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THE EFFECT OF SPECIAL MEMORY INSTRUCTION AND GUIDED ANALYSIS ON THE MEMORIZATION EFFICIENCY OF COLLEGE BRASS PLAYERS

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THE UNIVERSITY OF OKLAHOMA

GRADUATE COLLEGE

SCHOOL OF MUSIC

THE EFFECT OF SPECIAL MEMORY INSTRUCTION AND GUIDED ANALYSIS ON THE MEMORIZATION EFFICIENCY OF COLLEGE BRASS PLAYERS

A DISSERTATION

SUBMITTED TO THE GRADUATE FACULTY

in partial fulfillment of the requirements for the

degree of

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in

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by

Dorothy E. Bryant

Norman, Oklahoma

1985

THE EFFECT OF SPECIAL MEMORY INSTRUCTION
AND GUIDED ANALYSIS ON THE MEMORIZATION
EFFICIENCY OF COLLEGE BRASS PLAYERS

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THE EFFECT OF SPECIAL MEMORY INSTRUCTION
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BY: DOROTHY E. BRYANT

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The purposes of this study were to compare analytical ability with memorization efficiency, to determine if previous performance experience affected analytical ability and memorization efficiency, and to determine if exposure to a lecture on human/music memory would aid in analytical ability and memorization efficiency.

A pilot study was undertaken to develop a method of measuring analytical ability and memorization efficiency. Reliability and validity were determined through intra-observer and inter-observer comparisons. For the main study, forty-two subjects were randomly assigned to three groups and stratified according to levels. Level I included freshmen, sophomores and juniors and Level II included seniors and graduate students. Experimental groups I and II both received five memorization assignments with analytical guidance. In addition, Experimental group I received a lecture on human/music memory which focused on the information-processing theory of memory and the four components of music memory (analytical, auditory, visual, and motor). Control group III completed the five memorization assignments without guidance.

The three groups and two levels were compared on the variables of analytical observations and memorization efficiency

using the Two-Way Analysis of Variance. Additional follow-up comparisons were tested via the Scheffe procedure. Correlation was computed between analytical observations and memorization efficiency using the Pearson Product-Moment correlation coefficient.

A significant correlation was not observed between analytical observations and memorization efficiency. When comparing treatments, Experimental group I made significantly more analytical observations than Experimental group II and memorized significantly faster than group III. The level differences on the time variable were not significant but Level II subjects made significantly more analytical observations than Level I.

The most notable result was that a lecture on human/music memory resulted in faster memorization. The lecture, which gave insight into how human and music memory function, focused on a more apperceptive approach to the memorization task and motivated the subject to use individual cognitive resources. By applying analysis to the memorization of music, subjects utilized the memory system more effectively. Therefore, the group which received the lecture made significantly more analytical observations as well as memorized more efficiently.

ACKNOWLEDGEMENTS

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DEDICATION

This thesis is dedicated to my parents, Duane and Mildred Bryant, for their never ending love and support.

TABLE OF CONTENTS

Page

LIST OF TABLES

LIST OF ILLUSTRATIONS

CHAPTER 1

INTRODUCTION

In the past two decades, a wealth of research has given insight into human memory.

> This dramatic growth of research is an inescapable fact of modern experimental psychology which has added new and respectable dimensions to the scientific understanding of the concept of memory. It would appear that it is now imperative for the music educator to systematically examine this expanding body of knowledge and determine its possible application to the teaching of music.[1]

A review of literature and present teaching methods reveal that a majority of musicians and teachers are more concerned with the end product (memorized performance) rather than the means to that end (memorization process). With all attention and energy focused on the end product, most novice musicians create memory devices which are not always efficient or reliable. The methods and processes of music memorization are still a mystery to most performing musicians and music educators. "The memory process is perhaps the most complex, the most formidable, the most neglected, and the least understood component of the music making process."[2] Research into the music memorization process may

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[1]P. Thomas Tallarico, "A Study of the Three Phase Concept of Memory: Its Musical Implication," Council for Research in Music Education Bulletin 34 (1974): 2.

[2]George H. Pro, "Memorization: Acquired Skill or Intuition?" The Diapason 71 (May 1980): 3.

help to solve many of the mysteries surrounding successful memorized performance.

Background

The purpose and benefit of performance without music must be weighed against the anxiety generated from potential memory lapses occurring on stage. The debated issue focuses on how one can depend on memory under the pressure of performance.

> If a sudden mysterious power should suddenly tap you on the head and assure you that, come what may, your public performance of a composition would not be marred by memory failures, you would probably shout for joy and run to the nearest telephone to engage Town Hall and Carnegie Hall for a series of engagements.[1]

The following arguments are frequently cited by opponents of memorization: (1) the memorization process consumes too much time and limits the amount of literature covered,[2] (2) the added tension due to the "fear of forgetting" often ruins an otherwise perfect performance,[3] (3) performers tend to repeat memorized works rather than memorize new literature,[4] and (4) a performer does not need to memorize a piece in order to give a quality musical performance.[5]

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[1] Bruce Benward, "The Art of Memory Dexterity," The Southwestern Musician 17 (October 1950): 4.

[2] Arthur Birkby, "Memorizing, an Heretical Viewpoint," Clavier 9 (December 1970): 37.

[3] Ibid.

[4] Ida Elkan, "Piano Recitals of Tomorrow," Etude 72 (March 1954): 15.

[5] Carolyn Carson, "The Sounding Board," Clavier 8 (May-June 1969): 4.

Supporters of memorized performance maintain that (1) memorized performance is a tradition that audiences expect,[1] (2) the presence of music causes a distraction to the audience and the performer,[2] (3) the process of memorization leads to a better understanding of the piece and therefore a more musical and meaningful performance,[3] and (4) the ability to memorize can improve sight-reading ability.[4] In addition, if memorization is approached systematically, with an analytical understanding of what is being memorized, the musician may retain the formal contents of the music and may be able to apply it to future performance situations.

Memory problems are due, in part, to the lack of reliable memorization procedures. Therefore,

> it would seem exceedingly practical for performers, conductors and teachers alike to acquaint themselves with the nature and conditions of economical and effective memory work in order to approach it--not by trial and error hit-or-miss methods, but through scientifically established principles.[5]

A few studies have attempted to establish methods of memorization that lead to more efficient and reliable

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[1]Melton Granger, "Understanding Memorization," Clavier 16 (October 1977): 29.

[2]Grace Rubin-Rabson, "The Psychology of Memorizing," Music Educators Journal 36 (January 1950): 22.

[3]Benward, "Memory Dexterity," p.18.

[4]Frank Frederick, "Are Sight Reading and Memorizing Related?" Music Educators Journal 37 (November-December 1950): 40.

[5]Robert W. Winslow, "The Psychology of Musical Memory," Music Educators Journal 35 (January 1949): 15.

music memory. Rubin-Rabson's study indicated that analytical pre-study may improve memorization ability.[1] A study by Ross determined that a series of guided analysis sessions, focusing on analysis of formal content, may reduce the time required to memorize material.[2] Williamson found a small but significant difference in the speed of memorizing vocal material following a lecture on memorization techniques.[3] However, none of the studies attempted to measure how analysis was applied during the memorization task. More insight into the memorization process could identify some of the factors required to memorize efficiently.

Statement of the Problem

From the beginning of a musician's training, memory and memorization provide the foundation for all knowledge and skills to be acquired:

> Those who claim that they have no ability to memorize music are kidding themselves. Were this truly the case, almost all practicing would be futile because, after weeks of work on a piece, it would be no more familiar than it was the first time it was read through. Every time we repeat a passage when practicing, we commit to memory certain details of how it sounds, how it feels and what it looks like on the printed page. Therefore, any techniques that are aimed at

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[1] Grace Rubin-Rabson, "The Influence of Analytical Pre-Study in Memorizing Piano Music," Archives of Psychology 31 No. 220 (1937).

[2] Edgar Cecil Ross, Jr., "An Experimental Study of the Effect of Analytical Guidance in Music Memorization," (Ph.D. dissertation, State University of Iowa, 1961).

[3] Samuel Charles Williamson, "The Effect of Special Instruction on Speed, Transfer, and Retention in Memorizing Songs," (Ph.D. dissertation, University of Kansas, 1964).

> increasing the ability to memorize are sure to facilitate the process of mastering new repertoire.[1]

In addition, when entering a music contest, students are typically expected to memorize solos or are penalized for not having them memorized. In any realm or level of performance, the musician uses memory to retain prior learning, to perform solos from memory, to memorize parts of solos and ensemble literature that need full concentration, or to retain a passage when other factors such as a conductor lead one away from the printed page.

Music educators and professional musicians recognize the need for the highest level of proficiency in musical performance and memorization may serve as a means to that end. The National Association of Schools of Music (NASM) incorporates high performance standards into guidelines for all professional baccalaureate degrees in music. The 1963 degree requirements state that fluency in sight-reading and "ability to perform from memory and 'by ear'"[2] are a standard for musical performance proficiency. The specific requirement for memorization is omitted in the 1981 version:

> Skill in at least one major area of performance must be progressively developed to the highest level appropriate to the particular music concentration. Essential competencies and experiences are:
>
> . . . .
>
> c. the ability to read at sight,
>
> d. participation in solo and ensemble performance.[3]

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[1]John Weaver, "Memorizing Organ Music," Journal of Church Music 20 (April 1978): 2.

[2]NASM Handbook 1963, (Reston, VA: National Association of Schools of Music, 1963), p. 76.

[3]NASM Handbook 1981, (Reston, VA: National Association of Schools of Music, 1982), p. 43.

Additional general standards include the following:

> Basic musicianship is developed in studies which prepare the student to function in a variety of musical roles, both primary and supportive. All undergraduate curricula should therefore provide the following: (1) A conceptual understanding for such musical properties as rhythm, melody, harmony, timbre, texture and form, and opportunities for developing a comprehensive grasp of their interrelationships as they form a basis for listening, composing in a variety of ways the roles of listener, performer, composer and scholar, by responding to, interpreting, creating, analyzing, and evaluating music.[1]

These standards are met through music memory, in one form or another, as a part of the learning process. "Memorizing music is simply an extension of the process of learning music which most musicians instinctively follow though seldom far enough."[2] The concept of music memorization as a process, which includes music memory, learning, and perception as well as storage and retrieval, relates to the information-processing theory of memory.

> The main reason for concerning oneself with the empirical problem solving process in music is the following. In any but the simplest task, the performance program of a musician contains a substantial number of operations whose purpose is not to deal with data but rather with the organization of subroutines for processing data. Data are dealt with only indirectly, by way of subroutines. Therefore, in an analysis of complex behavior such as musical behavior, the emphasis must be on organization of the problem solving effort itself, not on data.[3]

According to Laske, the information-processing theory of

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[1] Ibid., p. 41.

[2] Thomas A. Brantigan, "A Dissection of Keyboard Memory," The American Guild of Organists--RCCO 9 (April 1975): p. 38.

[3] Otto E. Laske, Music, Memory, and Thought, (Ann Arbor, MI: University Microfilms International, 1977), p. 54.

memory may be applicable to the study of musical behavior.

The theory, as related to music, has been labeled by Laske as psychomusicology.

> I have suggested to call such a theory a psychomusicological theory. This term is meant to convey that studies leading to a process model of music concern musical structures as agents in human thought process.[1]

Included in the thought process of a musician are compositional or syntactic rules which designate how items are organized within contextual conditions.[2] These rules are applied in formal analysis, performing, and listening and may be considered the knowledge base required to successfully complete a musical task. By considering the compositional rules as information needed by a musician to perceive and act upon a problem solving situation, Laske has suggested a music theory that may be empirically observed and measured.[3]

> The theory of music is, then, a discipline whose task it is to link systematically what we know about music as an object or structure to what we know about music as an activity or process.

Due to the complicated functions in music memorization and performance, observing only the end product (performance) may not reveal adequate information for the understanding of the music memorization process. Although observing the complete problem solving process is impossible, a partial

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[1]Ibid., p. xvi.

[2]Ibid., p. 4.

[3]Ibid., p. 3.

observation may be made through experimental procedure. "By designing appropriate task environments in which controlled musical processes take place, the intrinsic tacit knowledge of musicians can be elicited and made observable."[1]

Previous studies indicate that theoretical analysis of formal content improved memorization efficiency. However, the focus on analytical procedure appears only in the treatment or is applied separately from performance. To emphasize the analytical process and observe its effectiveness, supervision of the process should appear in testing as well as during the treatment. By assigning a memorization task, then eliciting verbal response and memory performance from the problem solver, efficiency may be measured as well as the amount of analysis used to complete the task. In addition, a lecture on human memory and music memory processes may give additional insight and motivation for the application of analysis to the memorization task.

Purpose

The purpose of this study was threefold: (1) to determine if exposure to a lecture on human memory, with emphasis on information-processing and music memory, would aid in analytical ability and memorization efficiency, (2) to compare information processing, as measured by analytical

[1]Ibid., p. 10.

observation ability, with memorization efficiency, and (3) to determine if previous performance experience, represented by grade level, would affect analytical ability and memorization efficiency.

Hypotheses

The following null hypotheses were tested:

1. There is no significant difference in the analytical observation ability of the experimental group receiving five memorization assignments and that of the experimental group receiving five memorization assignments and a lecture on human/music memory.

2. There is no significant difference in memorization efficiency among the two experimental groups and the control group.

3. There is no significant correlation between the number of analytical observations and the memorization efficiency of the experimental groups.

4. There is no significant difference in the analytical observation ability of Level I students (freshmen, sophomore, and juniors) and Level II students (seniors and graduate students) in the experimental groups.

5. There is no significant difference in the memorization efficiency of Level I and Level II in the experimental and control groups.

Delimitations

In order to provide some control over variables, the following delimitations were imposed:

1. Human memory research focused on the information-processing theory of memory.

2. The term analytical ability was used to refer to the number of analytical observations made during the memorization task.

3. Subjects were brass players at the college level.

4. The music memorized during the posttest was limited in length to allow subjects time to focus on analysis and make verbal observations.

5. In order to maintain emphasis on the memorization process and the organizational ability of the subject, post-test material and memorization assignments were moderately difficult.

Summary

Memory and memorization are essential in the acquisition and retention of music skills and knowledge. Discussion and controversy concerning the memorization of music centers on the memorized performance; however, the process of memorization may be the cause of memory problems and should be systematically analyzed. Through an understanding of the human memory system and music memory, musicians and music educators may be able to organize the memorization process in order to make it more dependable and teachable.

CHAPTER II

REVIEW OF RELATED LITERATURE

The review of related literature is divided into three main sections: (1) Human Memory, (2) Music Memory, and (3) Previous Research.

Human Memory

Introduction

There are many memory theories to explain how humans store and retrieve information.

> Most authors assume that there are three different types of memory storage systems: a sensory information storage, a short-term memory, and a long-term memory. Everyone accepts the need for a sensory information storage. Some, however, do not believe that there is any need to distinguish between short- and long-term memory. Others feel that the distinction between short- and long-term memory is too crude and there is, in fact, an intermediate-term memory between the other two, making a total of four memory systems in all.[1]

Since the actual functions that aid in memory are hidden in the brain, attempts to prove a theory are possible only through experiments evaluating overt responses. Through observation of overt responses, psychologists may speculate as to exactly how a subject is able to perform a memory task.

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[1] Donald A. Norman, ed., Models of Human Memory (New York and London: Academic Press, 1970), p. 2.

> Our goal is to describe human memory as completely as possible, so that we can explain what happens when someone perceives information and later shows that he has retained it.[1]

Due to the discoveries of researchers and the aid of new experimental techniques, understanding of memory and its many functions has become more sophisticated although still speculative.

Several memory theories have been hypothesized and tested; however, the information-processing theory of memory seems to relate well to music memorization because of its emphasis on process. When determining what factors improve memorization, the information-processing model places emphasis on the mental activities that occur during the memorization task.[2]

> One characteristic assumption of an information-processing theory is that processing can be broken down into a series of subprocesses, or stages. In other words, the time between stimulus--information in the external world--and a response--some observable response--can be subdivided into smaller intervals, each of which corresponds to some subset of the events that intervene between stimulus and response.[3]

In the process of memorization, a person not only responds to a stimulus, but also governs what stimuli are admitted and modifies their properties through experience and anticipation.[4]

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[1] Michael J. A. Howe, Introduction to Human Memory, (New York: Harper and Row, Pub., 1970), p. 13.

[2] Roberta L. Klatzky, Human Memory: Structures and Processes, 2nd ed. (San Francisco: W. H. Freeman and Company, 1975), p. 45.

[3] Ibid., p. 43.

[4] John Frederick Buckner, "The Effect of Aural Models on Efficiency of Single-Line Instrumental Music Memorization," (Ph.D. dissertation, University of Kansas, 1970), p. 31.

> Thus, information-processing (a term cognitive psychologists have borrowed from computer scientists) broadly refers to the human being's active interaction with information about the world.[1]

Information-Processing Theory

A general acceptance of the information-processing theory appears relatively recent. Theorists began to use the term during the 1950s with some of the models and terms developed from computer terminology.

> Even if an information-processing theory does not explicitly compare a human to a computer, the computer often serves as a general metaphor for human processing.[2]

The theory is extensive and covers a large area of human memory functions.

> Human memory is depicted as a continously active system that receives, modifies, stores, retrieves, and acts upon information. This perspective therefore includes the study of memory, perception, learning, language, and problem solving as well as encoding, storage, and retrieval of information.[3]

Although memory, perception, learning, and problem solving are distinct functions, "some overlapping between their mechanisms probably takes place."[4]

> If we try to describe in detail what occurs in perception, learning, thinking and remembering, it becomes clear that many functions are common to more than one of these operations. Thus memory requires the storing of information, but so presumably do learning and thinking.[5]

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[1] Klatzky, Human Memory, p. 2.

[2] Ibid., p. 4.

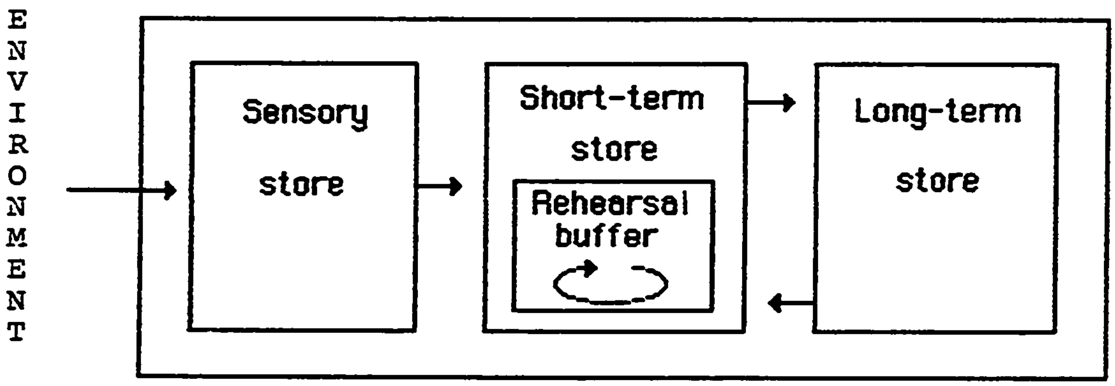
[3] Ibid., p. viii.

[4] Howe, Human Memory, p. 5.

[5] Ibid.

Therefore, the study of the memory system and the memorization process may aid in the understanding of perception, learning and problem solving.

The following model illustrates how the human memory system works according to the information-processing theory.[1]



Sensory Store

Information which enters through the senses and is stored in the sensory store remains unanalyzed for meaning. The sensory store can hold a large amount of information taken from the environment through sight, hearing, smell, or touch. Since the sensory store can hold more information than the short-term store, and since information is lost within one second, "a person must make a decision about which information is to be transferred to short-term store and which is left to decay away from sensory."[2] The main criteria for transferring information into the short-term store is its rélevance to the task.

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[1]Geoffrey R. Loftus and Elizabeth F. Loftus, Human Memory: The Processing of Information (Hillsdale, NJ: Lawrence Erlbaum Associates, Pub., 1976), p. 3.

[2]Ibid., p. 30.

Short-term Store

Short-term store or short-term memory (STM) lasts approximately fifteen seconds and may be called the working memory. In STM the information is encoded (put into a system or form that can be stored) through comparing it with previous knowledge in long-term memory (LTM), followed by chunking and rehearsing. Previous LTM store, as well as memory span and rehearsal, are all associated with STM.

Previous LTM store includes formerly acquired information and plays an important role in the other functions of memory. This information helps to interpret what is received, compares received information with what is known, and is used as a base for evaluation and association. With more associations, storage and retrieval become more dependable because ". . . the better incoming information is meaningfully related to existing information in LTM, the better it is remembered."[1]

Memory span, introduced by Miller, is the limit of information that can be held in STM.[2] Researchers have found that the capacity of STM is about seven chunks, and the information held in STM can be expanded only by building larger chunks. The capacity for each chunk is relative to the type of information being organized and encoded as well as previous experience with the information being memorized. Through the

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[1]Klatzky, Human Memory, P. 231.

[2]George A. Miller, "The Magical Seven, plus or minus two: Some Limits on our Capacity for Processing Information," The Psychological Review 63 (March 1956), 81-87.

process of "judiciously recoding many low-information chunks into fewer high-information chunks,"[1] a learner expands the amount of information held in STM and organizes the information for storage in LTM.

There are two types of rehearsal: (1) maintenance rehearsal which maintains information in the STM so that it is not forgotten, and (2) elaborate rehearsal which

> involves taking information and creating elaborate codes--for example, associative codes, imaginal codes, organizational codes--that are stable and later retrievable from long-term store.[1]

Elaborate rehearsal results in transfer of information to LTM "so that items rehearsed longer will be remembered better after relatively long periods of time."[2] In addition, when information must be retrieved immediately, elaborate rehearsal past the point of mastery--overlearning--may be required. When "given unlimited time, it is possible to gain access to any materials stored; but a fairly elaborate device may be required to guarantee speedy retrieval."[3]

Long-term Store

Long-term store or LTM presents more of a mystery than STM due to the following: 1) the bulk of information involved, 2) the complexities of storage and retrieval, and 3) the

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[1]Loftus, Human Memory, p. 45.

[2]Klatzky, Human Memory, p. 113.

[3]Howe, Human Memory, p. 47.

individual difference in organization and motivation. The keys to good LTM are organization and association.

> The capacity to retrieve information from any system that contains large quantities of material is related to organization factors. Other things being equal, the more effectively the stored items are organized, the easier they will be to locate.[1]

There are two types of LTM--semantic and episodic. Semantic memory deals with facts and is not subject to change due to events or the act of retrieval. "Episodic memory, in contrast, holds temporarily coded information and events, information about how things appeared and when they occurred."[2] Due to the constant state of change, episodic memory often becomes transformed or unretrievable.

The ability to recall stored information involves several subsystems that function interdependently.

> An example of a subsystem in memory is the retrieval system. We know it is not always possible to retrieve stored items, and this indicates that limitations in retrieval may sometimes restrict what can be remembered. On the other hand, active rehearsal of retained information facilitates future retrieval. The ease of retrieval also depends upon how items are encoded and stored, and the encoding process is at the heart of the mechanisms of memory. Encoding and storage processes in turn depend upon the relationship between the meaning of the material and the cognitive structure of the individual.[3]

Therefore, the attention level of the learner during each subsystem of the memorization system determines how well something

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[1]Howe, Human Memory, p. 54.

[2]Klatzky, Human Memory, p. 178.

[3]Howe, Human Memory, p. 94.

will be remembered.

Although many stages and factors are involved in memory and memorization, organization and association surface as significant components.

> Organization can mean either (1) trying to make it fit into some pre-existing logical framework or (2) trying to create some new logical framework that binds the material into some cohesive unit.[1]

Association occurs when "the individual can relate and link the material he perceives to what he already knows."[2]

In summary, memorization and retention depend upon

> the factors which underlie the understanding and perception of relationships and which are central to the various phenomena of cognition: perceiving, learning, and thinking, as well as memory.[3]

Music Memory

The components of music memory are extremely complex, but can be divided into four types of memory: 1) analytical, 2) visual, 3) auditory, and 4) motor.

Analytical Memory

Analytical memory surfaces as the most important and typically, the least applied of the four types of music memory. However, incorporating analysis and intellectual thought into performance is using the human memory system to the best advantage. Through the application of knowledge to

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[1]Loftus, Human Memory, p. 64.

[2]Howe, Human Memory, p. 95.

[3]Ibid.

form associations and organize material, music becomes a retrievable part of the memory system.

> One of the most important and most difficult types of memory procedures is the conscious or thought method. A good knowledge of form is the greatest insurance against memory failures. When this method has been cultivated to a high degree of perfection, most performers lose much of their fear and dread because come what may, a complete breakdown is impossible. Students must have sufficient knowledge of composing devices to analyze phrases, sections, modulations, etc., of the work to be performed.[1]

Analytical memory is not only reliable, but using the mind to organize the music structure facilitates efficiency in memorization.

> It should be understood that study, which is mental activity, is the element that gives value to practicing, and that without study, practicing, which is only the physical aspect of learning, is in a large degree a waste of time. It may be said with truth, therefore, that fewer hours would be required to learn a piece if the mind would be required to work as intensely as the muscles.[2]

Analysis may be considered a method of pulling together all of the factors involved in performance and the key to organization in LTM that facilitates retention and retrieval.

Visual Memory

Visual memory ability includes two types: photographic memory, and a visual sense linked with aural imagery or inner hearing stored in LTM. Photographic memory is considered

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[1]Benward, "Memory Dexterity," p. 18.

[2]Beryl Rubinstein, The Pianist's Approach to Sight-Reading and Memorizing, (New York: Carl Fisher, Inc., 1950) p. 57.

by some as an intrinsic gift,[1] while others regard it as a skill that can be developed to varying degrees.[2] Even with a photographic memory, performance pressure or interference can cause a lapse in concentration resulting in the loss of the visual image. Therefore, the major role of visual memory occurs in the analysis and preparation of a piece.[3]

After experience with music notation, a musician can transform the visual input (notation) into a structure (through analysis) and into sound (through inner hearing). Consequently music can be memorized internally, away from the instrument, then recreated later during practice or performance.

Auditory Memory

Since music represents an aural art, auditory memory is an essential function. Aural memory

> is the outstanding mark of a musical mind at the representative level--the capacity of living in a representative tonal world. This capacity brings the tonal material into the present; it colors and greatly enriches the actual hearing of musical sound; it largely determines the character and realism of the emotional experience; it is familiarity with these images which makes the cognitive memory of music realistic. Thus, tonal imagery is a condition for learning, for retention, for recall, for recognition, and for anticipation of musical facts. Take out the image from the musical mind and you take out its very essence.[4]

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[1] Pro, "Acquired Skill," p. 3.

[2] Norval L. Church, "Basic Principles," Music Journal 16 (April-May 1980); 52.

[3] John Sweeney, "Piano Problems," International Musician 63 (December 1964): 21.

[4] Carl E. Seashore, Psychology of Music, (New York: McGraw Hill, 1938), p. 5.

This aural image or inner hearing seems to be a natural ability. Although few people are trained musicians, most individuals can remember melodies quite accurately. "This fact, together with that of the existence of tonal languages, suggests that relational pitch perception is a natural process."[1] In order for a musician to benefit, the natural process of pitch perception needs to be refined and linked to notation as well as the musical instrument.

Auditory memory, if used properly, can function as a cue or as feedback during performance.

> Such feedback would provide valuable information in the form of cues calling forth new images to direct future behavior and in the form of cues describing the adequacy of ongoing performance.[2]

Motor Memory

All performers deal with the conditioning and training of some motor, kinesthetic, or physical skill. For example, the physical aspect of playing brass instruments

> consists of the intelligent conscientious application of many physical factors. Knowing exactly how to train the embouchure, tongue, throat, diaphragm, air column, etc. enables the player to perform efficiently, from high to low, from loud to soft, with relative ease.[3]

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[1] "Psychology of Music: Memorization," The New Grove Dictionary of Music and Musicians, ed. by Stanley Sadie, (London: Macmillan Publishers Limited, 1980), p. 414.

[2] John R. Bergan, "The Relationship Among Pitch Identification, Imagery for Musical Sounds, and Musical Memory," Journal of Research in Music Education 15 (Summer, 1967): 109.

[3] Fred Fox, Essentials of Brass Playing (Pennsylvania: Volkwein Bros., Inc., 1974), p. 3.

The complexity of motor skill during performance adds an additional dimension which further complicates the music memorization process.

There are two types of motor memory: (1) continuous (walking, bike riding) with a high retention level, and (2) discrete (typing, music performance) with a very low retention level.[1]

> Apparently one reason for the rapid forgetting of discrete motor responses is that they are behaviorally complex and have a verbal component in them, at least at certain stages of training.[2]

Consistent and accurate practice is essential in order to develop and maintain physical skills on a musical instrument. At some point, motor skills become automatic.

> As one moves from practice to performance, motor memory becomes increasingly reflexive and automatic without the need for conscious thought. It cannot be accomplished without the practice necessary to 'program' one's interneuromuscular computer.[3]

Musicians should understand the automatic nature of motor skills in order to avoid interference of subconscious functions.

> It cannot be repeated too often that the role of the musician's intelligence lies in selecting and educating the habits, in correcting them if need be; but there comes a stage when they must be allowed to work unimpeded.[4]

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[1] Alan D. Baddeley, The Psychology of Memory, (New York: Basic Books, Inc., 1976), p. 255.

[2] Jack A Adams, Human Memory, (New York: McGraw-Hill Book Co., 1967), p. 236.

[3] Nancy Bricaid and Ssherwyn M. Woods, M.D., "Memory Problems for Musical Performers," Journal of the College Music Society 18 (Fall 1978): 104.

[4] Lilias Mackinnon, Music By Heart, (London: Oxford University Press, 1938), p. 15.

Interdependence of Music Memory Factors

The ability to memorize music entails a complex combination of several memory processes.

> Certainly, memorizing music is an intricate and elaborate combination of processes--perhaps as complicated as any one thing people are asked to do. The kinesthetic factors entering into it are tactile, spatial and interdependent, insofar as one movement acts as a link in a chain of movements; the sensory factors are both visual and auditory, and the conceptual factor, little or as much as it may be employed, is occupied with analyzing and resynthesizing the musical organization in logical and continuous patterns.[1]

Although a great deal of evidence supports analysis in memorization, most musicians depend most heavily on motor memory. However, motor memory can be slow, tedious and unreliable in pressure situations.[2] The interrelationship between these two memory functions is important because, as previous mentioned, a continued conscious interference of what should be subconscious or unconscious motor function can cause problems with the automatic reflex of good muscular response.[3]

Gallwey discusses this relationship between the mind and body in The Inner Game of Tennis.[4]

> In other words, the key to better tennis--or better anything--lies in improving the relationship between the conscious teller, Self 1, and the unconscious, automatic doer, Self 2.[5]

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[1] Rubin-Rabson, "Memorizing," p. 23.

[2] Pro, "Acquired Skill," p. 3.

[3] Stewart Gordon, "The New Davidities XXII," American Music Teacher 21 (April-May 1972): 33.

[4] W. Timothy Gallwey, The Inner Game of Tennis (New York: Random House, Inc., 1974), pp. 3-61.

[5] Ibid., p. 13.

A working relationship, based on trust, needs to be developed between Self 1 and Self 2 in order for motor memory to function automatically. "The primary role of Self 1 is to set goals for Self 2, then to let Self 2 perform."[1]

Most sources agree that inner hearing needs to be used more in memorized performance,[2] especially in brass performance where the physical set determines the frequency of the pitch to be produced. Inner hearing acts as a cue for the physical responses needed to produce the note. "It is for the lips, aided by our ear, to regulate and control the rate of vibrations necessary to produce the note or notes desired.[3]

Each individual has different strengths which should be considered during the memorization process.

> There are lots of theories on how to memorize, yet it is doubtful if any two people memorize in quite the same fashion. Obviously the best way is that which is easiest and most reliable for the individual.[4]

After analyzing one's own strenths and weaknesses, the weaker memory functions may be emphasized during practice in order to develop a more well-rounded memory. The different memories may be emphasized at various points during the memorization of a piece in order to build more associations.

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[1]Ibid., p. 55.

[2]Thompson, "Help Students," p. 61.

[3]Rafael Mendez, Prelude to Brass Playing, (New York: Carl Fischer, Inc., n.d.), p. 21.

[4]Don Mills, "Pre-Fright Training," American Music Teacher 21 (April-May 1972): 33.

> In the initial steps toward learning a piece one should be able to employ each part of the memory singly for purposes of analysis and study. That this can be done after a piece has been thoroughly learned is open to question, for the consistent relation of one memory to the others, which happens naturally and inevitably, makes it almost impossible, in the later stages of learning, to deal with any of them entirely separately.[1]

Information-processing and Music Memorization

As previously mentioned, memory involves several interdependent subsystems including encoding, storage and retrieval as well as three memory stores--sensory store, STM, and LTM. The music memory functions--analytical, aural, visual, and motor--are also interdependent and each one may be emphasized during practice in order to collaborate more effectively during performance. In relating information-processing to music memorization, three essential ingredients surface: attention, organization, and association.

During the sensory stage, many types of input are taken in through the senses. When rehearsing a passage of music, a musician may be aware of several inputs simultaneously. The following possibilities may be considered: 1) visual--the printed page and other objects in the environment, 2) aural--feedback from performance and other extraneous sounds, 3) smell--familiar and unfamiliar odors within the environment, and 4) feel--physical sensations of performance

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[1] Rubinstein, Sight-Reading and Memorizing, p. 50.

as well as input about the temperature of the environment. Although some of these sensory inputs are not related to the task, they have the potential of gaining the attention of the musician. However, with concentration, the applicable inputs are selected and transferred into STM.[1]

STM requires not only attention, but also organization and association. The three components of STM--previous LTM store, memory span, and rehearsal--play important roles in music memorization.

The previous LTM store includes previously acquired knowledge about music and performing. This body of knowledge includes composition rules, cognitive knowledge of terms, translative knowledge of musical notation, and knowledge of stylistic interpretation. This information may be used to interpret received information, compare information to what is known, and evaluate and associate for the purpose of storage and retrieval. The amount and quality of previous knowledge about music, in addition to performing experience, aids in the interpretation and encoding of new material.

The memory span, the limit of information that can be held in STM, includes about seven chunks or bits of information.[2] The capacity of STM can be expanded by building

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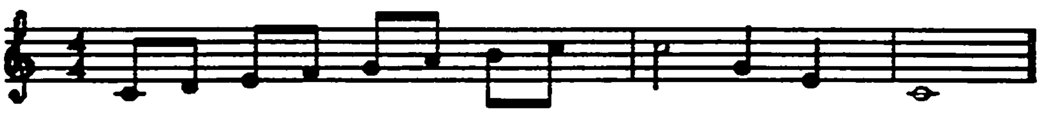
[1]Klatzky, Human Memory, p. 70.

[2]Miller, "The Magical Seven," p. 81-87.

larger chunks which means organizing and relating several bits of information into a structure. For example, the pitch patterns in the following passage could equal ten chunks (C to D, D to E, E to F, F to G, G to A, A to B, B to C, C to G, G to E, and E to C) or two chunks (up the C-major scale and down the C triad).



The ability to build larger chunks is relative to technical ability, knowledge of musical structure, and previous performing experience.

Expanding the memory span in music is complicated by the many bits of information that are processed simultaneously. For example, in order to play a measure of music, a performer must process several bits of information: (1) the notes and rhythms, (2) how it will sound, (3) dynamics and style, and (4) how to produce the sound. Without storage of a variety of musical experiences and prior rehearsal, the bits of information quickly overload the STM span of the performer. In other words, some of the information may be automatic or easily associated with previous knowledge, while other concepts are new and require more attention, therefore limiting the STM capacity. However, with more advanced technical ability, knowledge of musical structure, and prior experience in performance, a musician is able to increase the memory span by building larger chunks.

In comparing the two types of rehearsal, maintenance rehearsal involves basically thoughtless repetition of passages, while elaborate rehearsal includes attention to the organization and association required for storage in LTM.

> Attentive repetitions implies practice with concentration and there can be no reliable memorizing or performing without it. It naturally follows that the greater the concentration the fewer repetitions will be required.[1]

In order for the complex combination of mental and physical skills to register, the rehearser needs to be organized and observant at all times.

Because of the rapid retrieval required during performance, overlearning is essential for reliable music memory.

> A memory available at will, as opposed to recognition or involuntary recall, necessitates a higher degree of overlearning; and the most productive, economical and natural way of attaining dependable retrieval processes is related to the manner of encoding and to the timing of practice sessions which repeatedly reactivate the memory traces.[2]

However, experimental evidence indicates that there should be emphasis on quality of overlearning rather than quantity.

> Thus overlearning is indispensable to freedom in performance but yields greater attention capacity, which needs to be fully occupied by a rich substratum of previous musical analysis and understanding of the work; this is protection against possible intrusion or distraction capturing an attention channel which by virtue of high arousal is of greater capacity.[3]

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[1]Robert Rayfield, "Memorizing at the Organ," The Diapason 56 (August 1965): 34.

[2]"Psychology," Groves, p. 418.

[3]Ibid.

Therefore, the effectiveness of overlearning depends upon attention to content and organization of the material being memorized.

The efficiency of LTM is dependent upon how well information has been encoded and rehearsed in STM. Therefore, all information should be encoded properly through organization and association. Analysis may be considered as a method of encoding music. In the process of analysis, a musician perceives a form and associates it with previous information or develops a new logical structural component. Through a cognitive understanding of the music, involving analysis as well as aural, visual, and motor memory, a musician develops an LTM that is retrievable and applicable to future encounters with music. Since the rate of recall required in music performance happens at an incredible speed, little time is available for an extensive LTM search. Therefore, at all times, the memory system, nerves, and muscles must respond at a well-synchronized and organized level.

Through insight into information-processing and music memory, a musician may be able to understand the components necessary for successful music memorization and to systematically apply these components during practice and performance. In addition, this information may lead to more effective approaches to teaching music memorization.

Teaching Memorization

A review of articles on music memorization reveals (1) that memorization techniques should and can be taught, and (2) that the best approach involves analysis coupled with visual, aural, and motor memory.

> The psychologists who devote attention to this area tend to empahsize an enviromental base. That is to say, memory--regardless of its evaluated level in a given situation--can be improved through training. Such improvement, then, it is evident, must come by way of increased perceptive speed and broader apperceptive preparation.[1]

Improvement does not come through requiring material to be memorized without guidance, because bad memorization habits may develop in addition to a lack of confidence in memorization skills.

Teaching memorization through analysis may be approached in a variety of ways: 1) assisting the student in memorization through an aural model and guided analysis,[2] 2) using a Gestalt approach to analyze the whole then move to the parts, always thinking of the relationship to the whole,[3] 3) increasing the knowledge of compositional rules and future material,[4] and 4) finding "pick-up spots" that can be

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[1]Vernon W. Stone, "Memorizing at the Piano," Music Journal 17 (February 1959): 34.

[2]William Krevit, "Memorizing," American Music Teacher 1 (January-February 1952): 3.

[3]Pro, "Acquired Skill," p. 31.

[4]Eric Steiner, "Memorizing Chinese Poems?" American Music Teacher 4 (November-December 1954): 4.

used in case of memory lapses.[1]

A myriad of memorization aids are suggested by authors of books and articles. Most suggestions are based on the personal performing or teaching experience of the author rather than systematic experimentation. However, such observations are often valid and do merit listing. The following list represents the most frequently mentioned memorization aids: 1) distribute practice sessions,[2] 2) limit new material at each practice session,[3] 3) study music away from the instrument,[4] 4) self test frequently to check retention of memorized material,[5] 5) transcribe the memorized material from memory,[6] and 6) develop confidence through positive suggestion.[7]

Previous Research

Although a multitude of articles have been written on memorization, very few experiments have been undertaken to

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[1]Celia Mae Bryant, "Memorizing: a Science," Clavier 2 (October 1963): 22.

[2]Grace Rubin-Rabson, "Studies in the Psychology of Memorizing Piano Music: II. A Comparison of Massed and Distributed Practice," The Journal of Educational Psychology (1940): 279.

[3]"Psychology," Groves, p. 420.

[4]Andor Foldes, "A Musicians Working Capitol," Etude 64 (August 1951): 17.

[5]Paul Paradise, "Don't Forget Memorization," The School Musician, Director and Teacher 44 (June-July 1978): 24.

[6]James Francis Cooke, How to Memorize Music, (Pennsylvania: Theodore Presser Cl., 1948), p. 14.

[7]Kenneth Sarch, "Memory and Music," American Music Teacher 13 (November-December): 17.

determine a single recommended method of memorization or those factors in musical memory which result in better memorization and retention. Review of studies in this area is limited to those that involve music performance.

The most extensive research on music memorization was published by Rubin-Rabson between 1937 and 1947. Although these numerous studies dealt with the memorization of piano music, they have some relevance to the memorization process used by other instrumentalists. The following results of three studies were of particular interest. 1) Pre-study analysis significantly improved memorization efficiency.[1] 2) A comparison of pre-study periods (three, six, and nine minutes in length) revealed that learning trials were significantly reduced when the pre-study period was doubled or tripled; however, the tripled period offered no advantage over the doubled one.[2] 3) In a comparison of the whole versus part method, no superiority was found in either of the approaches and retention was not affected by having first learned the whole in smaller parts.[3]

All of Rubin-Rabson's studies involved the counterbalanced

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[1]Rubin-Rabson, "Analytical Pre-Study," pp. 1-57.

[2]Grace Rubin-Rabson, "Studies in the Psychology of Memorizing Piano Music: V. A Comparison of Pre-Study Periods of Varied Lengths," Journal of Educational Psychology 31 (1941): 101-112.

[3]Grace Rubin-Rabson, "Studies in the Psychology of Memorizing Piano Music: III. A Comparison of the Whole and the Part Approach," Journal of Educational Psychology 81 (1941): 460-476.

design which provided only partial control.[1] The treatments included several variables resulting in questionable internal validity. Although the studies were well-organized, they lack randomization and other benefits of more contemporary experimental procedure and data analysis.

A more recent study by Shockley analyzed the effect of a pre-study method called "mapping" on the memorization and sight-reading of piano music.[2] Perhaps because of complications in the procedure and measurement, a significant difference was not found after treatment. This study served mainly as an example of the complexity of measuring memorized performance and the numerous variables involved. Due to the lack of a pilot study, the reliability and validity of the testing and scoring were questionable. Results of the study were empirically inconclusive. Perhaps with a different design and procedure, more revealing results might have been observed.

Four studies were found that focused on the memorization of single-line material. The study by Ross[3] represents a primary influence on this study. The results of studies by

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[1] Stephan Isaac and William Michael, Handbook in Research and Evaluation, (San Diego, Ca.: Robert R. Knapp, 1971), p. 49.

[2] Rebecca Payne Shockley, "An Experimental Approach to the Memorization of Piano Music with Implications for Music Reading," (DMA dissertation, University of Colorado, 1980).

[3] Ross, "Analytical Guidance."

Becker,[1] Williamson,[2] and Buckner[3] are mentioned because they represent the diversity of areas involved in music memorization.

Using Rubin-Rabson's study as a model, Ross found that extensive analytical guidance significantly improved the memorization efficiency of college woodwind players.

> An analysis of tonal relationships, the use of imitation, important intervals, repetitions of motives and phrases, and rhythmic patterns is of utmost importance in reducing the time required for memorization, even to those instrumentalists limited to a one-dimensional line.[4]

The results of this study may be questioned due to the following design characteristics: 1) The study involved subjects who were selected on the basis of performance ability and matched according to the results of a memorization pretest and intelligence test. 2) For the experimental treatment, the experimental group memorized twenty selections with analytical guidance while the control group was given only the pretest and posttest.[5] These two factors, the lack of randomization and the preferential treatment of the experimental group, could have significantly influenced the results.

Becker, using junior high school students as subjects,

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[1] William Robert Becker, "The Effect of Overlearning, Initial Learning Ability and Review Upon the Music Memory of Junior High School Cornet and Trumpet Players," (Ph.D. dissertation, University of Iowa, 1962).

[2] Williamson, "Memorizing Songs."

[3] Buckner, "Aural Models."

[4] Ross, "Analytical Guidance," p. 86.

[5] Ibid, pp. 4 and 5.

studied the effect of overlearning on the retention of trumpet music. The memorization system did not include analysis, and no evidence was found to support the belief that overlearning of music facilitates recall at a later date.[1]

Williamson, using adult males as subjects, found that singers benefited in speed of memorization after hearing a taped lecture on memorization techniques. The study also revealed that transfer of training and retention were aided by the treatment.[2]

Tape-recorded aural models were used in Buckner's study to determine if using an aural model during memorization would aid in efficiency of memorization. Twenty-eight university instrumentalists were used as subjects. The aural model had little effect on memorization, but did tend to increase the goal-oriented behavior.[3]

The previously mentioned studies give some insight into music memorization as applied to performance. However, more information through empirical study must be collected in order to achieve a better understanding of single-line music memorization.

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[1]Becker, "Overlearning," p. 67.

[2]Williamson, "Memorizing Songs," p. 105.

[3]Buckner, "Aural Models," p. 203.

Summary

The information-processing theory of memory describes the memory system as a continuous process that involves ". . . memory, perception, learning, language, and problem solving as well as encoding, storage, and retrieval of information."[1] The sensory store, STM, and LTM are interdependent functions that affect the storage and retrieval of material. The four types of music memory (analytical, visual, auditory, and motor) are also interdependent and reinforce each other during music performance. Through focus on the separate functions involved in music memorization, a musician may systematically analyze and emphasize each function, resulting in improvement of the entire memorization process.

A few studies have given insight into one or more of the aspects of the music memorization process. Authors of articles give suggestions on music memorization through personal experience and observation. Only three books were found written exclusively on music memorization: Guide to Memorizing Music by Goodrich in 1906,[2] Music by Heart by Mackinnon in 1938,[3] and How to Memorize Music by Cooke in 1948.[4]

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[1]Klatzky, Human Memory, p. viii.

[2]A. J. Goodrich, Guide to Memorizing Music (New York: The John Church Co., 1906).

[3]Mackinnon, By Heart.

[4]Cooke, How to Memorize.

Although memorized performances are expected by audiences and preferred by some musicians and teachers, little research has been done to determine the necessary procedures for efficient memorization and ways of insuring against memory lapse. In addition, previous experiments in verbal and motor memory may guide music research, but

> applying the learning principles derived from non-musical experimental studies of memory will not suffice. None of these comprises at once the motor, kinesthetic, temporal, spatial, aural, visual, intellectual, melodic, and harmonic aspects as piano (instrumental) learning does.[1]

The psychomusicological theory with empahsis on process provides a solid foundation for the present study and future research. The challenge lies in measuring not only musical behavior but also in developing ways of determining how a body of musical knowledge is applied during a music memorization task.

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[1]Rubin-Rabson, "Psychology," p. 45.

CHAPTER III

DESIGN

Introduction

Music memorization involves a complex combination of several memories and skills. In order to observe how memory factors are applied during the memorization task, attention should focus on the process rather than the end product.[1] In this study, emphasis was placed on the problem solving process and its relationship to memorization efficiency.

Two previous experiments indicated that analytical guidance training[2] and knowledge of memorization techniques[3] improved single-line memorization efficiency. Therefore, combining a lecture on human/music memory with structured memorization assignments was hypothesized as leading to improved memorization efficiency. In addition, the analytical procedure was emphasized and observed during testing in order to give more insight into factors which enhance memorization skills.

The research study was carried out in two stages: pilot study and main study. The purposes of the pilot study were

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[1]Laske, Memory, p. 54

[2]Ross, "Analytical Guidance."

[3]Williamson, "Memorizing Songs."

to determine the reliability and validity of the posttest procedure through intra-rater and inter-rater agreement and to determine the appropriateness of the memorization assignment.

The purpose of the main study was threefold: 1) to determine if a significant difference existed among the groups on the number of analytical observations and memorization efficiency, 2) to determine the relationship between analytical observation ability and memorization efficiency, and 3) to determine if previous performance experience, represented by grade level, affects analytical ability and memorization efficiency.

The experimental design of the main study involved a randomized, posttest-only, control group design incorporating two experimental groups and one control group. Both experimental groups, Groups I and II, received five memorization assignments with analytical questions. Additionally, Group I received a lecture on human/music memory. The control group, Group III, participated in the study by completing the memorization assignments without guidance. The independent variables were the lecture on human/music memory and analytical questions with the memorization assignment.

At the conclusion of the treatment, the posttest was administered in order to measure 1) analytical observation ability (the number of observations made by the subject during the memorization task) and 2) memorization efficiency (the amount of time required to reach the memorized performance). The following hypotheses were then tested:

1) There is no significant difference in the analytical observation ability of the experimental group receiving five memorization assignments and that of the experimental group receiving five memorization assignments and a lecture on human/music memory.

2) There is no significant difference in memorization efficiency among the two experimental groups and the control group.

3) There is no significant correlation between the number of analytical observations and the memorization efficiency of the experimental groups.

4) There is no significant difference in the analytical observation ability of Level I students (freshmen, sophomores, and juniors) and Level II students (seniors and graduate students) of the experimental groups.

5) There is no significant difference in the memorization efficiency of Level I and Level II in the experimental and control groups.

Pilot Study

A purpose of the pilot study was to determine the reliability and validity of the posttest procedure, material and scoring. One memorization assignment was administered to prepare the pilot study subjects for the posttest and to test the material and procedure of the memorization assignment.

The posttest was administered to five brass players at Notre Dame University selected by the researcher on the basis of performance experience. Tapes of the posttest performance of each pilot study subject were evaluated by the researcher and a panel of four brass experts at Ohio University.

Prior to listening to the tapes, the evaluators were instructed in the criteria for rating the analytical observations on the analysis check-list (Appendix B). A sample tape was used during instruction for discussion and practice in the evaluation procedure.

Reliability of the posttest was determined by the Scott coefficient of intra-rater agreement. "Reliability . . . can be thought of as the percentage of rater's agreement with himself with correction for chance factors and the perfect rating."[1] The researcher evaluated each tape twice with a six-week time interval between evaluations. A reliability coefficient of .90 was chosen as the minimal acceptable level since reliability coefficients are expected to be in the upper brackets of r values, usually .70 to .98.[2]

Two types of validity were considered: content validity and criterion-related validity. Content validity was deter-

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[1] Richard L. Ober, Ernest L. Bentley, and Edith Miller, Systematic Observation of Teaching (Englewood Cliffs, NJ: Prentice Hall, Inc., 1971), p. 79.

[2] J. P. Guilford and Benjamin Fruchter, Fundamental Statistics in Psychology and Education (New York: McGraw-Hill Book, 1975), p. 92.

mined by the judgment of the researcher and the Ohio University brass faculty. A list of etudes and solos used by brass instructors at Ohio University served as a guide for content validity. In addition, the Ohio University brass faculty responded to a questionnaire on the validity of the analytical observation measurement, memorization efficiency, and posttest material (Appendix F).

To determine criterion-related validity of the measuring instrument, the ratings were compared using the Scott coefficient of inter-rater agreement. Validity, as determined by the Scott coefficient, is a percentage of rater agreement between observers, with a correction for chance factors and the perfect rating.[1] For the purpose of this study.

> the criterion judgment would be the observation of an expert, the investigator, to which the coefficient of agreement of the trained observers (also experts) would be assessed.[2]

A validity coefficient of .80 was chosen as the minimal acceptable level for the inter-rater agreement since validity coefficients may be as high as .80.[3]

<u>Material</u>

The posttest material (Appendix A) and weekly memoriza-

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[1]Ober, <u>Systematic Observation</u>, p. 79.

[2]Richard C. Gipson, "An Observational Analysis of Wind Instrument Private Lessons," (D.Ed. dissertation, The Pennsylvania State University, 1978), p. 101.

[3]Guilford, <u>Statistics</u>, p. 92.

tion assignments (Appendix E) were sixteen measures in length and of moderate difficulty. Limiting the length of the material facilitated a manageable time limit for the posttest. A moderate level of difficulty allowed the subject to focus on memorization rather than performance problems.

The music was specifically composed for the study using the following criteria from Ross's study: the test material should 1) be a complete and logical musical thought, 2) be composed with one or two basic motives, 3) adhere to the range requirements and technical demands of the instrument, 4) reflect the style and articulation familiar to an instrumentalist with moderate experience, and 5) be interesting and musical.[1]

The level of difficulty was determined by a review of etudes and solos in conjunction with suggestions from brass instructors at Ohio University. A list of etudes and solos used by those instructors served as a guide for the moderate level of performance skills required. The test material was composed by Ernest E. Bastin, Professor of Trumpet and Chairman of Performance Studies at Ohio University (Appendix A). To confirm the appropriate level of difficulty, the material was reviewed by members of the Ohio University brass faculty according to the previously mentioned criteria.

Procedure

Two procedures were evaluated during the pilot study:

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[1]Ross, "Analytical Guidance."

1) the memorization assignment and 2) the posttest. Prior to taking the posttest, pilot study subjects completed one memorization assignment. The same procedure was followed by each subject: 1) obtain the material and analytical question sheet from the instructor, 2) answer the questions and memorize the material within twenty minutes, and 3) verbalize about the formal content of the material and perform from memory. The verbalization procedure served to, 1) encourage subjects to "think aloud" in order to apprehend the content of the material, and 2) prepare the subject for the requirements of the posttest.

For the posttest, each subject was asked to memorize the test material with a goal of two consecutive memorized performances. Thinking-aloud protocol and action protocol were used to empirically observe the information-processing behavior required to complete the task. According to Laske,

> Protocols, as used in cognitive psychology, are lists of natural or formal language statements documenting some behavioral process. Thinking-aloud protocols are documentations of verbally mediated thought as it occurs during a problem solving session. Action protocols document the actions taken by a problem solver.[1]

An example of thinking-aloud protocol would be a statement about a repeated rhythmic motive within the test material. Counting or clapping the rhythmic motive would be considered action protocol.

During the memorization process, subjects were asked to

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[1]Otto E. Laske, Memory, p. 20.

verbalize analytical observations and any other thoughts concerning the memorization task (thinking-aloud protocol) as well as play through the material. No guidance was given during the posttest. Verbal observations and performance trials were allowed to occur in any sequence. In addition, subjects were required to 1) use a metronome to insure consistency in tempo, 2) refer to the manuscript as many times as necessary, and 3) decide when the material was prepared for a memorized performance. Singing, clapping, or counting rhythm patterns, moving valves or slide, and other overt responses (action protocol) were allowed, but not suggested or encouraged.

The material was considered memorized when played twice in succession according to the following criteria:

1. Played without the score.
2. Played through without stopping.
3. Played with no wrong notes.
4. Played without omitting notes.
5. Rhythm maintained as written.
6. Observed metronomic speed as set for example.[1]
7. Observed articulation marks.
8. Played with good intonation.[2]

The posttest was tape-recorded for later evaluation.

<u>Measurement</u>

Two scores were recorded for the posttest, one for memorization efficiency and the other for analytical observations. <u>Memorization efficiency</u> was determined by the amount of time

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[1] Rubin-Rabson, "Analytical Pre-Study," 25.

[2] Ross, "Analytical Guidance," 38.

required to memorize the material as defined by two correct performances according to the previously stated performance standards. The time interval started after instructions were given by the researcher and ended after the final memorized performance.

An analysis check-list was prepared with analytical observations of the test material to record thinking-aloud and action protocol (Appendix B). The analysis check-list included the following categories: 1) general observations on rhythm, melody, and form, 2) overt responses such as singing, clapping or counting rhythms, and moving valves or slide, and 3) specific observations and associative observations on form, rhythm, melody, and dynamics (organized phrase by phrase). Each category included a section for incorrect observations as well as additional statements not included on the analysis check-list. Since the evaluation involved a tape-recorded performance, the evaluator was encouraged to rewind selected portions and review comments when rating analytical observations.

Results

Memorization Assignment. All five of the pilot study subjects were able to complete the memorization assignment within twenty minutes. The analytical questions were understandable and gave the subject insight into the material being memorized. It was necessary for the researcher to prompt thinking-aloud protocol with questions about the analytical content of the material.

Posttest. The following aspects of the piloted posttest are covered: material, procedure and revisions. The musical test material was considered acceptable if the following criteria were met: 1) the subjects were able to make verbal comments about the formal content (i.e., formal structure, motives, etc.) and 2) there were no consistent performance problems. In addition, a review by four Ohio University brass faculty resulted in the following response to the difficulty level of the material:

Question: Is the posttest music of moderate difficulty?

Response: two strongly agree and two agree (Appendix F).

During the posttest, subjects understood the instructions given by the researcher and were able to articulate analytical observations. Although all five subjects completed the memorization assignment, one subject was not able to attain the memorized performance of the posttest material. It was determined by the researcher and the Ohio University brass faculty that the subject was not able to attain the goal due to performance level problems, mainly accuracy and technical ability.

One aspect of the posttest was revised. During the pilot study, subjects were asked to verbalize analytical observations and any other thoughts concerning the memorization task as well as play through the material. Verbal observations and performance trials often occurred in random order. This procedure was awkward for the subjects, evaluators and scoring procedure. It also did not encourage analysis before performance trials. During the main study, posttest subjects were asked to make verbal observations before performance trials. Therefore, the analytical observations and performance trials were measured separately. In addition, since subjects in the control group would not make verbal observations, a more accurate comparison of data would be obtained if analytical observations were made separately from performance trials. With the aforementioned results and revisions, the posttest was considered acceptable.

Scoring. The posttest produced scores for both analytical observations and memorization efficiency. Each observation made by the subject was indicated by the evaluator on the analysis check-list. Every correct thinking-aloud and action protocol, including those not listed on the check-list, was assigned a point value (Appendix B). Observations were in two basic categories--specific and associative. Specific observations as well as overt responses were worth one point while associative observations were worth two points. The increased point value for associative observations was determined by information gained in background research which indicated that associating new information into a previously known structure increases retention and long-term memory storage.[1] In addition, the encoding of information from low-information chunks to high-information chunks improves the

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[1]Sharon Begley and John Carey, "The Mystery of Memory," Newsweek, June 1, 1981, p. 89.

efficiency of STM.[1] Incorrect observations, which might either aid in or be detrimental to the memorization task, were recorded but not assigned point values. In order to clarify the interpretation of data, incorrect observations were indicated on the analysis check-list. To further check the validity of the analytical check-list, the Ohio University brass faculty were asked the following questions:

1) Does the verbal analysis of music indicate the analytical ability of the subject? Response: strongly agree--1, agree--2, agree with reservation--1.

2) Does the analysis check-list provide an objective method of rating verbal analysis? Response: strongly agree--2, agree--2 (Appendix F).

During the pilot study, memorization efficiency included verbal observations and silent practice as well as performance trials. Due to the previously mentioned changes in procedure, memorization efficiency included only performance trials. The time interval started at the beginning of the first performance trial and ended after the final memorized performance. The Ohio University brass faculty agreed unanimously on the revised process of the measurement of memorization efficiency (Appendix F).

Reliability and Validity. Four of the five tapes were evaluated by the researcher and four members of the Ohio University brass faculty. The fifth tape was eliminated because the subject did not reach the memorized performance.

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[1]Loftus, Human Memory, p. 45.

Reliability was determined by the Scott coefficient of intra-rater agreement. The researcher evaluated each tape twice with a six-week time period between evaluations. The criterion r value was .90. Results of the pilot study tape evaluations revealed a coefficient of .96 for intra-rater reliability.

The Scott coefficient of inter-rater agreement was used to determine the criterion-related validity of the measuring instrument. The evaluations by the researcher were compared to the evaluations by four members of the Ohio University brass faculty. A coefficient of .80 was set as a minimum requirement for inter-rater validity. The results of the pilot study evaluations ranged from .86 to .96. (see Figure 1)

FIGURE 1
Inter-rater Correlation Coefficients

	E1	E2	E3	E4	E5
E1	1.00	.99	.99	.99	.94
E2	.99	1.00	.98	.97	.90
E3	.99	.98	1.00	.99	.96
E4	.99	.97	.99	1.00	.97
E5	.94	.90	.96	.97	1.00

Main Study

Introduction

The design of the experimental portion of the main study was the randomized, posttest-only, control group design.[1]

[1]Donald T. Campbell and Julian C. Stanley, Experimental and Quasi-Experimental Design for Research, (Chicago: Rand McNally, 1966), p. 25.

Random assignment was used to equalize the experimental and control groups. Most experts in music education agree that

> the most adequate all-purpose assurance of lack of initial biases between groups is randomization. Within the limits of confidence stated by the tests of significance, randomization can suffice without the pretest.[1]

The independent variables were 1) the presence or absence of a lecture on human/music memory and 2) the presence or absence of analytical questions with the memorization assignments. The dependent variables included a) analytical observations and b) memorization efficiency as measured by the posttest. In order to avoid the reactive effects of the experimental procedure, all three groups were given the same number of memorization assignments.[2]

Setting

The main study was conducted during the 1983 Spring Quarter at The Ohio University in Athens, Ohio. Ohio University has an enrollment of approximately 15,000 students on the main campus with an additional 3,000 students on branch campuses. The School of Music consists of thirty-three full time faculty and maintains an enrollment of approximately 250 music majors.

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[1]Donald T. Campbell and Julian C. Stanley, Experimental and Quasi-Experimental Design for Research, (Chicago: Rand McNally, 1966), p. 25.

[2]Isaac, Handbook in Research, p. 40.

Subjects

Forty-two brass players from Ohio University participated as subjects in the study. Three subjects were randomly eliminated from the total enrollment of forty-five brass players who were pursuing bachelor's or master's degrees in music or music education. Subjects were then randomly assigned to three groups with fourteen subjects in each group. The sample population was stratified according to levels; Level I included freshman, sophomores, and juniors and Level II included seniors and graduate students. Each group contained seven from each strata. The following figure illustrates the instrumentation of each group.

FIGURE 2
Instrumentation in Each Group

	G1	G2	G3
Trumpets	7	8	4
Horns	1	1	2
Trombone	5	3	6
Tuba	1	2	2

All subjects were enrolled in private lessons on their principal instrument. Approximately sixty percent of the total pool participated or had recently participated in the Ohio University marching band. While a memorized performance is not required for juries or recitals, all marching band music must be performed from memory. Subjects were told that they were participating in a special program to improve memorization ability.

Treatments

As previously mentioned, three groups were used in the experiment. Experimental group I (n=14) received five memorization assignments with analytical questions and a lecture on human/music memory. Experimental group II (n=14) received only the five memorization assignments with analytical questions. Group III (n=14) served as the control group and completed five memorization assignments without guidance. The same memorization assignments were given to each group. The length and difficulty of the material was equivalent to the posttest material and was composed by Ernest E. Bastin (Appendix E).

Experimental groups I and II. Experimental groups I and II completed five memorization assignments during the five-week period with one week between each assignment. The assignments were accompanied by analytical questions designed to focus on the formal content of the material. Analytical questions were developed by the researcher.

The purpose of the memorization assignment with analytical questions was to develop memorization skills through the analysis of material during the memorization process. The analytical questions (Appendix E) were designed to encourage the subject to 1) analyze the overall form, 2) make associative observations about the relationship of phrases, 3) look for rhythmic and melodic motives, and 4) make associative observations about dynamics and articulation.

The following procedure (tested during the pilot study) was followed by each subject: 1) obtain the material and analytical questions from the instructor, 2) answer the questions and memorize the material in twenty minutes or less, and 3) return to the instructor to verbalize the formal content of the material and perform from memory. During the practice period, subjects were encouraged to achieve two or more consecutive memorized performances. If questions and memorization were completed prior to the time limit, subjects were asked to continue rehearsal of the material by testing for retention. Subjects were required to use a metronome during practice to insure consistency in tempo.

Since the verbal analysis required in the posttest represented an unfamiliar procedure, a performance for the instructor (with verbal analysis) served as preparation for the posttest. The instructor encouraged analysis through questions about the material. All subjects were encouraged to achieve the goal of two consecutive memorized performances. When the subject was unable to achieve the goal, the instructor discussed the analysis procedure and asked the subject to reflect on possible reasons for the problem. One memorization assignment was completed each week. The instructor retained the analytical question sheet for feedback on each subject's performance.

Experimental group I received the same memorization assignments with analytical questions and performance follow-ups as described above. In addition, one week prior to the first memorization assignment, Group I received a thirty-minute lecture on human/music memory followed by questions and discussion totaling no more than one hour. At the conclusion of the session, subjects were instructed on the procedure for the memorization assignment. Group I subjects were asked not to share the information from the lecture with other students.

The memory lecture, based on information set forth in Chapter II, was presented by the researcher (Appendix C). Subjects received a written outline to follow during the lecture and to use as a guide for the discussion session (Appendix D). The lecture was approximately thirty minutes in length and was followed by ten minutes of discussion. Only three questions were asked by students after the lecture. An additional fifteen minutes was devoted to discussion of the memorization assignment procedure.

The lecture was divided into four parts: 1) an introduction to the advantages and disadvantages of memorized performance and reasons for memory lapses, 2) an overview of the human memory process, 3) discussion of the memory functions in musical memory, and 4) suggestions and discussion on how to improve memorization efficiency. The lecture and subsequent discussion was video-taped by the Ohio University Radio-Television Department and placed on file at Ohio University.

Control group III. Group III subjects completed the same five memorization assignments as Groups I and II. However, Group III did not receive analytical guidance. The following procedure was followed by each Group III subject: 1) obtain the material from the instructor, 2) memorize the material in twenty minutes or less, and 3) return to the instructor to perform from memory. The memorization assignments were completed one per week for five weeks.

Posttest

At the conclusion of the five-week treatment period, the posttest was administered to each subject by the researcher. All subjects were assigned a forty-five minute time period. Subjects from Experimental groups I and II were asked to verbally analyze the material, then practice until the goal of two consecutive memorized performances was reached. Group III subjects were asked to memorize the posttest material with a goal of two consecutive memorized performances. No verbal guidance was given after the performance trials began. If the subject made an error during a performance trial, the researcher would point to the measure in which the error occurred.

The posttest performance was tape-recorded for later evaluation. To maintain rater consistency in scoring, three tapes were randomly selected and rated by the Ohio University brass faculty. The intra-rater reliability and inter-rater validity values for the main study are reported in the next chapter.

Data Analysis

At the conclusion of the posttest, two scores were tabulated: 1) analytical observations which were rated on the analytical check-list and 2) memorization efficiency which was determined by the time interval required to memorize the material. Using these data, the previously stated null hypotheses were tested.

A comparison between groups and levels on the variables of analytical observations and memorization efficiency was determined by a Two-Way Analysis of Variance. The Scheffe Test for Variables was used as a follow-up procedure. A correlation between analytical observations and memorization efficiency was determined by the Pearson Product-Moment correlation coefficient.

Summary

Throughout this study, focus was on the process of memorization in addition to the end product of memorized performance. The basic premise of this study concerned process as the source of memory problems. A significant part of the music memorization process involves analysis of formal content. Therefore, comparing the analytical ability (analytical observations made during the problem solving process) with memorization efficiency may indicate factors which enhance music memorization ability. In addition, more knowledge of the memory process provided by a lecture on human/music memory may give insight into the memory process and motivation for the application of analysis to the memorization task resulting in a significant improvement of memorization efficiency.

A pilot study was undertaken to develop a method of measuring analytical ability and memorization efficiency. Reliability and validity were determined through intra-observer and inter-observer comparisons. The posttest procedure was modified according to the results of the pilot study. For the main study, forty-two subjects were randomly assigned to three groups: Experimental groups I and II completed five memorization assignments with analytical questions. In addition, Experimental group I received a lecture on human/music memory. Control group III completed five memorization assignments without guidance. A posttest measuring memorization efficiency was administered to all subjects. Groups I and II verbally analyzed the material before memorizing to determine analytical ability. The posttest scores were tabulated to compare the variables of memorization efficiency and analytical ability.

CHAPTER IV

RESULTS

The results of the main study include a discussion of the data obtained to test the five hypotheses stated in Chapter I. As previously mentioned, two scores were tabulated for each subject in Groups I and II, one for analytical observations and one for memorization efficiency. For Group III, only memorization efficiency was measured. In order to maintain rating consistency within the main study, three analytical observation scores were compared. Intra-rater reliability was computed at .99 with inter-rater validity ranging from .90 to .98.

The scores were then compared using a Two-Way Analysis of Variance which determined the between groups and level differences on the variables of analytical observations and memorization efficiency. For analytical observations, the data were compared in an RS7 in (G2 X L2) design, or seven random subjects nested in each cell of a matrix created by the crossing of two groups with two levels (see Figure 3, Analytical Observations). For memorization efficiency, the data represented an RS7 in (G3 X L2) design, or seven random subjects nested in each cell of a matrix involving the crossing of three groups with two levels (see Figure 3, Memorization Efficiency).

FIGURE 3
Pictorial Illustration of Research Design

Analytical Observations

	L1	L2
G2	n=7	n=7
G3	n=7	n=7

Memorization Efficiency

	L1	L2
G1	n=7	n=7
G2	n=7	n=7
G3	n=7	n=7

Follow-up analysis procedures compared means via Scheffe's Test for Variables. Scheffe's test controls the Type I experimentwise error rate, but provides less control for a Type II error, therefore representing a conservative comparison. Results are stated for Hypotheses 1, 2, 3, 4 and 5 respectively.

Hypothesis I

Hypothesis I states that there will be no significant difference in the analytical observation ability of the experimental group receiving five memorization assignments (Group II) and that of the experimental group receiving five memorization assignments and a lecture on human/music memory (Group I). The five memorization assignments for both groups were identical and included analytical questions to aid in the memorization process. A Two-Way Analysis of Variance was used to test the hypothesis of no difference. Table 1 reports the results of the analysis of variance.

TABLE 1
ANOVA Summary Table for the Variable
ANALYTICAL OBSERVATIONS

SOURCE	DF	SS	MS	F	PROB
GROUP	1	302.29	302.29	8.82	0.007
LEVEL	1	146.29	146.29	4.27	0.05
GROUP LEVEL	1	41.29	41.29	1.20	0.28
ERROR	24	822.86	34.29		

The analysis of variance procedure indicated a between groups relationship of $F\ (1,36) = 8.82$, $p < .007$. In other words, the difference between groups was significant beyond the .01 level. The indicated level significance is discussed later in Hypothesis IV. The Interaction F for group and level was not significant. A follow-up procedure using Scheffe's variable test revealed that the difference between the means of Group I and Group II was significant at the .05 level. These results are reported in Table 2; means with different letters are significantly different.

TABLE 2
Scheffe's Test for Variable
ANALYTICAL OBSERVATIONS

GROUP	MEAN	N	SCHEFFE GROUPING
G1	23.50	14	A
G2	16.92	14	B

Group I which received the memory lecture and analytical questions with memorization assignments made significantly

More observations than Group II which received only the analytical questions.

Hypothesis II

Hypothesis II states that there will be no significant difference in memorization efficiency among the three groups. Table 3 reports the results of the analysis of variance.

TABLE 3
ANOVA Summary Table for the Variable TIME

SOURCE	DF	SS	MS	F	PROB
GROUP	2	267.03	133.52	3.30	0.05
LEVEL	1	55.84	55.84	1.38	0.25
GROUP LEVEL	2	150.89	75.45	1.86	0.17
ERROR	36	1,457.71	40.49		

An analysis of variance for the time variable reveals $F(2,36) = 3.30$, $p < .05$ for the between group difference which indicates that the null hypothesis was rejected at the .05 level. However, neither the Interaction F nor the Level F were large enough to indicate a significant interaction or level effect.

In order to determine where the significant group effect occurred, Scheffe's follow-up procedure was employed. The results are reported in Table 4. Means with different letters are significantly different.

TABLE 4
Scheffe's Test for Variable
TIME

GROUP	MEAN	N	SCHEFFE GROUPING
G1	14.83	14	A
G2	17.69	14	A,B
G3	21.00	14	B

Results indicated a significant difference in the means of groups I and III. The two experimental group means were not significantly different, nor were the means for the Experimental group II and the Control group. These data reflect a significant difference in the amount of time taken to memorize the music to the criterion level between the Experimental group I, which received the memory lecture and memorization assignments with analytical questions, and the Control group which received only the memorization assignments without analytical questions.

Hypothesis III

Hypothesis III, which states that there will be no significant correlation between the number of analytical observations and the memorization efficiency of the experimental groups, was retained. The following table represents the correlation coefficients computed using the Pearson Product-Moment correlation coefficient.

TABLE 5
Correlation Coefficients between
TIME AND ANALYTICAL OBSERVATIONS

GROUP OR LEVEL	COEFFICIENT	SIGN. LEVEL
GROUP I	-.17	.54
GROUP II	-.03	.90
BOTH GROUPS	-.20	.29
LEVEL I	-.00	.99
LEVEL II	-.16	.56

These results reveal no significant correlation between analytical observations and memorization efficiency in either group or at either level.

Hypothesis IV

Hypothesis IV states that there will be no significant difference in the analytical observation ability of Level I students (freshmen, sophomores, and juniors) and Level II students (seniors and graduate) of the experimental groups. The following table reveals the analysis of variance data for the number of analytical observations made between levels.

TABLE 6
ANOVA Summary Table for the Variable
ANALYTICAL OBSERVATIONS

SOURCE	DF	SS	MS	F	PROB.
GROUP	1	302.29	302.29	8.82	0.007
LEVEL	1	146.29	146.29	4.27	0.05
GROUP LEVEL	1	41.29	41.29	1.20	0.28
ERROR	24	822.86	34.29		

The difference between levels on analytical observations in the two experimental groups was significant at the .05 level. As previously stated, the group/level interaction effect was not significant. For more data comparison Scheffe's follow-up procedure was employed. Table 7 indicates the results when comparing analytical observations and levels. Means with different letters are significantly different.

TABLE 7
Scheffe's Test for the Variable
ANALYTICAL OBSERVATIONS/LEVEL

LEVEL	MEAN	N	SCHEFFE GROUPING
L1	17.92	14	A
L2	22.50	14	B

Senior and graduate level subjects made significantly more analytical observations than freshmen, sophomore and junior level subjects in both Experimental I and Experimental II conditions.

Hypothesis V

Hypothesis V states that there will be no significant difference in the memorization efficiency of Level I and II in the experimental and control groups. The analysis of variance comparison for the time variable according to levels indicated $F\ (1, 36)=1.38$, $p<.25$ (see Table 8).

TABLE 8
ANOVA Summary Table for the Variable
TIME/LEVEL

SOURCE	DF	SS	MS	F	PROB.
GROUP	2	267.03	133.52	3.30	0.05
LEVEL	1	55.84	55.84	1.38	0.25
GROUP LEVEL	2	150.89	75.45	1.86	0.17
ERROR	36	1,457.71	40.49		

As previously mentioned, there was no significant interaction F for the group/level effect.

The results indicate that the amount of previous performance experience had little effect on the memorization efficiency. When comparing the level means in each group, it is obvious that Level II subjects took less time to memorize than Level I subjects in Group I and Group II, (see Figure 4).

FIGURE 4
Time Means in Each Group
(according to levels)

	G1	G2	G3
L1	17.30	20.22	19.48
L2	12.38	15.17	22.54

One factor which may have contributed to this test result is the large variance in raw scores in combination with the small sample size. The combination tends to inflate the error term thereby requiring a larger difference in means in order to reject the null hypotheses. Given a larger sample size and smaller variance, the results may have been different.

Summary

During the Spring Quarter of the 1982-83 academic year, forty-two brass players from Ohio University were randomly assigned to three groups which included two levels: Level I included freshmen, sophomores, and juniors and Level II included seniors and graduate students. Experimental groups I and II completed five memorization assignments with analytical questions. Experimental group I received the additional treatment of a lecture on human/music memory. Group III received five memorization assignments without guidance. At the end of the experiment, Groups I and II were tested on analytical ability and all three groups were tested for memorization efficiency.

The three groups and two levels were compared on the variables of analytical observations and memorization efficiency using the Two-Way Analysis of Variance. Additional follow-up comparison was tested via the Scheffe procedure. Correlation between analytical observations and memorization efficiency was determined using the Pearson Product-Moment correlation coefficient.

When considering analytical observations, a significant difference was observed between means for Groups I and II and Levels I and II. There was no significant correlation between analytical observation ability and memorization efficiency. A significant difference was found between means for Groups I and III on memorization efficiency, but not between Groups I and II or II and III. The memorization efficiency means were not significantly different between levels. Hypotheses 1, 2, and 4 were rejected at the .05 significance level while hypotheses 3 and 5 were retained.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary and Conclusions

When memorizing music, a musician must rely on a myriad of cognitive information and performance variables. The goals of memorization include efficiency, retention, and dependable recall during performance. Much of the discussion about memorized performance focuses on the end product of the performance rather than the process of memorization. However, by focusing on the process of memorization, more insight might be gained into those factors which influence efficient memorization and dependable recall.

In researching the complex subject of human memory and musical memory, the information-processing theory of memory surfaced as the most viable memory theory for music cognition. Background research also revealed few studies on music memorization related to performance or the application of the information processing theory of memory to music memorization. The purpose of this study was threefold: (1) to determine if a lecture on human memory, with emphasis on information-processing and music memory, would aid in analytical ability and memorization efficiency, (2) to compare information-processing, as measured by analytical observation ability, with memorization efficiency, and (3) to determine if previous performance experience affects analytical ability and memorization efficiency.

During the main study, subjects were randomly assigned to three groups with two levels in each group. The treatment for Group I included five memorization assignments with analytical questions and a lecture on human/music memory. Group II received only the five memorization assignments with analytical questions. Group III, the control group, received five memorization assignments without guidance. At the conclusion of the treatment, a posttest was administered to measure analytical ability for Groups I and II and memorization efficiency for all three groups. The posttest scores for analytical ability and memorization efficiency were compared using the Two-Way Analysis of Variance, Scheffe's follow-up procedure, and the Pearson Product-Moment correlation coefficient. A summary and conclusion of the results follows the statement of each hypotheses.

1) There is no significant difference in the analytical observation ability of the experimental group receiving five memorization assignments and that of the experimental group receiving five memorization assignments and a lecture on human/ music memory. Hypothesis I was rejected at the .01 level. The group which received the lecture made significantly more analytical observations than the group that received only the memorization assignments with analytical questions. These results indicate the lecture on human/music memory aided in the subject's

ability and motivation to analyze the material being memorized. By understanding the memorization process therefore emphasizing an apperceptive approach to the task, subjects were able to apply analysis to the memorization task. However, these results do not guarantee that the music is memorized more efficiently.

2) There is no significant difference in memorization efficiency among the two experimental groups and the control group. Hypotheses II was rejected at the .05 level of significance. Scheffe's follow-up test revealed that there was a significant difference in the amount of time required to memorize the material between the Experimental group I, which received the lecture and memorization assignments with analytical questions, and the Control group which received only the memorization assignments. The two experimental group means were not significantly different, nor were the means for the Experimental group II and the control group.

When comparing the memorization efficiency of all three groups, the results indicated a gradual increase in efficiency according to the amount of treatment administered. Group III with no guidance, was the least efficient. Group II, receiving the guidance through analytical questions, was more efficient than Group III but not sufficiently greater to be statistically significant. Group I, receiving the analytical guidance and lecture, was significantly more efficient than Group III while only slightly more efficient than Group II. The memory lecture, plus the application of analysis to the memorization task prior to performance resulted in a more efficient use of time.

3) There is no significant correlation between the number of analytical observations and the memorization efficiency of the experimental groups. This hypothesis was retained. There was no significant correlation between analytical observations and memorization efficiency in either group or at either level. These results, in addition to other observations lead to three possible conclusions: A) there is no correlation between the ability to analyze music and memorization efficiency, B) some of the analysis was not indicated by the subjects or C) the five-week time period of the experiment was not sufficient to change previously acquired memorization habits.

During the posttest there were undoubtedly covert thought processes that occurred while the subject was performing the material which were incapable of being measured by the analytical check-list. In addition, some of the subjects did not mention certain factors related to the analytical content but did use the information to perform the material correctly. For example, some of the subjects did not mention meter or key signature but did perform the material in the correct meter and key. These problems in the measurement of information-processing reiterate the complexity of the human mind and could be factors which affected the results. A more accurate measuring method could and should be designed.

4) There is no significant difference in the analytical observation ability of Level I students (freshmen, sophomores, and juniors) and Level II students (seniors and graduate

students) of the experimental groups. Hypothesis IV was rejected at .05 level of significance. Scheffe's follow-up procedure revealed that senior and graduate level subjects made significantly more analytical observations than freshman, sophomore and junior level subjects. These results indicate that subjects with more experience and musical training were able to make more analytical observations before performing the material. However, according to the results of Hypothesis V, this ability did not result in a significant difference in memorization efficiency.

5) There is no significant difference in the memorization efficiency of Level I and Level II in the experimental and control groups. This hypothesis was retained. Although within the two experimental groups, Level II memorized faster than Level I, when combining the results of all groups, the amount of previous experience had little effect on the memorization efficiency. However, the inverse relationship in Group III between levels, i.e., Level I memorized faster than Level II, indicates that more performance experience does not guarantee the efficient application of this experience to memorization. In order for the transfer of information to take place, the conscious application of information must be present (apperceptive information-processing).

In conclusion, this study reveals that a lecture on human/music memory coupled with the application of analysis to the memorization task resulted in better memorization efficiency. The lecture, which gave insight into how human and music memory function, focused on a more apperceptive approach to memorization which encouraged and motivated the subject to use individual cognitive resources. Therefore, the group which received the lecture made significantly more analytical observations. These results indicate that, in addition to teaching a student how to memorize through analysis, information on how the memory system functions should be provided. With this information, a musician builds more understanding and confidence to apply analysis to the memorization task and insight into how to evaluate their own strengths and weaknesses.

In order to promote the application of analysis to performance, the student should be encouraged to describe the form, compare phrases and sections, and locate motives and key centers. Furthermore, verbally discussing this information involves thought processes and encourages the student to apply previously known information to the new material and/or to organize it into a logical structure. This method may be applied in private lessons or in group situations and may be adapted to all levels of students, beginners through college level. For example, after the form of a selection has been analyzed, labels which refer to formal sections may be used during rehearsal instead of measure numbers, i.e. "begin at the B section" rather than "start at measure 40."

The ability to memorize music should be an objective incorporated into the study of musical performance instead of an isolated act reserved only for solo performance. Information about formal analysis acquired in music theory classes needs to be directly related to performance situations in order for transfer to take place. Students should be assigned memorization studies after examples of analytical memorization technique have been covered during the lesson or class period. Confidence in memorization skills may be developed if memorization assignments are simple at first, progressing in length and difficulty as the student's performance and memorization skills develop. In addition, according to the results of this study, musicians would benefit from a course or seminar on human/music memory function and how this information may be applied to the memorization process.

The analytical approach to music memorization benefits the performer in a myriad of ways. The confidence of knowing the music thoroughly and having reference and cross-reference points to depend upon in case of a temporary memory lapse results in a more reliable performance. Analytical memorization facilitates future memorization tasks and develops the musical knowledge required to perform other musical tasks. In addition, the apperceptive approach to the task through the understanding of the human and musical memory systems results in better memorization techniques.

Recommendations for Further Study

There seems to be limitless research opportunities concerning the relationship of information-processing and music memorization. Since the research area is at a rudimentary level, the complexity of the problem reflects a need for various approaches. Discussions at the 1981 Ann Arbor Symposium support the need for research into this problem: "We should begin to develop theoretical models of memory processing as a means to facilitate research in music and to communicate the results to music education."[1] The following are a few suggestions for further research related to this study.

This study needs to be applied to other instruments and other age groups. Of particular interest would be students at the grade school or junior high school level that are experiencing music memorization for the first time. Of significant importance would be how analysis may be applied to music memorization at this level in order to facilitate efficiency, retention, and retrieval.

Two areas of the experiment need review and revision. First, the time period of the treatment should be lengthened in order to provide more time for the memorization technique to be acquired by the subjects. Second, the measurement of analytical ability, which attempts to determine the thought process used to complete the task, needs to be more accurate.

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[1]David Brian Williams, "Music Information Processing and Memory," in <u>Documentary Report of the Ann Arbor Symposium</u>, ed. R.G. Taylor (Reston, VA: Music Educators National Conference, 1981), p. 92.

A validity and reliability test of the analysis check-list revealed that the measurement of information was valid and reliable. The problem seems to relate to the verbalization by the problem solver. One possible solution would be to use a computer program which would demand certain responses from the subject during the memorization task leading them to reveal as much information processing as possible.

A final area for additional research would be a comparison of analytical ability, memorization efficiency, and retention. According to memory theorists, retention is more probable and more reliable if the new information is associated with previously known facts and/or organized into a structure for storage. Since music analysis represents the storage process, a comparison of the three factors could lead to a better understanding of music memorization and retention.

Every attempt should be made to relate general processing models to music information processing. Previous non-music studies on memorization may be applied to music memorization in an attempt to clarify the relationship, either congruent or noncongruent, between the information-processing theory of memory and music information processing.

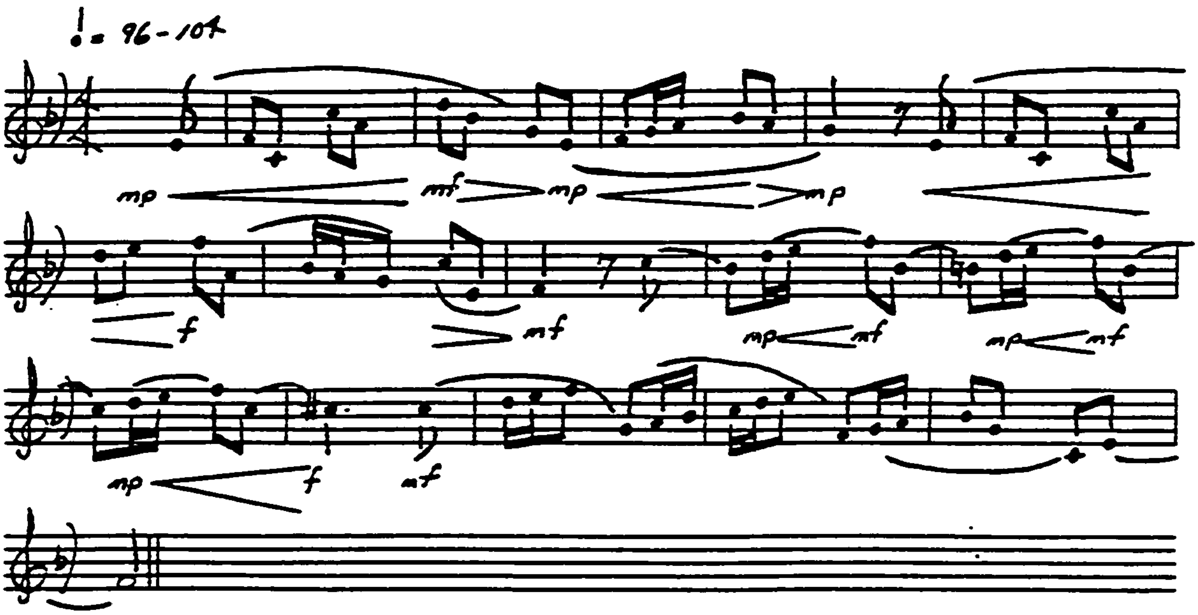
Due to the complexity of the human mind and music performance, few studies have attempted to determine how music information is processed. However, new information continuously becomes available through both music and non-music related research. Each study may reveal some solutions as well as many new questions to be answered. As stated earlier, music memorization involves a complex process of information processing as well as storage and retrieval. The same type of cognition permeates learning, thinking, and problem solving. Research in this area may be difficult and challenging, but each new bit of information brings a better understanding of not only how to memorize and retain music, but how to more effectively teach memorization as well as other related music information and skills.

APPENDIX A - POSTTEST MATERIAL

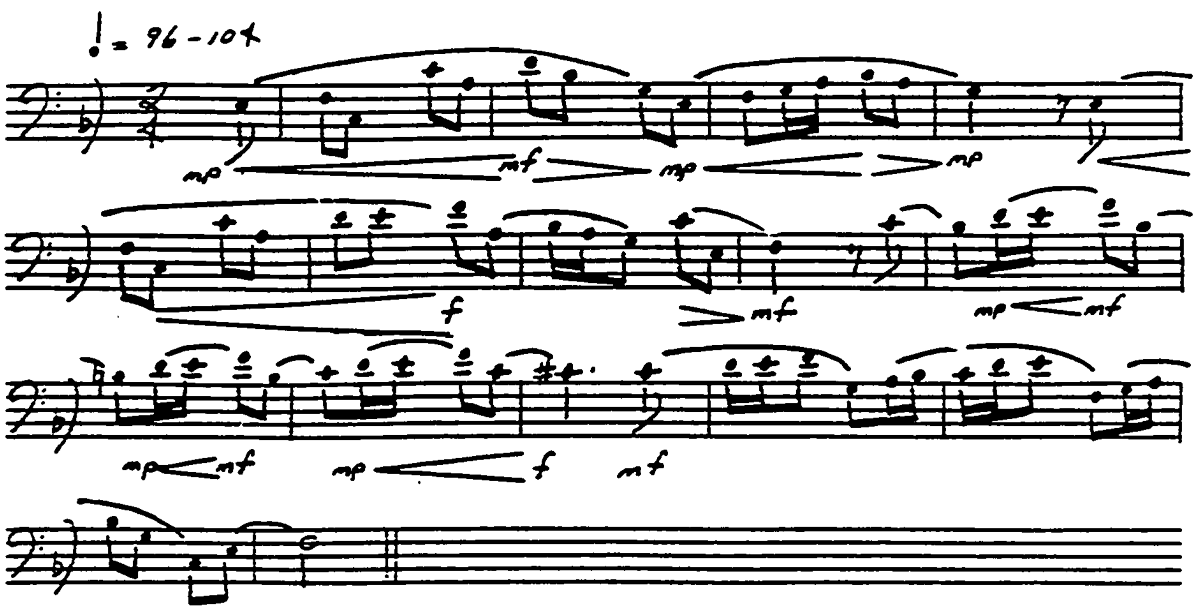
APPENDIX A

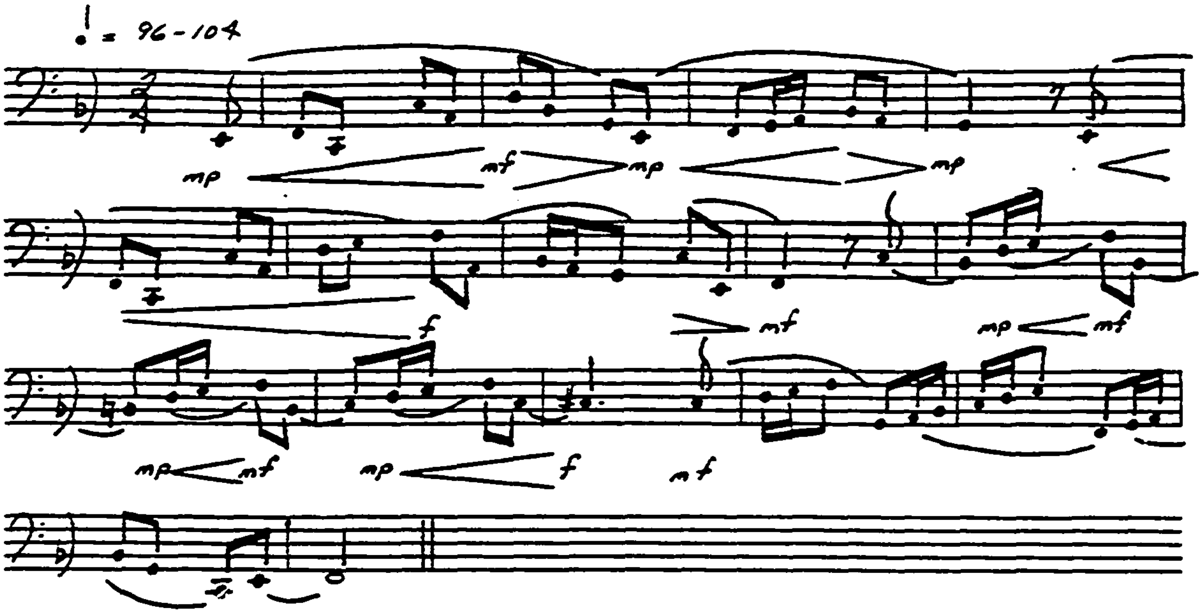
POSTTEST MATERIAL

Trumpet and Horn



Trombone



Tuba

APPENDIX B - ANALYSIS CHECK-LIST

APPENDIX B

Analysis Check-list

The following analysis check-list was used to record thinking-aloud and action protocol and includes the following categories: (1) general observations on rhythm (R), melody (M), and form (F), (2) overt responses, and (3) specific observations and associative observations on form, rhythm, melody, and dynamics (d). Each section includes a category for additional observations and incorrect observations.

Thinking-aloud protocol includes two types: associative observations and specific observations. Associate observations are observations made by the subject that relate the analytical fact to other characteristics of the test material or previous knowledge. The following phrases were considered as cues to associative observations: similar to, different from, sounds like, or the labeling of notes or sections (i.e., leading tone, phrase).

Specific observations, as opposed to associative observations, includes the statements made by the subject that were not associated with stored knowledge or other characteristics of the test material. For example, a specific observation would be "the phrase starts on E" while an associative observation would be "the phrase starts on E which is the leading tone."

The Additional Observation category was included for statements that were not indicated on the check-list or were not located by the evaluator. Incorrect observations were noted in order to represent a complete representation of what the subject stated.

During the tape evaluation, the evaluator indicated observations made by the subject on the analysis check-list. Since the evaluation was made from a tape-recorded performance, the evaluator was allowed to stop the tape at any time and review verbal comments.

ANALYSIS CHECK-LIST

GENERAL OBSERVATIONS

Specific Observations

R ____ Meter signature
____ Rhythmic motive

F ____ Four phrases
____ Ph. I and II = period
____ Ph. III and IV = period

M ____ Key of F-major
____ Melodic motive m. 9-11
____ Range = C to F

Associative Observations

____ eighth note anacrusis prevalent

____ half-step interval prevalent (anacrusis)
____ Ph. I, II, & IV begin with half-step below
____ Ph. III begins with step above
____ Ph. I & II begin on 7-8

ADDITIONAL OBSERVATIONS

INCORRECT OBSERVATIONS

OVERT RESPONSES

____ taps rhythm
____ vocalizes rhythm
____ sings melody
____ moves valve or slide

PHRASE I

Specific Observations	Associtive Observations
R ____ eighth note anacrusis	____ all eighth notes except m. 3 (♫♪) & m. 4 (♩)
M ____ begins on E	____ begins on leading tone
____ ends on G	____ ends on 2nd scale degree
____ top note is D	____ top note is sixth scale degree
D ____ crescendo in m. 1	____ dynamics reflect the direction of the melodic line
____ decrescendo in m. 2	
H ____ m. 1 = F triad	____ m. 1 = I
____ m. 2 = B-flat to C	____ m. 2 = IV to V
____ m. 3 = F to B-flat	____ m. 3 = I to IV
____ m. 4 = C	____ m. 4 = V

Additional Observations:

Incorrect Observations:

PHRASE II

Specific Observations	Associative Observations
R ____ eighth note anacrusis	____ anacrusis like Ph. I
	____ same rhythm as Ph. I except m. 7
	____ all eighth notes except m. 7 & 8
M ____ begins on E	____ begins on leading tone
	____ begins on leading tone like Ph. I
____ top note is F	____ top note is tonic
	____ top note is higher than Ph. I
H ____ m. 5 = F	____ m. 5 = I
____ m. 6 = B-flat to G7	____ m. 6 = IV to V7
____ m. 7 = G to G7	____ m. 7 = V to V7
____ m. 8 = F	____ m. 8 = I

Additional Observations:

Incorrect Observations:

PHRASE III

	Specific Observations	Associative Observations
R	___ eighth note anacrusis	___ eighth note anacrusis like Ph. I & II
	___ ends on	___ ends on (different from Ph. I & II)
	___ rhythmic motive	___ leads to Ph. I
M	___ anacrusis is step above	___ anacrusis different than Ph. I and II
	___ anacrusis on C	___ anacrusis on fifth scale degree
	___ melodic motive	
	___ sequence pattern	___ sequence pattern ascends chromatically
	___ ends on C-sharp	___ ends on raised fifth scale degree
D	___ cresc. from mp to f	___ dynamics move with melodic line
	___ ends on f	___ forte leads to Ph. IV
F	___ builds tension	___ leads to Ph. IV
H	___ m. 9 = B-flat	___ m. 9 = IV
	___ m. 10 = B-dim.	___ m. 10 = vii of V
	___ m. 11 = F	___ m. 11 = I
	___ m. 12 = C-sharp dim 7	___ m. 12 = vii 7

Additional Observations:

Incorrect Observation:

PHRASE IV

	Specific Observations	Associative Observations
R	___ eighth note anacrusis	___ eighth note anacrusis like Ph. I, II, & III
		___ same rhythm in m. 13 & 14
M	___ starts on C-sharp	___ starts half-step below like Ph. I and II
		___ starts on leading tone to D
	___ melody moves downward	___ sequence pattern in m. 13 & 14 moves down by a 7th
D	___ mf	___ mf to the end
F		___ releases tension--moves downward
		___ releases tension--slows rhythmically
H	___ m. 13 = B-flat to C7	___ m. 13 = IV to V7
	___ m. 14 = dm to B-flat	___ m. 14 = vi to IV
	___ m. 15 = gm to C7	___ m. 15 = ii to V7
	___ m. 16 = F	___ m. 16 = I

Additional Observations:

Incorrect Observations:

APPENDIX C - MEMORY LECTURE

APPENDIX C

MEMORY LECTURE

Introduction

Practically all musicians are expected to memorize music at some point in their career and typically without knowledge of a procedure (method) to successfully complete the task. In many cases this leads to confusion, anxiety, and embarrassment. Due to problems with reliable memory, memorized performance is a controversial issue which performers and teachers try to avoid by justifying performance with music.[1]

The main disadvantages of memorized performances are (1) the possibility of memory lapse and the tension that results from the fear of forgetting and (2) the amount of time needed to memorize.[2] If these two factors could be controlled, many musicians might prefer performing from memory.

One reason for memorization is that performing with the music puts a barrier between the performer and the audience, like an actor reading from the script.[3] A more significant reason pertains to the process of memorization.

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[1] "A Sacred Madness," Time, December 18, 1972, p. 97.

[2] Birkby, "Heretical Viewpoint," p. 37.

[3] Rubin-Rabson, "Memorizing," p. 22.

To memorize, one needs to know the form, compositonal devices used, how it sounds, and the physical aspects required to accurately perform the piece. A performer must perceive and interpret every detail of the piece resulting in a more musical and convincing interpretation.[1] In addition, retained information may be applied to future performance demands, for example, sight-reading and memorizing new material.

The main reason for memory lapse during performance concerns incomplete learning[2] and a lack of understanding about how the memory system works. Other factors, related to the first two, are the following: (1) lack of confidence due to the fear of forgetting,[3] (2) lack of attention and complete concentration during practice and performance,[4] and (3) too much dependence on one type of music memory.[5] Knowledge of the memory process and factors in musical memory can increase memorization efficiency and retention by giving a more goal-oriented approach to music memorization. Every successful experience with memorization will build

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[1]Morrette Rider, "The Pro's and Con's of Memorization," The Instrumentalist 35 (October 1980): 94.

[2]Barnes, "Performing Solo Literature," p. 101.

[3]Avis Bliven Charbonnel, "The Psychology of Forgetting," Musical Courier 149 (January 1954): 8.

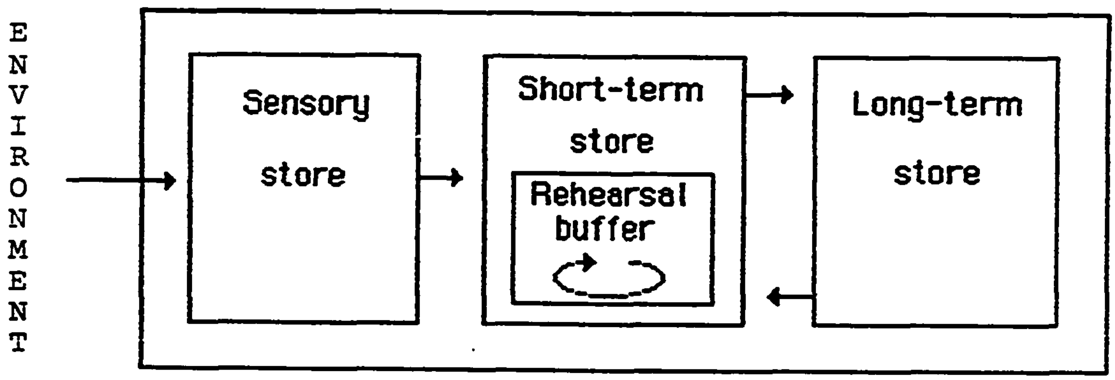
[4]Bricaid, "Memory Problems," p. 104.

[5]Jean Charles Kohler, "Some Ideas on Memory," Clavier 5 (May-June 1966): 46.

confidence and increase the ability to memorize future material.[1] In addition, the perceptive abilities used in memorization can improve sightreading ability and overall performance ability.

Human Memory

The information-processing theory, one of many memory theories, will be used to demonstrate the memory process. The following graph illustrates how the process works.



There are three main storage areas in the memory system: (1) sensory store, (2) short-term store or short-term memory (STM), and long-term store or long-term memory (LTM). The separate stores have separate yet interdependent functions.

The sensory store holds the information taken in through the senses. This information remains unanalyzed and is lost in one second unless moved into the STM. Since the sensory store can hold more information than STM, a person chooses

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[1] Stewart Gordon, "The New Davidities: XIII," American Music Teacher 29 (June-July 1980): 23.

which information will remain and which will be allowed to decay from sensory store.

Short-term memory, the working memory, lasts approximately fifteen seconds. In STM, information is encoded (put into a system or form that can be stored) through comparing it with LTM store, chunking, and rehearsing.

The LTM store is previously acquired knowledge about music and performing. This information may be used to interpret received information, compare information to what is known, and to evaluate and associate for storage and retrieval. The amount of previous knowledge and experience about music aids in the interpretation and encoding of new material.

The memory span is the limit of information that can be held in STM. The capacity of STM includes about seven chunks and the amount of information held in STM can be expanded by building larger chunks. An example of chunking in music would be putting separate notes into a structure. The following passage could equal ten chunks (C to D, D to E, E to F, F to G, G to A, A to B, B to C, C to G, G to E, and E to C) or two chunks (up the C-major scale and down the C triad).

The ability to build larger chunks is relative to technical ability, knowledge of musical structure, and previous performance experience.

There are two types of rehearsal: (1) maintenance rehearsal which maintains information in STM so it is not forgotten, and (2) elaborate rehearsal which organizes information and builds associations to facilitate long-term storage and retrieval. Rehearsing past the point at which material has been learned is called overlearning. The effectiveness of overlearning depends upon the attention to content and organization of what is being rehearsed.

Long-term memory, previously mentioned as the knowledge base for the processing of new information, may be improved through organization and association. The more different associations that are formed for one fact, the more dependable the retrieval will be. There are two types of LTM--semantic and episodic. Semantic memory deals with facts (for example, the key signature for F-major is B-flat) and is not subject to change due to events or the act of retrieval. Episodic memory holds information about events (how they appear or when they occur) and is often transformed or made unretrievable. An example of episodic memory would be memories of the last performance of a solo.

The ability to recall stored information involves several subsystems that must work in order to facilitate retrieval. To attain reliable memory, the information must be encoded properly and stored in LTM in an organized form that can be located and recalled when needed. The rate of recall required in music performance happens at an incredible speed, leaving little time for an extensive LTM search. Therefore, the memory system, nerves and muscles must respond at a well-synchronized and organized level.

Music Memory

There are four types of music memory which aid in the memorization process. (1) analytical, (2) visual, (3) auditory, and (4) motor.

Analytical memory incorporates knowledge of compositional rules to analyze and organize the material to be memorized. The analysis process represents the formation of chunks of information that can be stored in LTM, then located and retrieved. It is not only more reliable but also more efficient than the other memories. When organized properly, a cognitive understanding of the structure of a piece can cue auditory memory and motor responses.

Visual memory can be used in two ways for music memorization. First, as a photographic memory of the printed page, and second, as a visual sense that transforms the notation into an aural image, sometimes called inner hearing. Through experience with music notation, one can hear the music that is notated. Therefore, music can be memorized internally, away from the instrument, then recreated later during practice or performance.

Auditory memory is an essential function in musical learning. If used properly, it can function as a cue or as feedback during performance. The musician should not only be able to see notation and transform it into sound but also hear the sound and translate it into notation. An example of good auditory memory is being able to "play by ear."[1]

Motor memory involves the physical or kinesthetic aspect of performance. For a brass player this involves embouchure, tongue, throat, air column, etc., all of which vary from one range to another and one dynamic to another. The complexity of the physical reproduction of sound adds another dimension which further complicates the music memorization process.

There are two types of motor memory: (1) continuous (walking, bike riding) with a high retention level and (2) discrete (typing, music performance) with a very low retention level. Discrete motor responses are behaviorally complex and have a verbal component in certain stages of training. Therefore, they are harder to retain and the conscious thought can interfere with the automatic functions of discrete motor skills. In order to avoid conscious interference, one must understand the subconscious and automatic nature of motor skills.

Improvement of the memorization process

In order to improve memorization and retention, one must (1) understand how the memory system works, (2) determine strengths and weaknesses of the separate music memories (analytical, visual, auditory, and motor memory), and (3)

[1] Kohler, "Ideas on Memory," p. 48.

improve on the weaker memories and capitalize on the stronger ones.

A review of literature on music memorization reveals that most performers emphasize motor memory. For example, when memorizing, the mind lies dormant while a passage is played over and over until it is learned. Then during actual performance, the mind begins to interfere with automatic motor responses, or the performer may "wake up" during a passage and become aware of factors that were not noticed before causing disruption of the previously set responses. By analyzing the music and using the mind as much as the physical aspect during practice, material can be memorized faster and will be retained longer.

Applying the different memories separately can build more associations and increase the involvement of each memory. For example, when memorizing a phrase, one needs to analyze the formal contents, sing through the passage and then play through it, each time building more associations by organizing and relating the contents of the phrase to how it sounds and feels to play through it.

Other suggestions for good memorization procedures are (1) distribute practice time, (2) limit the amount of material memorized at each session and review previously learned material, (3) concentrate on the initial learning of the material, and (4) analyze larger compositions as a whole then concentrate on the parts, always relating the parts to the whole.

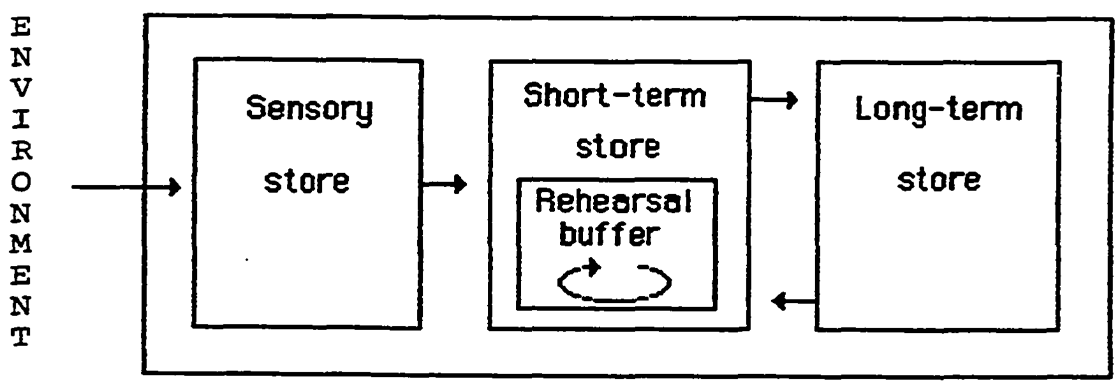
Improvement of memory is similar to self-improvement of any type, taking practice and evaluation. One must determine the present method, evaluate its effectiveness, then revise the system using information about human and musical memory processes.

APPENDIX D - MEMORY LECTURE OUTLINE

APPENDIX D

MEMORY LECTURE OUTLINE

Human Memory



I. Memory systems

A. Sensory Store

1. information taken in through the senses (input)
2. input remains unanalyzed and is lost within one second
3. sensory store holds more information than STM--concentration is required to select the proper inputs

B. STM--the working memory

1. LTM Store--previously acquired knowledge about music and performing
2. Memory Span--our capacity is about seven chunks, chunking is organizing and associating information
3. Rehearsal
    a. maintenance--maintains information
    b. elaborate--organize and build associations
    c. overlearning

C. LTM--organization and association

1. Semantic--rules
2. Episodic--events

The ability to recall stored information involves several subsystems that must work in order to facilitate retrieval. To attain reliable memory, the information must be encoded properly and stored in LTM in an organized form that can be located and recalled when needed. The rate of recall required in music performance happens at an incredible speed, leaving little time for an extensive LTM search. Therefore, the memory system, nerves and muscles must respond at a well-synchronized and organized level.

<u>Music Memory</u>

I. Analytical Memory

    A. compositional rules--analysis

    B. organization and association

    C. can cue auditory memory and motor responses

II. Visual Memory

    A. photographic

    B. inner hearing

III. Auditory Memory

    A. cue

    B. feedback

IV. Motor Memory

    A. physical or motor responses

        1. continous (walking, bike riding) with a high retention level
        2. discrete (typing, music performance) with a low retention level

    B. must be trained then allowed to become subconscious or automatic

<u>Improvement of Memory</u>

I. Improvement of the memorization process

    A. understand how the memory system works

    B. analyze music--organize into a structure and form associations

C. determine own strengths and weaknesses

D. capitalize on strengths and improve weaker memory functions

II. Additional Suggestions

A. apply music memories separately to build associations

B. distribute practice time

C. limit the amount of material memorized at each session

D. review often

E. concentrate on the initial learning of material

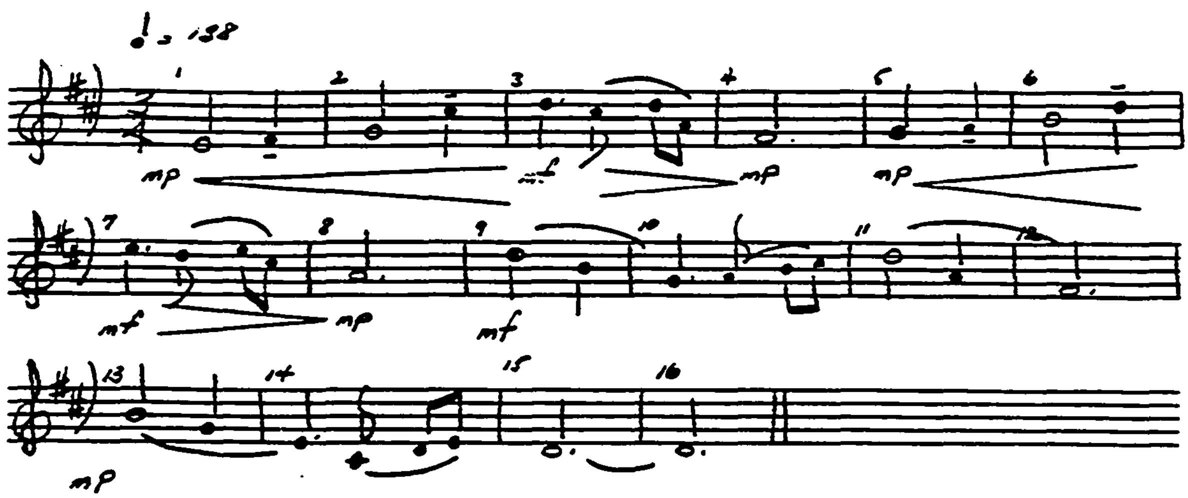
F. analyze larger compositions as a whole then concentrate on the parts, always relating the parts to the whole

Improvement of music memory is similar to self-improvement of any type; it takes evaluation and practice. Determine the present method, evaluate its effectiveness, then revise the system using information about human and musical memory processes.

APPENDIX E - MEMORIZATION ASSIGNMENTS I, II, III, IV, AND V

APPENDIX E

Memorization Assignment I

Trumpet and Horn

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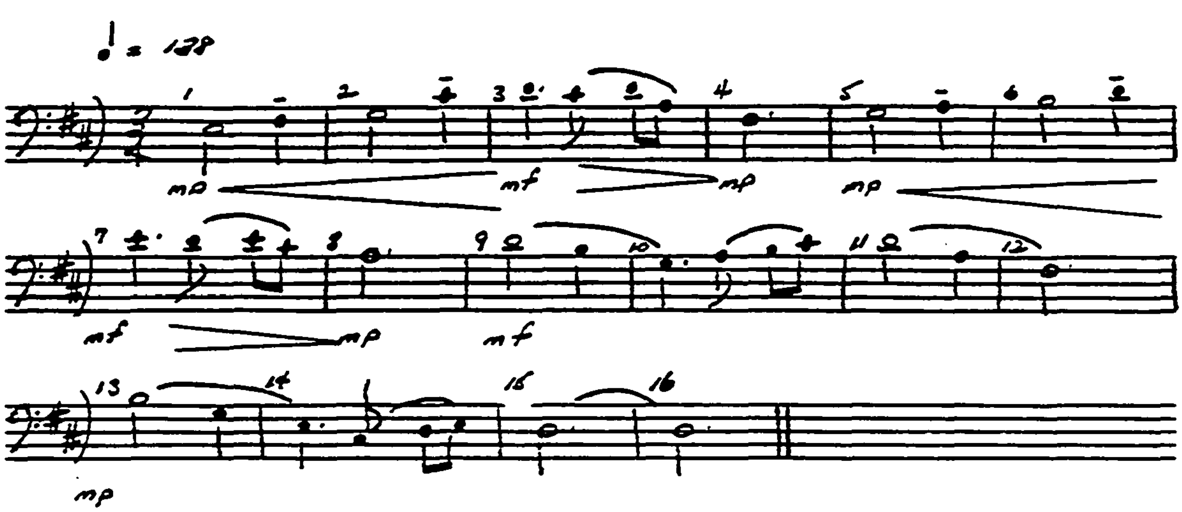
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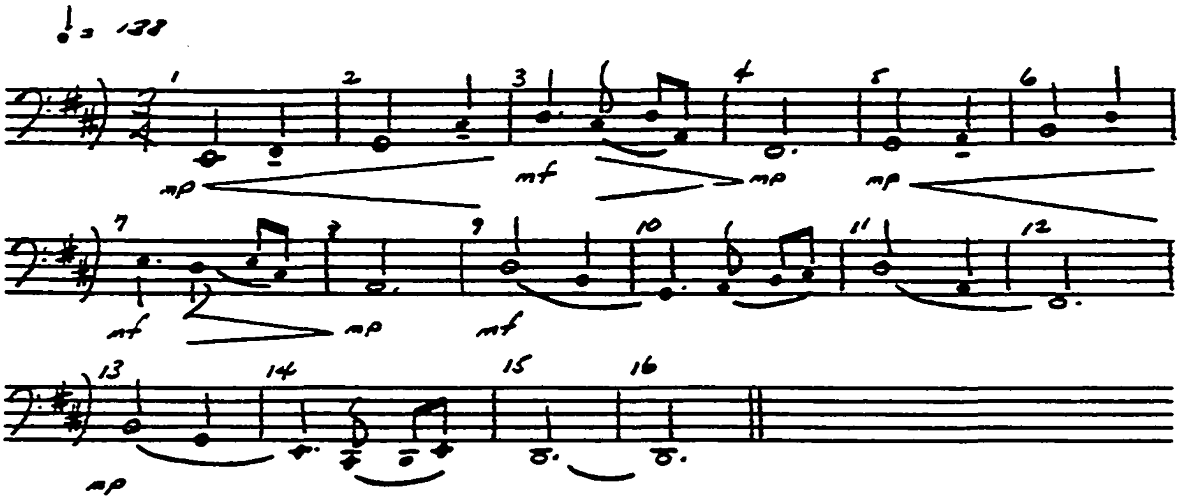

Memorization Assignment I: Analytical Questions

Key? ______

Meter? ______

How many phrases? ______

How many periods? ______

Indicate, by measure number, the first measure of each phrase.

How are phrases I and II related?

1. melodically
2. rhythmically

How are phrases III and IV related?

1. melodically
2. rhythmically

Do the dynamics compliment the melodic line? ______

Are there any rhythmic motive patterns?

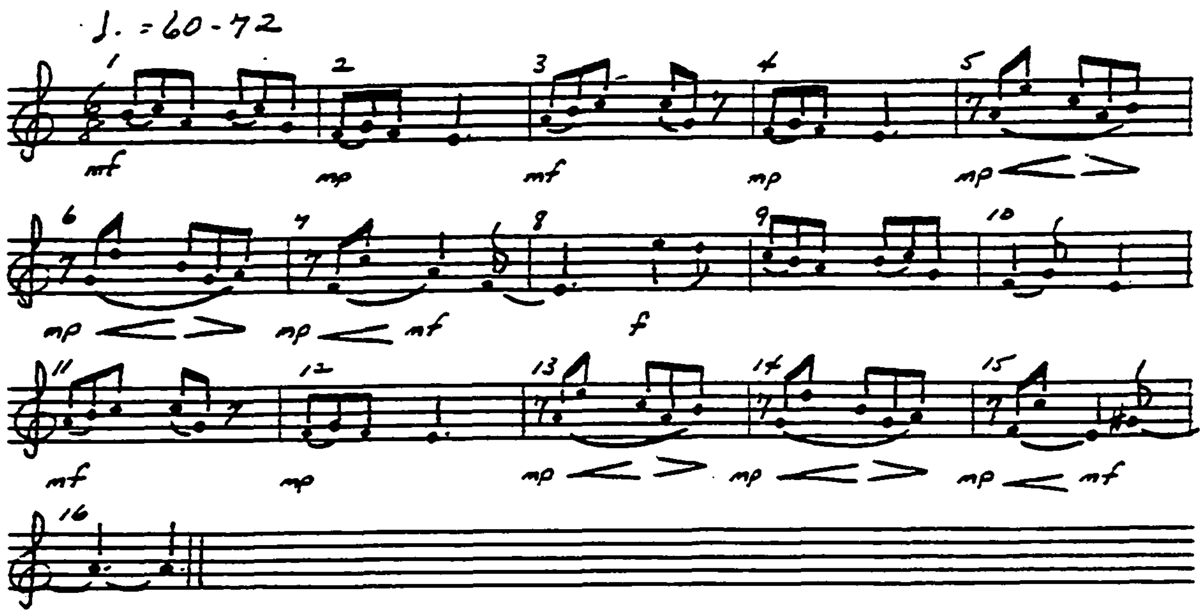
If yes, notate the rhythmic motive patterns.

Are there any melodic motives?

If yes, indicate by measure numbers.

Do the articulation marks delineate the motives? ______

Memorization Assignment II

Trumpet and Horn

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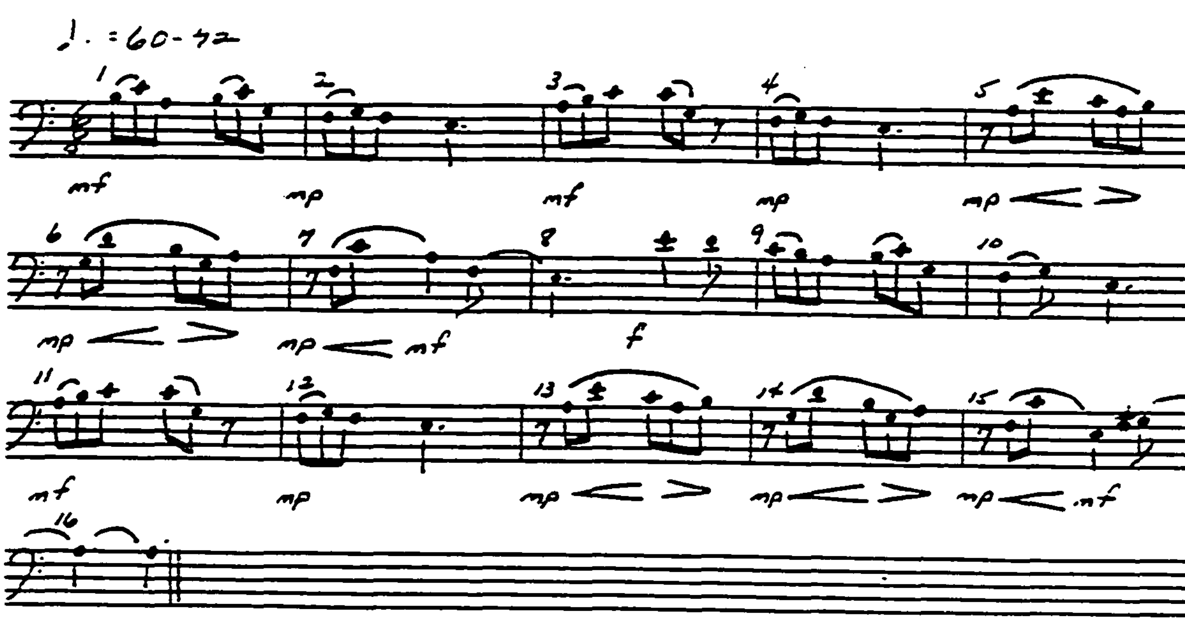
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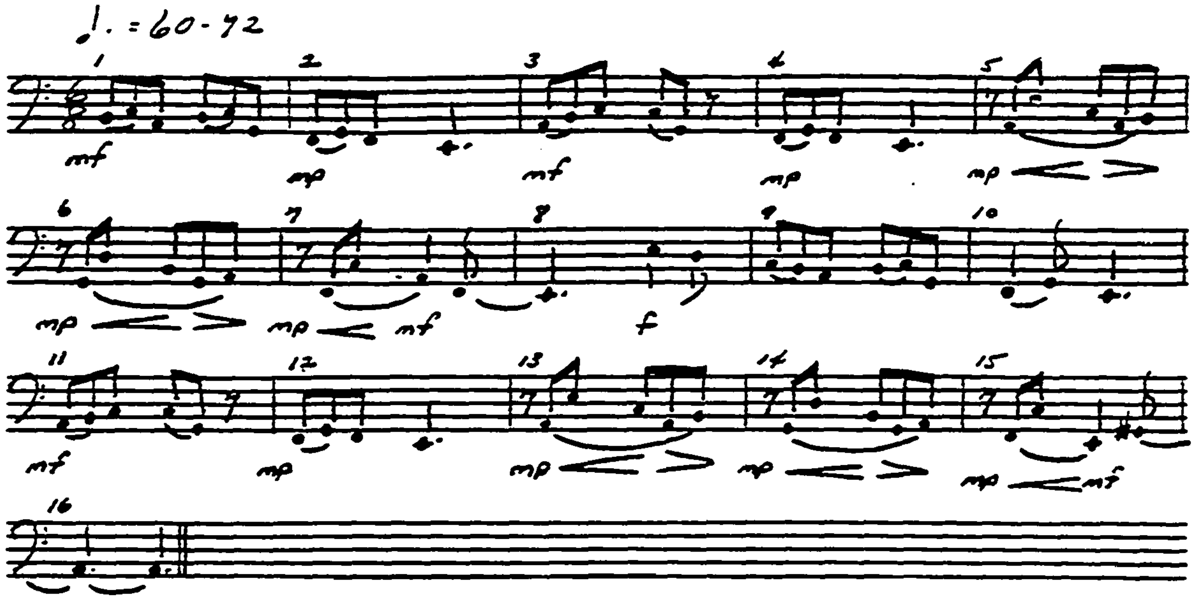

Memorization Assignment II: Analytical Questions

Key? ______

Meter? ______

How many phrases? ______

Indicate, by measure number, the first measure of each phrase.

How are phrases I and III related?

1. melodically
2. rhythmically

How are phrases II and IV related?

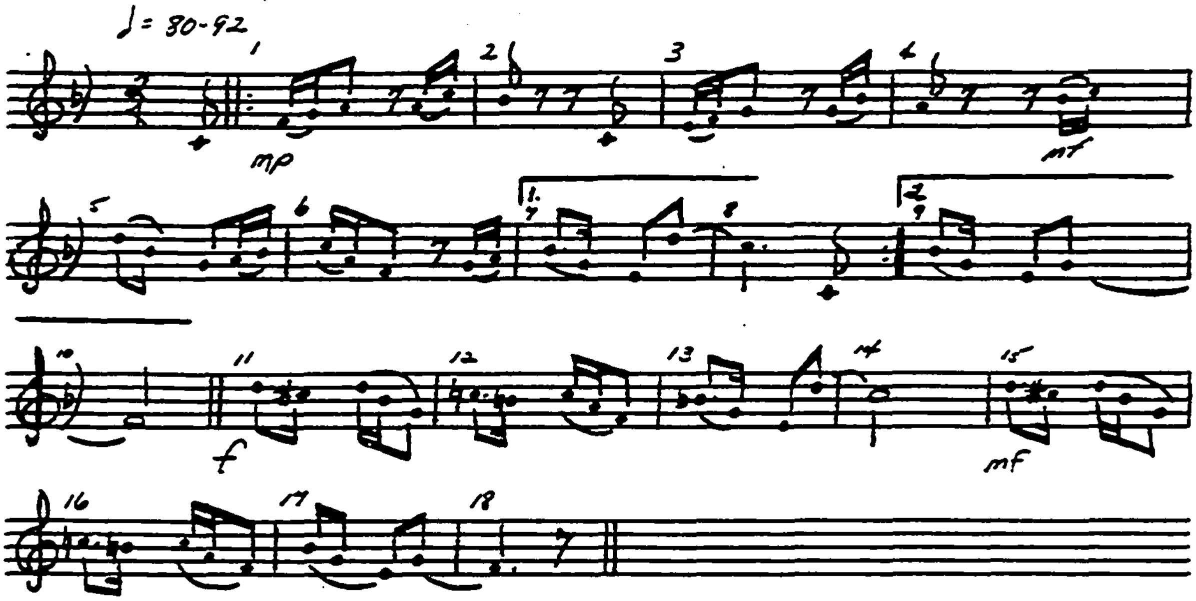
1. melodically
2. rhythmically

Indicate, by measure number, two melodic motives.

Are the articulation patterns for the triplet motive consistent throughout? ______

Are the dynamics consistent with the melodic line (m.6)? ______ and the motive (m.2)? ______

Memorization Assignment III

Trumpet and Horn

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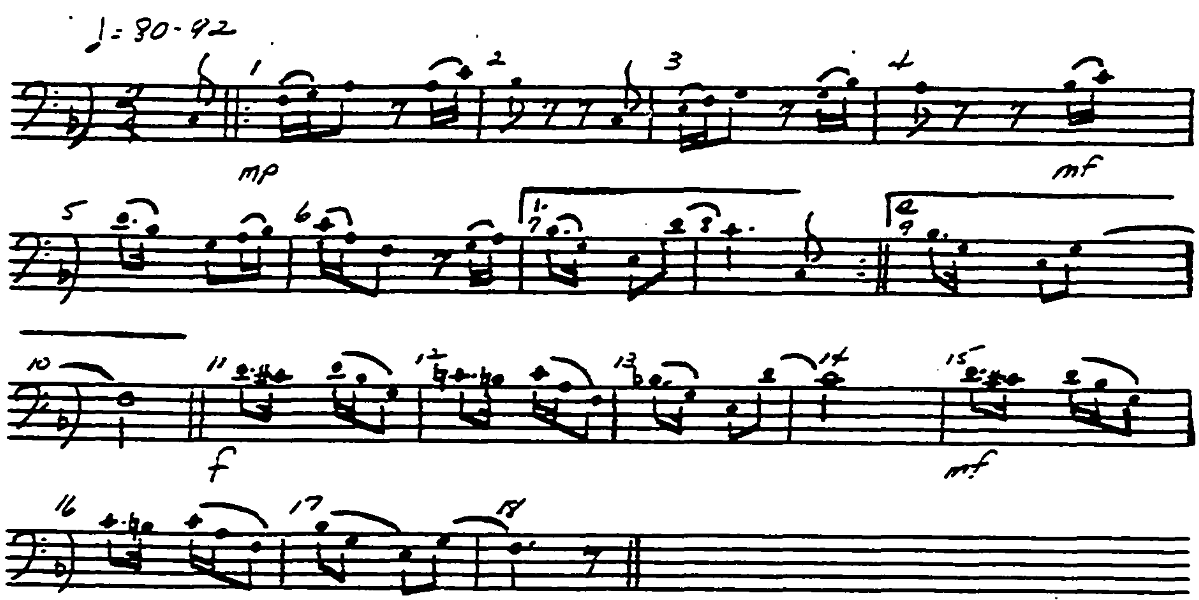
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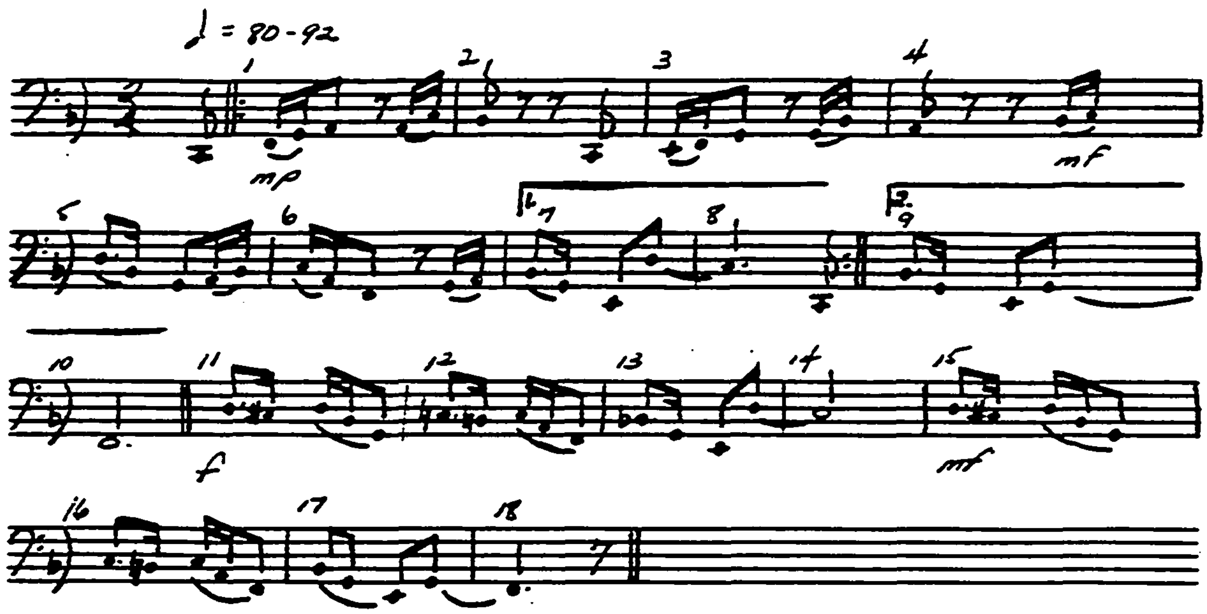

Memorization Assignment III: Analytical Questions

Key? ______

Meter? ______

How many phrases? ______

Are there any melodic motives? ______

If yes, indicate by measure numbers.

Are there any sequential patterns? ______

If yes, indicate by measure numbers.

How are the last two measures of Phrases I and II different?

Associate with chords: m.8=______ and m. 10=______

Phrase III includes two four measure phrases, compare these phrases. Which measures are the same______and which measures are different______

Compare the patterns in Phrase III with Phrases I and II. Which measures are the same______, and which measures are similar?______

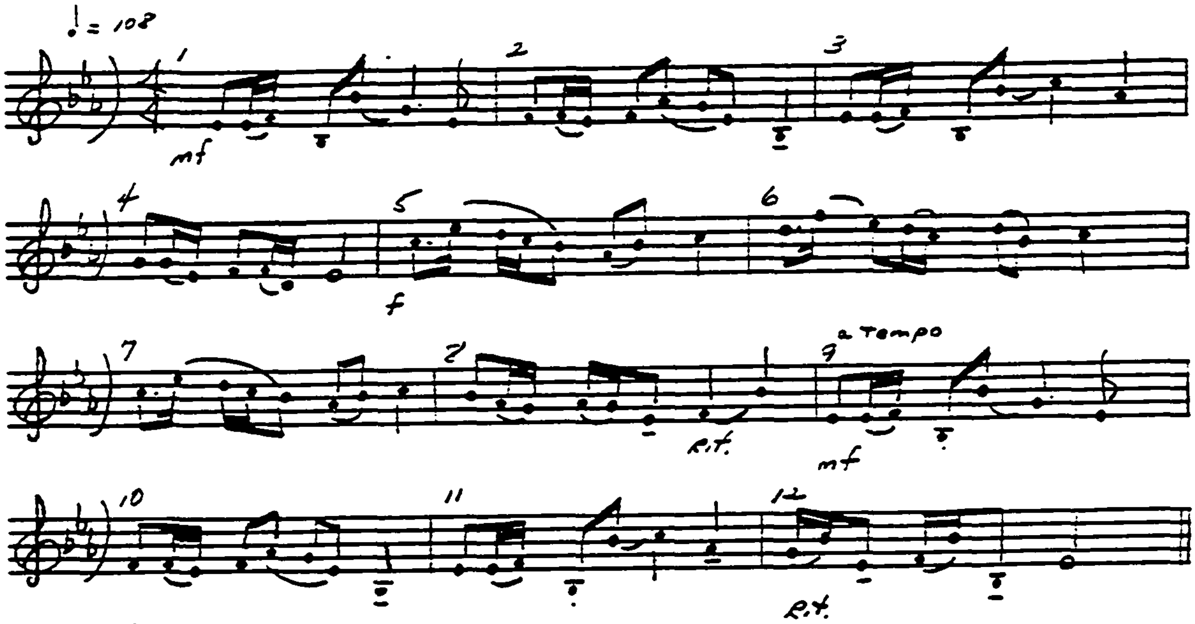
Compare the articulation marks for this pattern ( ) in Phrase I and II with Phrase III. Notate the articulation pattern below.

Phrase I and II =

Phrase III =

In relation to the overall form, what is the purpose of Phrase III?

Memorization Assignment IV

Trumpet and Horn

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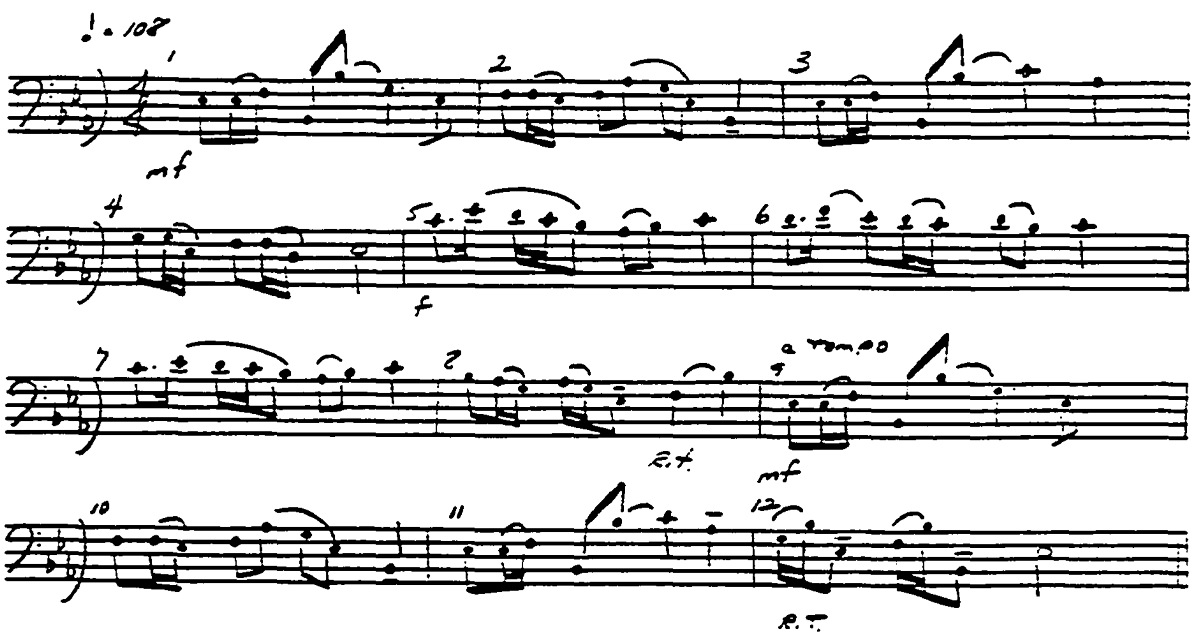
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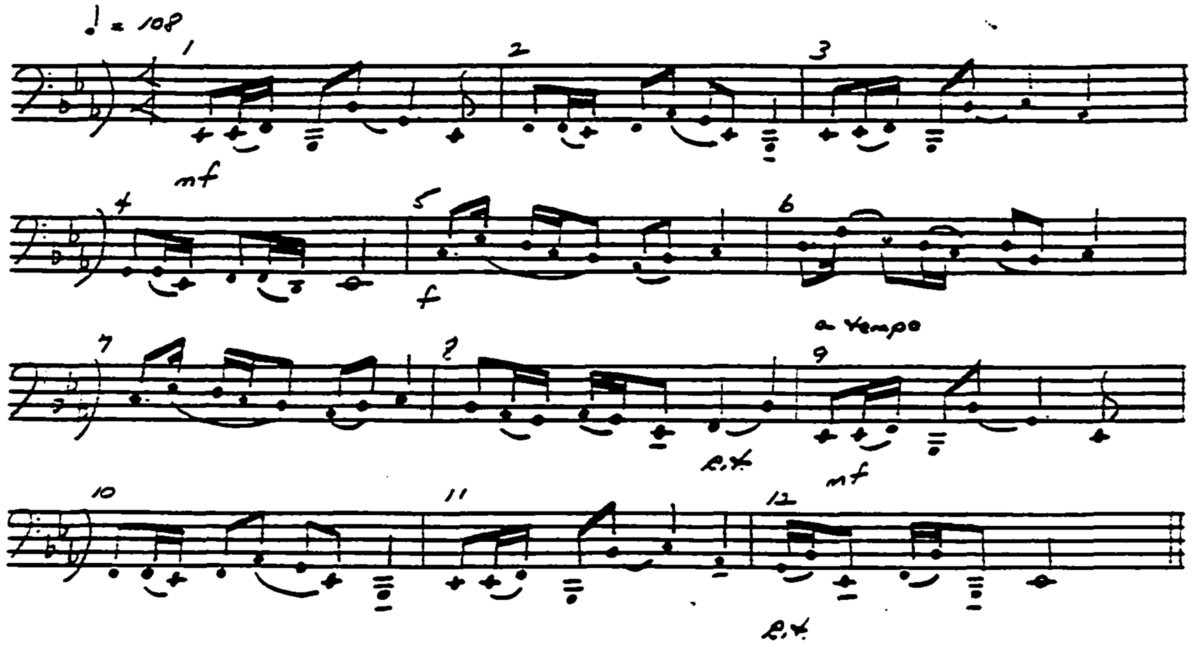

Memorization Assignment IV: Analytical Questions

Key? ______

Meter? ______

Indicate, by measure number, the first measure of each phrase.

Compare Phrases I and III.

All measures are identical except______

Why do Phrases I and III end differently?

Check the articulation marks for this pattern( ), are they the same or different throughout?

Phrase II centers around what note? ______

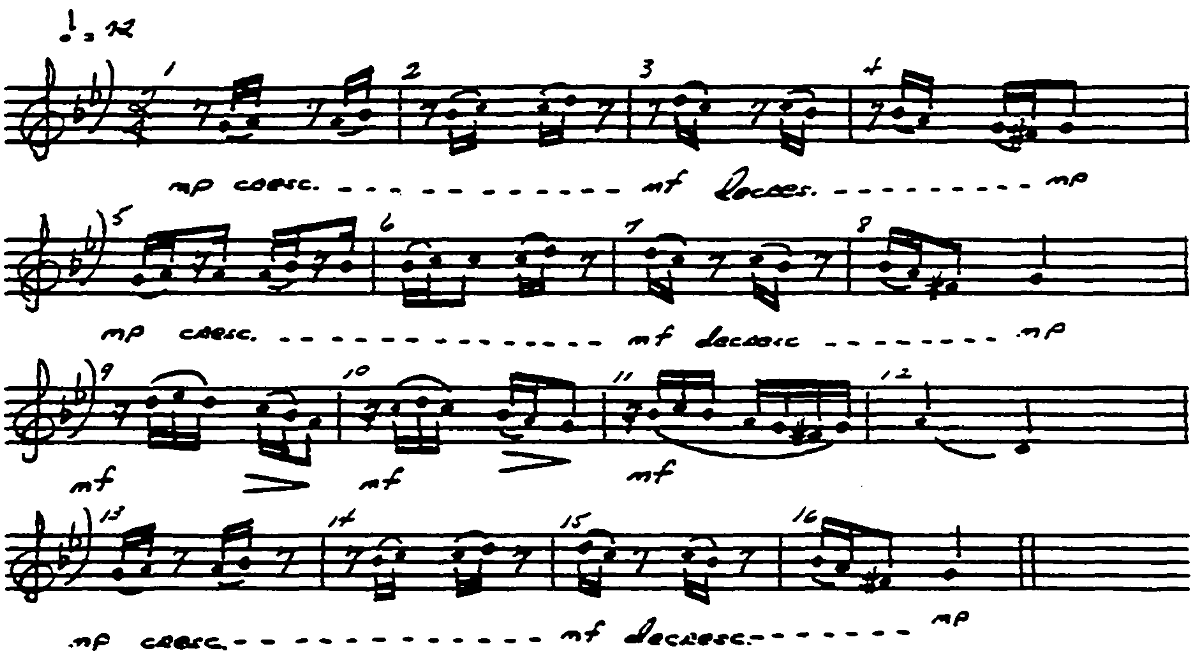
How is that pitch related to E-flat major?

Which measures in Phrase II are the same?______

What is the purpose of measure 8?

Note the dynamic markings for Phrases I and III compared to Phrase II. (no response required)

Memorization Assignment V

Trumpet and Horn

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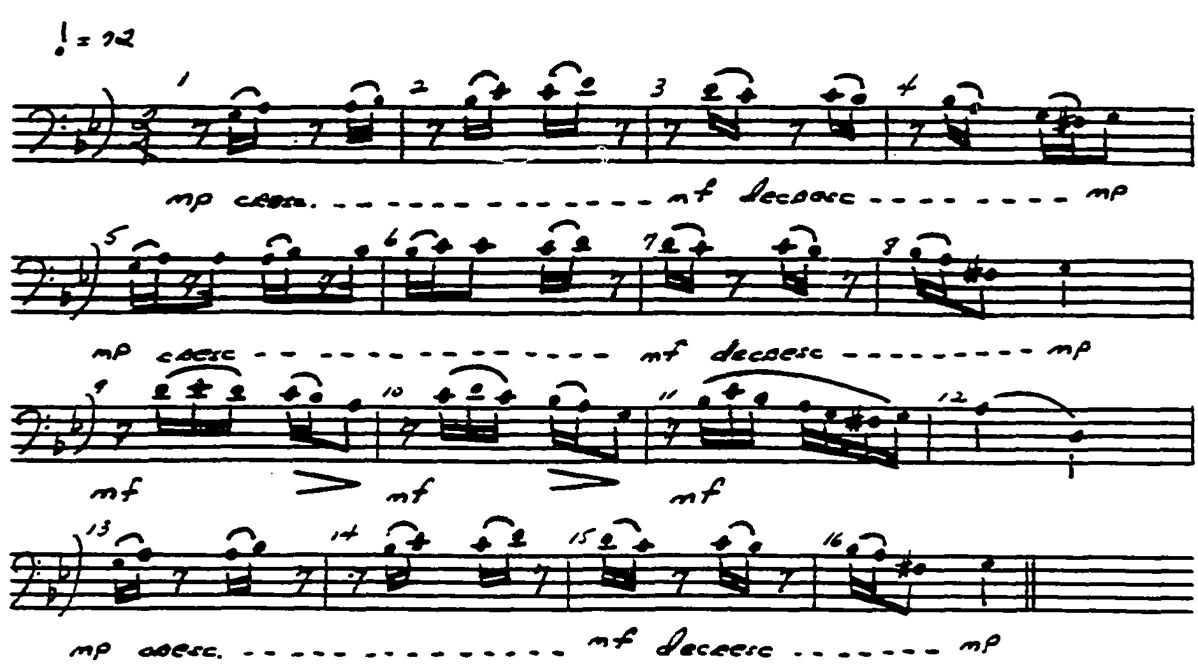
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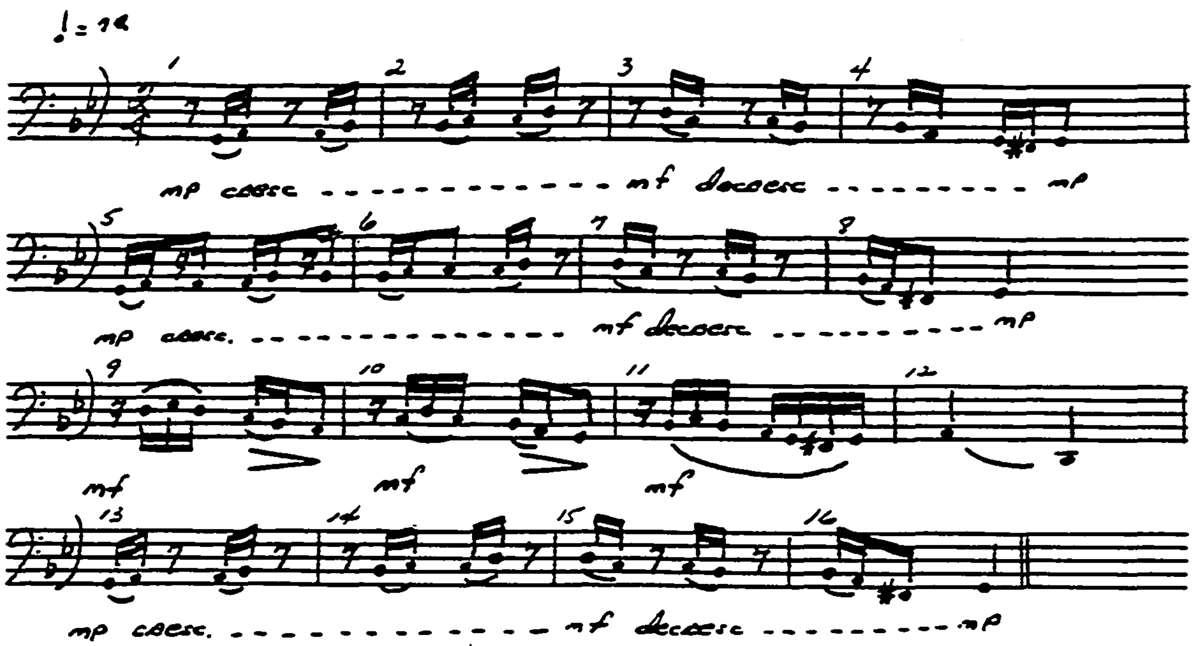

mp cresc ------------ mf decresc ---------- mp
mp cresc. -------------- mf decresc ---------- mp
mf
mf
mf
mp cresc. -------------- mf decresc ---------- mp

Memorization Assignment V: Analytical Questions

Key? ______

Meter? ______

How many phrases?

Indicate, by measure number, the first measure of each phrase.

Compare Phrases I, II, and IV.

Melodically, how are they the same?

When comparing the short rhythmic fragment, does each one start on the note which precedes it?______

Rhythmically, how are they different?

Notate the articulation for each rhythmic fragment. (♫)

Phrase III starts and ends on what scale degree? ______

Note the melodic sequence starting in measure 9. (no response)

Do the dynamics compliment the melodic line?______

APPENDIX F - POSTTEST VALIDITY QUESTIONNAIRE

APPENDIX F

POSTTEST VALIDITY QUESTIONAIRE

The posttest will include two parts: I. analytical observations, and II. memorization efficiency.

I. Analytical observations: The subject will verbally analyze the music by describing the perceived form and content of the music. Verbal analysis will be tape-recorded and rated on the analysis check-list.

1. The verbal analysis of music indicates the analytical ability of the subject. (circle one)

1	2	3	4	5
strongly agree	agree	agree with reservation	disagree	strongly disagree

2. The analysis check-list provides an objective method of rating verbal analysis. (circle one)

1	2	3	4	5
strongly agree	agree	agree with reservation	disagree	strongly disagree

II. Memorization efficiency: The subject will rehearse the music until memorized with a goal of two consecutive memorized performances. The time interval will be rated by timing from the first trial to the end of the final memorized performance.

1. The memorization efficiency measures the time required to memorize the material. (circle one)

1	2	3	4	5
strongly agree	agree	agree with reservation	disagree	strongly disagree

2. The posttest music is of moderate difficulty. (circle one)

1	2	3	4	5
strongly agree	agree	agree with reservation	disagree	strongly disagree

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