

Hymn
Exaggerated Dynamic Contrast/Simple MIDI Orchestration Accompaniment Score

Andantino Schytte

Piano

(Piano part included on the accompaniment track)

Strings

Flute

The musical score is written for three instruments: Piano, Strings, and Flute. The key signature is one sharp (F#) and the time signature is 3/4. The tempo is marked 'Andantino' and the composer is 'Schytte'. The Piano part is marked '(Piano part included on the accompaniment track)' and has whole rests in all four measures. The Strings part starts with a piano (p) dynamic and features a half note in the first measure, a half note in the second measure, and a half note in the third measure. The Flute part also starts with a piano (p) dynamic and features a quarter note in the first measure, a quarter note in the second measure, and a quarter note in the third measure. The score is marked 'p' (piano) at the beginning of each part.

Note: This accompaniment score is identical to the Exaggerated Dynamic Contrast/Complex MIDI Orchestration Accompaniment score, except that the guitar, bass guitar, and celeste parts have been deleted.

The image displays a musical score for piano, consisting of three systems of staves. The key signature is one sharp (F#), and the time signature is 4/4.

System 1: Features a grand staff with a treble and bass clef. The right hand (treble) begins with a piano (*p*) dynamic and contains a series of chords and eighth-note patterns. The left hand (bass) also starts with a piano (*p*) dynamic and features a similar rhythmic pattern. Both hands end with a final chord and a fermata.

System 2: Continues the piece with a grand staff. The right hand plays a series of chords, while the left hand plays a series of chords with a fermata. A crescendo hairpin is placed over the right hand, indicating a gradual increase in volume.

System 3: The final system shows a single staff with a treble clef. It begins with a piano (*p*) dynamic and contains a series of chords and eighth-note patterns. A crescendo hairpin is placed over the staff, indicating a gradual increase in volume.

The image displays three systems of musical notation, likely for a piano piece. Each system consists of a treble staff and a bass staff, with a large brace on the left side of each system. The key signature is one sharp (F#), and the time signature is 9/8, indicated by a '9' above the first staff of each system.

System 1: The treble staff contains a series of eighth notes and quarter notes, with a large wedge-shaped dynamic marking (crescendo) spanning the first two measures. The bass staff contains a series of eighth notes and quarter notes, with a large wedge-shaped dynamic marking (crescendo) spanning the first two measures.

System 2: The treble staff contains a series of eighth notes and quarter notes, with a large wedge-shaped dynamic marking (crescendo) spanning the first two measures. The bass staff contains a series of eighth notes and quarter notes, with a large wedge-shaped dynamic marking (crescendo) spanning the first two measures.

System 3: The treble staff contains a series of eighth notes and quarter notes, with a large wedge-shaped dynamic marking (crescendo) spanning the first two measures. The bass staff contains a series of eighth notes and quarter notes, with a large wedge-shaped dynamic marking (crescendo) spanning the first two measures.

13

p

13

13

p

13

p

17 *mf* *p*

17 *mf* *p*

17 *mf* *p*

The image displays three systems of musical notation, each consisting of a single staff. All staves are in treble clef and key of D major (indicated by two sharps). The first system begins with a treble clef, a key signature of two sharps, and a measure number of 17. It starts with a mezzo-forte (*mf*) dynamic and features a series of eighth notes. A crescendo hairpin spans the next three measures, leading to a piano (*p*) dynamic in the final measure. The second system also begins with a treble clef, a key signature of two sharps, and a measure number of 17. It starts with a mezzo-forte (*mf*) dynamic and features a series of eighth notes. A crescendo hairpin spans the next three measures, leading to a piano (*p*) dynamic in the final measure. The third system begins with a treble clef, a key signature of two sharps, and a measure number of 17. It starts with a mezzo-forte (*mf*) dynamic and features a series of eighth notes. A crescendo hairpin spans the next three measures, leading to a piano (*p*) dynamic in the final measure.

APPENDIX O

RAW DATA OF PARTICIPANTS ORGANIZED BY GROUP

Raw Data of Participants Organized by Group

Group	Pretest (Free At Last)	Free At Last with accomp.	Russian Dance	Hymn	Free At Last with no accomp.
Exaggerated	22%	96%	67%	67%	70%
Dynamic	41%	56%	56%	86%	85%
Contrast/	37%	67%	44%	86%	67%
Complex MIDI	22%	56%	56%	24%	44%
Orchestration	33%	67%	17%	19%	0%
Accompaniment	7%	11%	44%	29%	19%
Group	19%	37%	33%	48%	48%
	22%	33%	44%	48%	33%
	26%	11%	17%	19%	15%
	11%	7%	50%	24%	7%
	33%	52%	33%	29%	59%
Mean	25%	45%	42%	43%	41%
St. Dev.	10	28	16	26	28

Subtle Dynamic	30%	78%	28%	43%	37%
Contrast/	41%	44%	22%	33%	15%
Complex MIDI	15%	50%	17%	33%	30%
Orchestration	11%	48%	17%	38%	11%
Accompaniment	11%	67%	22%	43%	56%
Group	19%	37%	17%	29%	19%
	7%	4%	33%	38%	48%
Mean	19%	52%	22%	37%	31%
St. Dev.	12	15	6	5	17

(This appendix is continued on the next page.)

Group	Pretest (Free At Last)	Free At Last with accomp.	Russian Dance	Hymn	Free At Last with no accomp.
Exaggerated	11%	7%	28%	33%	30%
Dynamic	11%	4%	17%	19%	22%
Contrast/	4%	52%	56%	76%	11%
Simple MIDI	11%	70%	17%	14%	74%
Orchestration	7%	22%	67%	33%	52%
Accompaniment	11%	48%	0%	33%	41%
Group	15%	74%	39%	57%	30%
	0%	18%	39%	24%	11%
	4%	56%	50%	52%	48%
	52%	70%	50%	33%	37%
	7%	0%	22%	14%	15%
Mean	12%	38%	35%	35%	34%
St. Dev.	14	29	20	19	19
Control Group	30%	0%	33%	52%	0%
(No	22%	59%	22%	76%	59%
accompaniment)	33%	7%	44%	38%	44%
	22%	78%	22%	62%	78%
	0%	0%	22%	5%	7%
	19%	4%	28%	24%	33%
	22%	67%	17%	48%	4%
Mean	21%	31%	27%	44%	32%
St. Dev.	11	35	9	24	30

All percentages are rounded to the nearest integer. Standard deviation values given are in terms of percentage points.

This table excludes the three pretest outliers.

APPENDIX P

PARTICIPANTS' RESPONSES CONCERNING PRACTICING WITH MIDI ACCOMPANIMENTS

Participants' Responses Concerning Practicing with MIDI Accompaniments

Group/Participant	Enjoy listening to them	Enjoy practicing with them	They aid continuity	They aid note accuracy	They aid dynamic accuracy	They make practice interesting	Accompaniment Attitude Rating
Exag./Complex 1	0	1	1	1	0.5	1	.75
Exag./Complex 2	-1	-0.5	0.5	1	1	0.5	.25
Exag./Complex 3	0.5	1	1	1	1	1	.92
Exag./Complex 4	0	1	0	-0.5	0.5	0.5	.25
Exag./Complex 5	1	0.5	1	0	-0.5	0.5	.42
Exag./Complex 6	0	1	0	0	0.5	0.5	.33
Exag./Complex 7	0.5	1	1	0	1	1	.75
Exag./Complex 8	0	0.5	0	0.5	0.5	0	.25
Exag./Complex 9	-0.5	0	0.5	1	0.5	0	.25
Exag./Complex 10	0	0.5	0.5	0.5	0.5	0.5	.42
Exag./Complex 11	0	0	0.5	0.5	0.5	1	.42
Group Mean	0.05	0.55	0.55	0.45	0.55	0.59	.45
Subtle/Complex 1	0	1	0.5	1	1	1	.75
Subtle/Complex 2	0.5	0.5	0.5	0.5	1	1	.67
Subtle/Complex 3	0.5	1	1	1	0.5	1	.83
Subtle/Complex 4	0	0.5	1	0.5	0.5	1	.58
Subtle/Complex 5*	0.5	0	0.5	0	-0.5	0	.08
Subtle/Complex 6	0	0.5	0.5	1	0.5	0.5	.50
Subtle/Complex 7	0	0.5	1	0.5	1	1	.67
Subtle/Complex 8	0.5	0.5	0.5	0	0.5	0.5	.42
Group Mean	0.25	0.56	0.69	0.56	0.56	0.75	.56

(This appendix is continued on the next page.)

	Enjoy listening to them	Enjoy practicing with them	They aid continuity	They aid note accuracy	They aid dynamic accuracy	They make practice interesting	Accompaniment Attitude Rating
Exag./Simple 1	1	0.5	0	0	0	-1	.08
Exag./Simple 2	0.5	0.5	0.5	0.5	0	0.5	.42
Exag./Simple 3	1	1	0.5	1	1	1	.92
Exag./Simple 4	-0.5	0.5	1	1	0	0.5	.42
Exag./Simple 5	0	0.5	1	1	1	0.5	.67
Exag./Simple 6	0	0.5	0.5	0.5	0.5	0.5	.42
Exag./Simple 7	0	0.5	0.5	1	0	1	.50
Exag./Simple 8	0.5	0.5	0.5	1	0	1	.58
Exag./Simple 9	0	1	0.5	0	1	1	.58
Exag./Simple 10	1	1	1	1	1	1	1.00
Exag./Simple 11	-0.5	1	1	0	0.5	0.5	.42
Exag./Simple 12*	0.5	1	1	1	1	1	.92
Exag./Simple 13*	1	1	1	1	1	1	1.00
Group Mean	0.35	0.73	0.69	0.69	0.54	0.65	.61

*Participants whose dynamic accuracy scores were outlying on the pretest distribution.

APPENDIX Q

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June 9, 2000

Mr. Peter Davis
235 Mohawk Drive
Greenville, SC 29609

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