A Descriptive Study of the Relationship Between Language Reading Proficiency and the Age At Which Music Lessons Are Begun

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ABSTRACT

The purpose of this descriptive study was to explore whether there is a relationship between the age at which music lessons begin and language reading proficiency as an adult. Such a relationship may indicate that transfer of learning takes place between the processes of learning to read language and learning to read music. One hundred forty-seven subjects, ages fifteen and up, took a standardized reading test and filled out a music experience questionnaire. The scores of the reading test were compared to the age at which individuals began taking music lessons. Scores were grouped in several different ways, including the average age when lessons were begun and by current age cohorts. Results show that there is a statistically significant relationship between language reading proficiency and early training in music. By emphasizing music literacy at an early age, music educators can provide optimal conditions for transfer of learning between the two processes. (Contains multiple tables and charts.)

CHAPTER I

INTRODUCTION

Mention the "Mozart effect" to a group of music educators today and they will likely try to change the subject. Temple Grandin, Matthew Peterson, and Gordon L. Shaw's much publicized study on the relationship between listening to a Mozart sonata and increases in spatial-temporal reasoning provided considerable support for music education back in the nineties (Grandin, et al 2). Unfortunately, their findings were taken out of context, eagerly embraced by almost everyone from music teachers to mass marketers, and subsequently rejected in later replication of the study (May 4). Sadly, the "Mozart effect" did not provide the impetus for music education many had hoped it would.

Given the current educational climate of budget cuts, student testing, and standards assessment, some music teachers still find themselves defending their jobs. Schools are being held more accountable for their programs, and curricula are increasingly driven by measurable data. Ideally, music educators should be able to defend the study of music for its aesthetic value alone, but the current climate makes that impossible.

As a result, music teachers must follow the example of their colleagues in other disciplines who use the latest brain research to support curriculum design. Although this research is relatively new, there are "general principles and laws that explain what is known and predict what is not yet known" (Weinberger 6). There are many who believe that music behavior is a manifestation of other forms of brain function which are already

well understood (Weinberger 6). Likewise, there seems to be evidence of the transfer of learning from music to other disciplines.

Need for the Study

In response to an inquiry published in *Psychology of Music*, a study by Maria Spychiger of the University of Fribourg, Switzerland is cited which showed that "children who were involved in a curriculum which increased music instruction at the expense of language and mathematics became better at language and reading but no worse at mathematics" (Weinberger 5). A report summarizing The National Adult Literacy Survey, a project of the National Center for Education Statistics, states that "individuals demonstrating higher levels of literacy were more likely to be employed, work more weeks in a year, and earn higher wages than individuals demonstrating lower proficiencies" (Kirsch, et al 3). This suggests that reading skills have an impact on an individual's success in life. By extension, if transfer of learning occurs between reading music and reading language, then instruction in music literacy during childhood may be a valuable tool for improving adult literacy rates.

When considering the relationship between reading language and reading music, one needs to understand the specific cognitive processes involved in each of those skills and how they are similar or different. Comparisons between the two processes may reveal methods of teaching that will support learning in both areas. Previous research primarily focuses on elementary age children and involves relatively short-term projects which isolate individual elements of each skill.

These short-term studies have resulted in little consensus regarding which specific processes in music have an impact on reading. This suggests that the whole process of what happens in the brain when learning music may have an effect of positive transfer to language skills. According to Howard Gardner's theory, multiple intelligences "rarely operate independently…[but] are used concurrently and typically complement each other" (Brualdi 1).

Purpose of the Study

If learning in one area can enhance another, it follows that instruction in those areas should take place simultaneously. If, for example, music instruction has an impact on learning to read, early training in music literacy should result in greater language reading proficiency.

The purpose of this descriptive study is to investigate the relationship between the age at which one learns to read music and the degree of language reading proficiency later in life. Stated in more specific terms, the basic hypothesis is that those who learn to read standard musical notation at an early age become more proficient language readers.

Sub-Problems

Other questions addressed in this study are as follows:

- What cognitive processes are involved in learning to read language?
- What cognitive processes are involved in learning to read music?
- What are the similarities and differences between the two skills?
- What comparisons have already been made between them?

Basic Assumptions

1. A minimum of six months of formal music instruction is required to learn to read music.

2. An individual who has formal music instruction will learn to read music.

3. An individual does not have to be a proficient performer to be considered able to read music.

4. Participants in the study are capable of determining for themselves whether or not they are able to read music.

Delimitations

Delimitations Regarding Music Literacy:

1. This study is limited to those who read music as a result of formal music training.

2. Formal music training is limited to music instruction that occurred in private or small group lessons and lasted for a minimum of six months.

3. This study will not test music performance proficiency.

4. This study will not test music reading proficiency.

Delimitations Regarding Reading Proficiency:

1. Reading proficiency is limited to measures of speed and comprehension.

2. Reading speed and comprehension will be defined by the Nelson-Denny Standardized Reading Test, Form G from The Riverside Publishing Company, Itasca, Illinois.

Other Delimitations:

1. This study is limited to individuals age 15 and older who have had formal music instruction.

2. This study is limited to consideration of the variable of age at which formal music instruction begins.

3. This study will not consider less quantifiable variables such as environment, aptitude, intelligence, and motivation which may impact both music literacy and reading proficiency.

Terms and Definitions Used in the Study

Absolute pitch: An awareness of the exact frequency of the vibrations of a musical sound; the vocal ability to reproduce that frequency.

Accomodation: "Altering existing schemes or creating new ones in response to new information" (Woolfolk 29).

Age cohort: A grouping of individuals by similar age.

Alphabetic stage: The stage in reading where the "knowledge and correspondence between individual phonemes and graphemes is learned" (Lamb 2).

Assimilation: "Fitting new information into existing schemes" (Woolfolk 28).

Atonal music: Music created without any tendency to a specific tonal center (Politoske 550).

Beat: The steady pulse which forms the basis for rhythmic patterns.

Behaviorism: Theories of learning that "focus on external events as the cause of changes in observable behaviors" (Woolfolk 205).

Chaining: A series of "continuous, conditioned anticipations of stimuli" (Gordon, *Psychology of Music* 58).

Classical conditioning: An "association of automatic responses with new stimuli" (Woolfolk 207).

Correlation coefficient: An equation that gives a statistical description of the relationship between two variables.

Cortex: A "layer of gray matter that covers most of the surface of the brain" (Barnhart 199).

Criterial set: A group of characteristics used to classify an object.

Diatonic scale: "Any major or minor scale without chromaticism" (Politoske 552).

Discrimination learning: "Responding differently to similar, but not identical stimuli" (Woolfolk 208).

Domain: A field of thought, action, or emotion.

Dyslexic: A reading disability in which the reader has difficulty processing graphic symbols.

Egocentric speech: The self-directed speech of children which "guides their thinking" (Woolfolk 45).

Extra-musical reference: An external thought or idea which a composer attempts to express musically.

Fugue: A "contrapuntal composition of the Baroque and later period, based on a main melody, called a subject, that is presented in turn by each voice... and then repeated in different keys before ending in the original tonic" (Politoske 552).

Functional magnetic resonance imaging: An imaging technique that uses radio waves and a strong magnetic field to map the metabolic changes that take place in active portions of the brain.

Generalization: To "infer a general rule from particular facts" (Barnhart 335).

Generative grammar: The intuitive set of rules upon which a composition is based.

Gestalt theory: A theory of learning that "emphasizes the fact that a whole may be something more than the sum of its parts, and that the parts of a whole are often modified by their relationships to it and to one another" (Barnhart 338).

Graphemes: "The written symbol used to represent a phoneme" (Zintz 89).

Inference learning: Drawing conclusions by means of generalizations.

Intervals: The musical and mathematical relationship between two pitches.

Kodály training: A philosophy of music teaching based on the work of Zoltán Kodály and his associates.

Leitmotiv: The "melodic, rhythmic, and/or harmonic motive associated with a person, thing, or idea in the music dramas of Richard Wagner" (Politoske 553).

Logographic stage: The stage in reading where words are thought of as indivisible wholes (Weaver 312).

Meter: A "pattern of accented and unaccented beats" (Politoske 553).

Octave: An interval of an eighth, or that in which "the higher pitch has twice as many vibrations per second as the lower" (Politoske 554).

Orthographic stage: The stage in reading where the reader uses "knowledge of spelling patterns and the spelling system of the language" (Weaver 312).

Outlier: An individual point in a set of data that is outside the typical range for that data.

Phonemes: "The smallest significant unit of speech" (Zintz 90).

Phonemic awareness: The "awareness that there are separable sounds in words; the ability to hear separate phonemes in words" (Weaver 308).

Phonics: "The teaching of techniques about the sounds of written words so that children acquire letter-sound correlations" (Zintz 90).

Phonological awareness: The "awareness of the sound units in a language" (Weaver 308).

Pitch: The "sound of a tone, relatively high or low, determined by the number of vibrations per second" (Politoske 555).

Pitch discrimination: The ability to make aural distinctions between musical sounds.

Procedural knowledge: Knowledge that is demonstrated when performing a task (Woolfolk 248).

Response: An "observable reaction to a stimulus" (Woolfolk 207).

Rote learning: Learning which takes place by memorization.

Scale: A specific pattern of tones, usually within an octave, which serves as the basis for a composition (Politoske 556).

Schema: A "basic structure for organizing information and concepts" (Woolfolk 259).

Sight-reading: The ability to perform a musical composition at first sight with no previous rehearsal.

Signal learning: The perception and identification of sound (Gordon 57).

Social learning theory: A theory of learning that "emphasizes learning through observation of others" (Woolfolk 225).

Stimulus: An "event that activates behavior" (Woolfolk 207).

Theory of multiple intelligences: Howard Gardner's theory that postulates that intelligence is not limited to one type of human capability, but may be manifested in at least seven different types of capabilities (Woolfolk 115).

Tonality: The "aural effect of music centered around one note or based on a particular key" (Politoske 557).

Tonic: The "basic or home note of a scale, frequently called 'Do' " (Politoske 557).

Transfer of learning: The "influence of previously learned material on new material" (Woolfolk 319).

Verbal mediation: Talking oneself through the steps of a task.

Visual trace: The iconic memory of a perceived image.

The next chapter explores some of the theories of learning as proposed by various individuals. It also considers how those theories are applied to the processes of reading both language and music, and compares the cognitive and intellectual relationships between them.

CHAPTER II

RELATED RESEARCH

When considering the question of whether transfer of learning can occur between two different processes such as reading music and reading language, one must first understand what learning is. Gagné, an experimental psychologist specializing in the field of learning and education, defines learning as "a change in human disposition or capability that persists over a period of time and is not simply ascribable to processes of growth" (2). In other words, learning is not confined to changes that come with natural development, but requires the active participation of a learner, and in some cases, a teacher. If that teacher presents material in a way that demonstrates an understanding of how learning takes place, the learning is likely to be more efficient and more permanent.

Learning Theorists

Aristotle, Pavlov, and Skinner

Early theories of learning emphasized a simple behavioral aspect. Aristotle believed that people remember things that are connected or associated in some way, either by similarity or contrast. The more often those things are experienced together, the stronger the association becomes (Woolfolk 207). Pavlov, a Russian physiologist who studied reflex behavior, created deliberate associations by means of what he called classical conditioning. He believed that learning is a result of an involuntary response to a stimulus (Woolfolk 207). B. F. Skinner, a leader in the American school of behaviorism, took this a step further by using reinforcement or punishment to strengthen or suppress that response (Woolfolk 239).

Bandura

Believing that human behavior was too complex to be explained by physical stimulus-response theories, Stanford professor of psychology Albert Bandura felt there was also a mental component to learning (Hargreaves, *Developmental Psychology* 18). He developed behaviorism further into social learning theory, which allows for learning based on the observation of others. He taught that humans learn through imitation of and reinforcement by role models (Woolfolk 239).

In contrast to the behaviorist view of the learner as simply responding to external stimuli, cognitive learning theories view the learner as one who actively constructs meaning from his responses to those stimuli. Cognitive learning theorists approach the issue from a number of different perspectives.

Information Processing Theory

One of the most basic of these perspectives is information processing theory which uses the model of a computer to explain how humans learn. According to this analogy, information is gained through perception by the senses. This information is then processed in a way that is meaningful to the learner and stored in memory, resulting in a change in behavior or attitude. As more information is stored, or learned, the capacity and rate of processing of information increases (Hargreaves, *Developmental Psychology* 17).

Gestalt Theory

Close to information processing theory is Gestalt theory of learning, which states that “meaning and comprehension start with perception” (Skilters 2). Learning takes

place when the "perceived disorder" of a new experience is placed within the order of one's previous experience (Reynolds, *Learning Theories Part 2* 36). The new experience then becomes part of the whole of an individual's store of information.

Piaget

Jean Piaget was a Swiss psychologist who studied child development. His research on cognitive development convinced him that humans go through stages in which they employ "increasingly abstract and logical forms of thinking" as a result of the twin processes of assimilation and accommodation (Hargreaves, *Developmental Psychology* 32). Upon first exposure to an idea, a schema, or example, is formed and stored in an individual's memory. When another slightly different example is encountered or assimilated the learner experiences instability until he can adapt his schema for that idea to accommodate or include the new example. His way of thinking has been changed and learning has taken place. Piaget calls this learning equilibration, or the "stability of cognitive structures" (Hargreaves, *Developmental Psychology* 32-33).

Bruner

Jerome Bruner, a research professor of psychology at New York University, was influenced by Piaget's work and expands on his ideas. He proposes that the learner does not just absorb information but deliberately selects, retains, and acts upon what he perceives. This takes place in three stages: the experiential, where the learner perceives what is directly experienced; the iconic, where the learner receives information by means of visual or mental images; and the symbolic, where the experience is represented by some kind of symbol system such as writing or musical notation. Bruner advocates a

spiral curriculum model of instruction which introduces material at increasing levels of complexity, depending on the developmental stage of the learner (Reynolds, *Learning Theories Part 2* 36).

Gagné

Robert Gagné, an experimental psychologist involved with learning and education, divides what is learned into a variety of capabilities. He defines them as intellectual skills, which include such concepts as rules, discriminations, and procedures (53); cognitive strategies, which are the skills learners use to control their own thinking and learning processes (55); verbal information, which encompasses the facts one needs to know to function (58); motor skills, which are the sequences of movements that constitute a physical procedure (62); and attitudes, which are comprised of the thoughts and emotions which influence an individual's choices and behaviors (63).

Each of these capabilities requires different prior capabilities in order for learning to take place, therefore instruction must be sequenced (Gagné 17). Simpler behavioral principles must be learned before higher-order, cognitive principles can be mastered. The basic forms of learning consist of associations and chains, which are the connections between pieces of information. These are prerequisite to learning discrimination, which is the ability to make distinctions between ideas or perceptions and place them into categories. This in turn leads to learning concepts, which are broad categories of ideas. Learning concepts is a prerequisite for learning rules, which can be defined as relationships between concepts. Rules can then be combined into higher-order rules,

more complex rules which can be applied to general situations rather than specific ones (Gagné 55).

Gardner

Howard Gardner disagrees with the conclusion that logical thinking is the end state of cognitive development (Hargreaves, *Developmental Psychology* 50). His theory holds that intelligence is more than problem-solving; rather, it is also the "ability to create products as manifestations of understanding and learning" (Reynolds, *Learning Theories Part 3* 36). Instead of learning taking place as a sequence, he describes it as an interactive model of systems of development. These systems are described as making, the action of the creator; perceiving, the action of making discriminations; and affecting, which involves an emotional response to an action or product of an action. The major task of each of these systems of development is the acquisition and use of symbols (Hargreaves, *Developmental Psychology* 50).

Theories and Process of Language Learning

The theories of learning as they are applied in the field of education have resulted in a variety of approaches to the way different subjects are taught. Their application to teaching reading has yielded three perspectives.

Skills-Oriented Approach

The skills-oriented approach is sometimes referred to as a "bottom-up approach." It holds that reading is "composed of discrete parts that can be separated for units of instruction" (Zintz 8). The assumption is that, if a reader can identify and pronounce words, the meaning of those words will follow.

The skills approach teaches reading as a three-stage decoding process, beginning with the basic units of language. The first step in this process is learning to pronounce words by means of letter identification (Weaver 33-37). This is achieved by learning to recognize phonemes, the smallest units of sound in speech. Students are taught to learn which letters or groups of letters correspond to specific sounds, and then to combine those sounds into words (Lamb 2). Fundamental to this process is the teaching of phonics, a system of sound and symbol correspondence (Zintz 8).

The next sequential step is learning to identify words and associate them with a meaning (Weaver 14). Readers identify words in three stages (Lamb 2). The first stage, logographic, involves whole word recognition, where a word is learned by sight. The second, or alphabetic stage, requires letter by letter recognition and combination into words, and the identification of clusters of letters and spelling patterns which give cues to the identification of the word (Smith 120). The alphabetic stage also entails learning the correspondence between phonemes, or units of sound, and graphemes, the symbolic representation of those sounds. The third stage is the orthographic, where a reader has "knowledge of the way in which letters are grouped into words" (Smith 127). At this stage a reader can recognize these groupings instantly as words without having to go through the first two stages.

Language-Experience Approach

Conversely, the language-experience or top-down approach to reading is based on the idea that reading is "a total process that cannot be broken down into parts without distorting the process" (Zintz 8). Meaning does not come automatically from word

recognition but rather through the interaction that takes place between the mind of the reader and the language of the text (Weaver 14). As a reader perceives both visual and nonvisual information, there is a constant process of making and testing hypotheses regarding the meaning of the text (Smith 11).

In this approach, phonics is not taught specifically but is learned through generalization and inference (Zintz 11). Meaning is gained not by simple word recognition but by clues supplied by the surface structure of the text. This surface structure is defined as the part of text that is both seen and heard: elements such as word patterns, endings, and word order (Weaver 30). The surface structure in turn helps the reader determine the deep structure of the text, defined by Weaver as the "underlying relationships that are perceived by, or rather constructed by, the reader or listener, on the basis of his or her prior knowledge and experience" (30).

Another way to describe this approach to reading is with Gray's Four-Step model of reading. Gray breaks down the process into perception, the identification and pronunciation of a word; comprehension, the ability to make sense of the word as it occurs in the context; reaction, a judgement or emotional response to the meaning of the text; and integration, the assimilation of the meaning of the text into one's own set of experiences (Zintz 14-15).

Balanced Approach

Finally, a third and more recent approach to teaching reading combines elements of the first two to create what is called a balanced approach to reading. This view holds that the processes of recognizing letters and words and of extracting meaning from a text

are happening simultaneously (Chang 2). One process is not necessarily a prerequisite of the other, but instead "the ability to read the text results from the *interplay* of information from the language systems rather than from their *sequential* use" (Zintz 14, italics added). Smith calls this type of instruction mediated word identification. In this process, words can be identified in several different ways. The reader can use the context to rule out unlikely alternatives, use what is already known about other words to make generalizations about the unknown word, or use known spelling patterns to help decode the unfamiliar word (145-149).

This method has been shown to be a practical means of teaching children to read. In a survey of highly effective teachers, Metsala reports that these teachers use "both immersion in authentic literacy-related experiences and extensive explicit teaching…especially with respect to decoding and other skills" (519). Hansen also underscores the need for skill in all areas of reading, defining fluency in reading as demonstrating "high-level skills in phonological awareness, phonemic awareness, sight identification, orthographic awareness, and the ability to use effective cueing systems" (21).

Theories and Process of Music Learning

Since this study is concerned with parallels between the language reading process and that of music reading, it is necessary to investigate how these same learning theories are being applied to teaching music.

Despite Hodges' statement that there is currently "no theory devoted specifically to an explication of music reading" (469) there are analogies in music to the skills-

oriented/language-experience approaches of language reading. The two different approaches can be characterized as the differentiation between music teaching and music learning. Music teaching, deals mainly with the production or performance of music, while music learning addresses these but also involves the perception of music (Hargreaves, *Developmental Theories* 377-378).

Music Teaching/Skills-Oriented

The more traditional methods of teaching music have taught rules and skills in the abstract, much like the skills-oriented approach to teaching reading (Hargreaves, *Developmental Psychology* 215). This deductive method of teaching tends to use behavioral techniques. As students achieve a desired musical goal, their success is reinforced by extrinsic rewards such as certificates, privileges, or similar systems (Hargreaves, *Developmental Psychology* 21). This does produce success on a certain level. When teaching the recorder to fourth and fifth grade students using a curriculum titled *Recorder Karate* (Philipak), this researcher found that the reward of receiving a different colored ribbon or "belt" to tie on their recorders as each song level was passed proved to be a very effective motivator for her students.

Music Learning/Language-Experience

In contrast, allowing students to first experience music before drawing out and learning the concepts contained within it parallels the language-experience approach to reading. A report published by Her Majesty's Inspectorate and quoted by Hargreaves surmised that "an over-emphasis upon the 'academic' aspects of music…has probably stifled interest in the subject for many pupils" (*Developmental Psychology* 215). This

report went on to say that musical skills are better learned inductively, after students are allowed to experience and enjoy the music as a whole entity.

Cognitive Music Learning Theories

This latter approach to teaching music is embedded in many of the cognitive music learning theories currently being published. Though each theory has its own specific terminology and approach, most can be linked to at least one of the general cognitive theories of learning that have already been discussed.

E. J. Gibson's perceptual-development theory takes elements from both Gestalt theory and Bruner's concept of selecting, retaining, and transforming information. According to Hargreaves, she proposes that an individual is able to take in a limited amount of information. As differentiation and attention develop, more information is perceived and retained. The student is able to recognize "progressively larger units" of the music. The relationship to Gestalt theory comes in the view of Gibson that perception ultimately deals with the stimulus as a whole rather than with its individual elements. She links perception directly to learning without the need for internal cognitive processing (*Developmental Psychology* 14).

F. Lehrdahl and R. Jackendoff have developed a generative theory of music learning that is similar to the information-processing model of learning. They suggest that "acoustic information triggers mental operations that impose order onto input" (Reynolds, *Learning Theories Part 2* 37).

Robert Cutietta draws on Gestalt philosophy by stating that the mind puts music into categories based on its entire structure rather than on its individual elements. One

can know "what something *is* when that person can say what it is *not*" (Reynolds, *Learning Theories Part 3* 37).

Jeanne Bamberger's ideas about music learning parallel Piaget's ideas of developmental learning. She believes that music learning is a series of perceptual problem-solving activities. A listener is challenged mentally by hearing a piece of music, and with repeated hearings, mentally restructures his perceptions and conclusions about that music (Reynolds, *Learning Theories Part 3* 36). Another theorist whose ideas stem from Piaget is Thomas Regelski. He feels that children should create their own meaning from their musical experiences rather than being simply told what to think or notice about a piece of music (Reynolds *Learning Theories Part 3* 37).

A. Ruttenberg's theory is similar to Gagné's hierarchy of learning. Ruttenberg describes music learning as a progression of steps leading from sensation to perception , to cognition, and finally to creativity (Reynolds, *Learning Theories Part 3* 36).

Like the language-experience approach to reading, these theories of music learning seem to focus on deriving meaning from music, but do not address the question of how the student acquires the skills of reading and performing music. That information corresponds more to the skills-oriented approach of teaching phoneme recognition and letter identification in reading. As in teaching reading, music teaching may best be accomplished by a balanced method which incorporates both approaches.

Skill Acquisition

The problem of how students acquire skills in both reading language and reading music has been addressed by theorists in general learning as well as music learning.

Gordon

Edwin Gordon has developed a hierarchy of music learning which describes what happens as a student learns music skills. He divides this learning into two main levels, discrimination and inference. At the discrimination level, the emphasis is on rote learning and perception. Inference learning, on the other hand, is based on conceptual learning. The two levels of learning are presented as a sequential hierarchy, but Gordon states that they operate concurrently. (Gordon, *Learning Sequence* 7-8).

Gordon has compared this hierarchy of music learning to a similar one put forth by Gagné that applies to general learning. Gagné's hierarchy outlines eight types of learning in the following order: signal learning, stimulus-response learning, chaining, verbal association, multiple-discrimination learning, concept learning, principle learning, and problem solving. Gordon suggests that the first four of these types involve perceptual learning and correlate with his discrimination learning, while the last four deal with conceptual learning and correlate with inference learning (*Psychology of Music* 57-58).

The first level of learning described by Gordon is aural/oral. This involves rote learning of music and the development of a sense of tonality and meter. He compares this to the signal learning of Gagné's hierarchy. The next step in that hierarchy is stimulus-response learning, which Gordon describes as a musical response to and recognition of a musical sound. This leads to chaining, which is a series of stimuli and responses, and is comparable to the expectation of hearing a series of musical tones (*Psychology of Music* 58).

The next step in the discrimination level of learning is verbal association, so named by both theorists. What is heard is now identified with words, which are necessary in order to represent the stimulus conceptually (*Psychology of Music* 58). Gordon continues this level of learning with partial synthesis, which involves assimilating the aural and verbal associations that have been made and combining these into patterns with their own syntax. Next Gordon lists symbolic association, or writing music, which he describes as the reverse of verbal association, or reading music. His final step in discrimination learning is composite synthesis, which combines familiar patterns into complete musical structures (*Learning Sequence* 11-14).

Inference learning is characterized by generalization of what has been learned from familiar material to new material. Gagné calls this multiple-discrimination learning (*Psychology of Music* 58). Gordon describes it as being able to identify unfamiliar patterns based on knowledge of familiar ones (*Learning Sequence* 15). The next step, Gagné's concept learning, also falls under generalization, or applying known concepts to the unfamiliar patterns. From there the learner moves to principle learning, which is an understanding of the theoretical basis of the concepts being used. Gordon equates creativity and improvisation with Gagné's problem-solving, where the concepts that have been learned can now be used to create new patterns (*Psychology of Music* 58-59). Finally, Gordon's hierarchy leads to theoretical understanding, which he sees as "not a readiness for music reading…[but] an outcome of music understanding" (*Learning Sequence* 18). Theoretical understanding is a step beyond the "what" and "how" and moves to the understanding of the "why" of a musical composition. Gordon believes that

this progression to a higher level of learning is key to teaching students to be independent thinkers.

> When students are exposed only to rote learning, they learn to be told what music they should appreciate; when students are exposed to inference learning after discrimination learning, they learn to understand music of all types and therefore may make their own choices (*Learning Sequence* 19).

Production System Theory

Yet another way of looking at skills acquisition, Production System theory, has been proposed by Anderson and outlined by Sloboda in The Musical Mind. In simple terms, this theory breaks down any skill that may be learned into a series of individual goals, each of which has one or more production rules which determine how it is be achieved. A production rule states that IF a particular condition is present THEN a specific action can be taken (218). Once each production rule is satisfied, the skill has been mastered.

Sloboda presents this idea in combination with the theory by Fitts that separates the process into three different stages. The first stage, cognitive, consists of acquiring factual knowledge of what a skill is and breaking it down into achievable steps. It is common at this stage of learning for the participant to talk himself through the steps required to perform the skill. This is the stage in which production rules are given the most attention. The learner must engage in repetition and feedback until the skill becomes more automated (217).

The second stage, the associative stage, is where factual knowledge becomes procedural knowledge. There is a gradual "smoothing out" of the performance, and less verbal mediation is required. At this point the learner is ready to apply some of the procedures already learned to additional goals. This stage moves naturally into the third, autonomous stage, where there is gradual and continued improvement in the skill (Sloboda 217).

This section of Chapter II has shown how the broad theories of learning have been applied to the fields of both language and music. The next section will discuss some of the ways in which specific cognitive strategies, basic structures, and intellectual skills can also be applied in both areas.

Relationship of Cognitive Strategies

Cognitive strategies have been shown to impact the development of song formation in children. Hargreaves discusses how W.J. Dowling's research demonstrates that children "exercise schematic control over their songs" (*Developmental Psychology* 70). Rather than being random vocalizations, even the early songs of children contain a structure that forms the basis for later songs (*Developmental Psychology* 78). Children demonstrate assimilation by developing their own musical schemas based on what they hear. As they develop, these schemas change, showing accommodation to new information. Hargreaves notes that "spontaneous vocalizations gradually move…towards adult rules of tonality, rhythmic organization, and so on" (*Developmental Psychology* 78).

Dowling concludes that the development of song formation in children is "precisely parallel" to the way in which syntax is acquired in spoken language (qtd. in Hargreaves, *Developmental Psychology* 70). Smith writes that children learning to speak are not taught specific rules of grammar, but invent them based on what they hear from adults. They test these rules in their speech, making corrections as they receive feedback. (94).

Russian psychologist Lev Vygotsky's strategies of egocentric and inner speech also have a parallel in music learning. He felt that "language precedes thought" and that by talking to themselves out loud, children are learning to think about what they are doing. As their cognitive capabilities increase, the external speech eventually becomes internal (Newlin 32). The parallel to this in learning music is discussed by Sloboda as he relates the process he went through while learning to play a new musical instrument. He found he had difficulty remembering the fingering for a given note, and that he had "constantly to make recourse to verbal information" (217). As he moved from the cognitive stage of learning to the associative and finally the autonomous stage, this was no longer necessary.

Relationship of Structure

Language and music share a relationship of structure in several ways. The noted linguist and educator Noam Chomsky maintained that language can be divided into surface structure and deep structure. He believed that all natural languages have the same deep structure, an indication of a universal quality of human thinking (Sloboda 12).

Smith defines the surface structure of a language as the observable characteristics of that language while the deep structure is that meaning which exists in the mind of the originator or receptor of the language (70). Surface structure consists, among other things, of words and word order, but does not always convey the deep structure, or meaning behind the words. For example, one can say "John took the plane," a sentence with a relatively simple surface structure. It could have several different meanings, or deep structure. It could mean that John went to the airport, bought a ticket, and became a passenger on a plane that conveyed him to his destination. It could also mean that John commandeered the plane and flew away with it. The deep structure can only be determined by the context in which the sentence occurs.

In a similar vein, music also has surface structure and deep structure. The surface structure consists of the physical elements of the music itself, its melodic contour, rhythmic patterns, meter, and so on. The deep structure can be described as the underlying harmonic and rhythmic structures and basic tonality. For example, in the musical form known as theme and variations, differentiation is achieved at the surface structure while the underlying, deep structure remains essentially the same. As another example, many different compositions have been written using a twelve-bar blues formula, the deep structure, yet the individual songs can sound very different from each other because of variations in surface structure.

Music theorist Heinrich Schenker believed that all good music can be reduced to the same basic deep structure, an indication of the universal nature of music (Sloboda 12). The analogy breaks down somewhat at this point, however, as one considers in

which direction complexity moves. According to Schenkerian analysis, complexity lies in the surface structure, with very little differentiation between deep structures (Sloboda 15). The opposite is true, however, of John's relationship with the aforementioned plane. The example sentence is simple in its surface structure, whereas the deep structure has the potential to become quite complicated.

Notwithstanding the incompleteness of the analogy so far, the surface and deep structure of language can be broken down into elements that can also be attributed to the structure of music. Surface structure of language consists of phonology and syntax, while the deep structure can also be called semantics.

Phonology

Phonology in language can be defined as the method of categorizing the individual sounds which comprise a language (Sloboda 22). At its basis are phonemes, the basic units of sound in a language. Some correspond specifically to individual letters, such as "t," and some are comprised of the sounds of groups of letters, such as "sh." Each phoneme is characterized by significantly discrete frequency and duration parameters, as well as methods of production by the vocal mechanism (Sloboda 23). The phonology of each culture is somewhat unique, and is imparted to its members by the sounds they hear spoken as early as three days old (Sloboda 24).

The basic unit of phonology in music can be characterized as the individual notes, or tones, combined with rhythmic value. Each has its own discrete frequency and duration parameters. Each culture has its own musical phonology, generally determined by that particular musical culture's subdivision of the octave into the subset of pitches

used for a scale. This phonology is imparted to its members by the original music of that culture, called the "musical mother-tongue" by Kodály (Zemke 12).

Syntax

Smith defines syntax in language as "the manner in which words are organized in meaningful language, also referred to as 'grammar'" (238). There are three types of grammar which occur in language, the formal grammar of the classroom which can be taught, the semantic grammar which concerns itself with meanings, and transformational grammar, which is not taught but consists of the intuitive rules about language that are formulated as one learns language (Smith 79-80). The third type is that which children who are learning to speak hypothesize about and test as they hear speech from others.

Syntax in music is much more difficult to establish due to the great diversity of musical compositions. Culture comes into play in musical syntax, but so does genre. It can be successfully done if one considers a small, specific body of work (Sloboda 38). Syntax also needs to be broken down into melody, rhythm and meter, and harmony.

Melody, while not independent of rhythm, is the most recognizable feature of a piece of music. The listener processing a melody will compare it with his existing schemata for what a melody should be, using assimilation and accommodation to categorize each example. The melody is memorable to the listener when it is "sufficiently different from anything we might have thought of…and when we appreciate some particular rightness or fittingness about the choice" (Sloboda 52). This "rightness" is the quality of the melody that causes it to correspond to the listener's intuitive rules about what melody should sound like, or his "transformational grammar" for melody.

Syntax for rhythm and meter is perceived in stressed beats, groupings, and repeated pitch patterns. Even when there is no obvious stress pattern, a listener "may *impose* some rhythmic grouping of his own," depending on what his transformational grammar for rhythm dictates (Sloboda 47). Here again culture is a major factor. This researcher has been present on a number of occasions where a diverse congregation, singing an upbeat hymn, is divided into those who are able to clap on beats two and four, and those who only seem to be able to clap on beats one and three.

There is also a tendency to group rhythm into phrases. Research has examined the extent of eye-voice span when reading language and when reading music, finding that both "extend to a phrase boundary" (Sloboda 37).

Harmonic rules for syntax apply mainly to tonal music. When presented with a series of pitches, depending on his or her cultural background, a listener will choose as tonic that note which seems most fundamental or central. Sloboda describes the tonic as having a feeling of psychological centrality (42), which may be analogous to Piaget's idea that there is a need to accommodate in order to move toward equilibrium. In this researcher's classroom, children as young as second grade have described music that did not end on the major tonic as sounding like it "wasn't finished." They had intuitively formed their own syntax for harmonic structure long before they were ever taught the concept of tonic. Harmonic syntax becomes a complicated matter as soon as atonal music or that which uses ambiguity as a compositional device is considered. As with the other elements of music, a generative grammar for harmony needs to be limited to smaller subsets of compositions (Sloboda 47).

Semantics

The semantics of language is defined as "the way in which meaning is assigned to sound sequences" (Sloboda 22). As previously demonstrated in the example sentence, the same sounds can have different meanings, depending on the context. Meaning can also differ depending on the perception of the listener. When asked to recall something that was heard, a listener is likely to paraphrase what was heard, adding information from his or her own perspective (Sloboda 57). When reading, meaning is often derived from contextual clues (Zintz 75). Smith considers the derivation of meaning to be the fundamental objective of reading: "Reading is a matter of making sense of written language rather than of decoding print to sound" (2).

The analogy between music and language is perhaps weakest in the area of semantics, largely because there are a number of different ways of assigning meaning to music. Some argue that music has no meaning apart from its actual musical structure, yet it often evokes an emotional response from its listeners, however individual that response may be.

Sloboda proposes that one explanation of musical meaning has to do with extra-musical references which require some kind of prescience in the listener. The meaning may exist through mimicry of some familiar sound, such as birdsongs in Vivaldi or a rainstorm in Grofé. Composers such as Wagner used musical symbolism in the form of the leitmotif to suggest recurring themes. Other music has a programmatic meaning, or a reference to some extra-musical story which the composition is supposed to represent. An example of this is Dukas' S*orcerer's Apprentice* (Sloboda 59). Without a knowledge

of the associated story, the music would not have the same meaning. Would it still have meaning? That would depend on the listener. In a sixth grade general music class, this researcher played Rossini's *William Tell Overture* for a group of students who did not know the story. Their assignment as they listened was to write or draw what they thought was happening in the musical story. They were able to extract a variety of meanings from the music, most of which made a lot of sense.

Some researchers have made attempts to assign an emotional quality to specific musical patterns. Cooke proposed that the intervals of the diatonic scale suggested different emotional qualities. For example, major intervals denote positive emotions, upward movement away from the tonic signifies outgoing emotions, and movement toward the tonic indicates repose (Sloboda 62). It should be pointed out, however, that many of the examples Cooke used to support his theory consisted of vocal music, which involved an association of words conveying some type of emotion with a given melodic motif (Sloboda 61).

An attempt to test this theory was made by Gabriel using subjects who had no previous training in music. The melodic motifs were played twice, once with Cooke's designation of emotional meaning and once with a random characterization. Gabriel failed to find any relationship between the motifs and their implied emotional meaning. Sloboda points out, however, that the motifs were presented in isolation, without the context of the complete composition (63). It may be that "musical semantics is of a similar type to poetic semantics" (64), requiring more than one hearing to attach an emotional meaning.

Yet another theory regarding musical meaning has been put forth by Meyer, who divides it into two categories. The first category is designated meaning, which is dependent on some extra-musical association. For example, a stirring rendition of "The Star-Spangled Banner" can bring tears to the eyes of a patriotic American, yet have no emotional connotation for someone from another part of the world. The other category he calls embodied meaning, which involves the actual structure of the music and the interaction between that structure and the "musical knowledge and expectations" of the listener (Sloboda 65). A trained musician listening to a Bach fugue is aware of the various entrances of the theme and its derivations, while the untrained ear may not be able to make sense of the music at all.

Relationship of Intellectual Skills

The intellectual skills involved in reading language can be related to those skills used for reading music. The following section lists six skills and how they function in both areas.

Power of Prediction

When children first begin to learn language, they create their own set of rules for syntax based on what they hear from others. They form hypotheses that predict what correct language usage is, and test those hypotheses with their own speech patterns. Based on the feedback and correction they receive, correct patterns are reinforced and incorrect ones eliminated (Zintz 77).

As a child moves on to reading, this pattern of prediction and testing continues. When an unknown word is encountered, he takes in a variety of information in order to

make a prediction about what the word is and its meaning. This information includes what is known about spelling patterns, rules of syntax, and the meaning gained from the context. A prediction is made about the word, tested to find out if it fits in with what is known of the text, and altered if necessary (Smith 18).

Smith makes the analogy between a skilled driver who is constantly watching for what is coming in the road ahead and the skilled reader who is constantly making predictions about what is in the text. The skilled reader's eye is "always ahead of the brain's decisions, checking for possible obstacles to a particular understanding" (61). By eliminating "unlikely alternatives" the fluent reader can make sense of what he is reading (62).

Musicians, particularly those who are skilled at sight-reading, also make use of the power of prediction in reading music. Research by T. W. Goolsby into eye movement during the sight-reading of music found that good sight-readers tend to look ahead at where the music is going, "making inferences" about what is coming next (Weinberger, *Sight-Reading* 2). Gary McPherson of the University of New South Wales concurs, stating that even after removing the score, a musician can usually play up to seven notes ahead. The more predictable the patterns of the music, the more accurately it can be anticipated (217). Lois Hahn's research into the efficacy of teaching note-reading within the context of a larger piece of music concluded that "a reader can learn to perceive melodic contours and rhythmic patterns and to predict likely continuations of those patterns" (47).

The power of prediction does not seem to be confined to reading and performing music. Georgia Newlin gives the example of children listening to Mozart and becoming familiar with his style of compositions, then listening to an unfamiliar selection by the same composer and making predictions about what the music will sound like (32). According to Gordon, this happens because "you are anticipating or predicting what you will be hearing next, based on your music achievement" (qtd. in Newlin 32).

Whole to Part Strategy

A necessary component of the power of prediction is the strategy of considering the whole of a text to gain comprehension. Smith maintains that good readers scan to get the general idea of a passage, and then go back and reread to pick up the details of the information (153). This scanning reduces the uncertainty about what the text means, and therefore reduces the amount of visual information necessary to decode the individual words (Smith 156).

This strategy gives rise to a phenomenon called "proof-reader's error," demonstrated in a study by Pillsbury. The hypothesis was that readers are able to identify words without completely decoding them. This is accomplished as a result of the orthographic, syntactic, and contextual information which the reader already possesses. Readers were given passages that contained deliberate internal misspellings, and tended to "make misreadings which transform[ed] wrongly printed words into their correct form" (Sloboda 74).

The same type of error is common among skilled music readers. Sloboda conducted research similar to Pillsbury's by having musicians play selections of music

that contained deliberate notational errors at the beginning, middle, or ending of a phrase. He found that when the error was in the middle of the phrase, it was less likely to be noticed. The study participants had a tendency to correct the interior phrase errors and play what the notes should have been (Chang 6). Sloboda concluded that "both music and language readers do not have to get the complete information from what they read in order to achieve comprehension" (Chang 9).

Awareness of Rhythm

Another skill important to music may also play an important role in success in reading. Research done by Usha Goswami, a professor of cognitive developmental psychology, investigated a possible link between reading difficulties and problems in detecting rhythms in speech and other kinds of sound. Groups of dyslexic, normal, and gifted readers were tested for their auditory processing capabilities. It was found that "the better the child was at detecting rhythms, the more likely he or she was to be a better reader" (Warner). Dyslexic children had difficulty detecting rhythmic stresses in nonspeech sounds.

A. S. Wisbey, founder of The Association for Children's Learning Problems, also stresses the connection between awareness of rhythm and language ability. In connection with her work with teaching music skills to young children she states that making children aware of the beat in music serves as "valuable preparation for recognizing stress patterns in language" (113). Chang reports on a study done by Sheila Douglas and Peter Willats looking for a relationship between musical ability and literacy skills. Tests involved measurements of verbal ability, aural awareness for pitch and rhythm, and word

recognition and spelling. Their results showed a significant correlation between rhythm and reading and spelling (10).

Eye Span and Movement

Measurements of eye span and movement while reading give clues about successful reading strategies. When reading, the eye makes rapid and irregular jumps from one point in the text to another. These movements are called saccadic movements. Between these movements, the eye focuses, or fixates, on a specific point in the text (Smith 34). The key to fluent reading is the amount of meaning that can be gained during a single fixation (Smith 36). Weaver writes that during one of these fixations, the eye has three different sources of information. The area specifically in focus is called the foveal region and typically spans from six to eight letters. Surrounding the foveal region is the parafoveal, which brings the number of letters observed up to fifteen to twenty. Outside this area is peripheral vision (107). It is believed that a reader processes information from both the foveal and the parafoveal region while reading, likely making inferences about what is gained from the latter, less focused vision (Weaver 108).

Music reading also involves saccadic movement and fixation. McPherson reports that skilled music readers are able to use "eye fixations that are less than 100 milliseconds…use more fixations…[and] retain more notes in visual trace" (218) than those with lower skill levels. J. D. Harris' investigation of auditory and visual perception revealed that "poor music readers tended to read note by note just as poor language readers read word by word" (Chang 17).

Phonological Awareness

Research evidence supports the idea that reading ability is enhanced by phonological awareness. In a review of research on the subject, first grade teacher Tanya Krahn-Triebensee concludes that a relationship exists "between phonemic awareness and early reading acquisition" (21). This agrees with Stuart-Hamilton's research which found that "beginning readers possessing phonemic awareness had a better reading style than those without" (qtd. in Lamb, 2).

The absence of phonological awareness as a factor in reading problems is discussed in a study by Yale neuroscientist Sally Shaywitz. She used functional magnetic resonance imaging (fMRI) to show which parts of the brain were most active during reading. Three sections of the left side of the brain associated with language detection were identified and labeled loosely as the "phoneme producer," "word analyzer," and "automatic detector" (Gorman 4). Beginning readers tended to rely more on the first two of these sections. Shaywitz also found that poor readers relied more on the memory processing sections of the brain rather than the three sections linked to language detection. Dyslexic readers had the most activity in the phoneme producing section without as much use of the automatic detector, demonstrating that they typically had "inherent difficulty in deriving sense from phonemes" (Gorman 4).

Since learning to read involves both the decoding of individual words and comprehension of a whole text (Burgess 1), those researchers who advocate the language/experience approach to reading do not place as much emphasis on phonological awareness. Weaver insists that while it is important, phonological awareness does not

have to be present before one learns to read. She describes the relationship as contributory, not causal: "phonemic awareness helps in learning to read…[and] learning to read promotes phonemic awareness" (316).

Wisbey believes that a child's tonal awareness contributes to his or her language development. A child hears language as a series of pitches, deriving a sense of tonal center from adult speech. In imitating those pitches, or musical phonemes, the child gradually learns how they are combined to form words and eventually sentences (105). Lamb's study showed that phonemic awareness was significantly related to both pitch discrimination and reading (5). Lamb also quotes Harris' study which states that "basic to the hearing of sounds in words is an awareness of pitch difference" (5).

Pattern Recognition

Smith uses what he calls the feature-analytic model to describe the process of recognizing patterns in words and letters (119, 134). Based on experience, the reader forms a list of features associated with each category of patterns for letters and words. A set of criteria for each feature is established. For example, if the category is letters with a circular shape, the criteria could include closed or open circles, and the addition of another line. The letters C, G, O and Q would fit the category, while the criterial set of closed circles would limit the letter to either O or Q. This model allows for identification of a letter or word with a minimal amount of visual information. The reader recognizes familiar patterns as being familiar words or letters, learning not the names as much as the discriminations between the physical appearances of those patterns (Gagné 92).

Weaver compares this pattern recognition in reading to the pattern recognition that takes place in learning speech. She states that one acquires an "internalized knowledge of sound patterns," enabling speech recognition even when heard from different sources. This skill is then transferred to recognition of letter patterns, allowing recognition of words with only "a fraction of the visual information" (97).

Gordon maintains that a similar process of oral and visual pattern recognition takes place when learning music. The rote learning of music provides a vocabulary of sound patterns and relationships which have meaning for the listener (*Psychology of Music* 66). As a student advances in the music learning process to being able to read and write music, he or she continues to "see the same relatively few important patterns" (78). By means of inference and generalization, the student can then use the familiar patterns to read and write unfamiliar patterns (78).

The spatial-temporal aspect of musical pattern development is explored in a study by Temple Grandin, Matthew Peterson and Gordon L. Shaw. They describe this process as "the ability to create, maintain, transform, and relate complex mental images even in the absence of external sensory input" (Grandin, et al 3). Their research shows improved spatial-temporal reasoning ability in college students after listening to a Mozart Sonata. One of the conclusions of the study states that music serves as a "pre-language" with the capacity to "enhance the cortex's ability to accomplish pattern development" (3).

A further visual comparison of the intellectual skills involved in both processes is displayed here as a table taken from an article in Music Educators Journal by Dee Hansen and Elaine Bernstorf. The purpose of the article is to show that the skills involved in

reading music parallel those in reading language. Skills from both the skills-oriented and language-experience approach in reading are included (20).

	Language Reading	Music Score Reading	Music/Text Score Reading
Phonetic Awareness	A special kind of phonological awareness involving letter-sound correspondences in the smallest units of oral language-phonemes. Phonemic awareness involves identifying and manipulating the smallest sound units within the written symbol.	Instruction that emphasizes how notation is related to the smallest units of musical sounds in systematic ways; music symbol-sound correspondences. Articulation, phrasing, tonguing, performance practice.	In a choral setting, identifying and manipulating sounds as they relate to music symbols, including articulation of pure vowel sounds, diphthongs, elisions, consonants. vocally forming the smallest sound units so that the listener can comprehend the lyrics.
Sight Identification	The ability to identify high-utility words that appear most often in print.	The ability to identify and play high-utility notes, rests, lines, spaces, rhythm symbols, dynamic markings, fingerings.	Learning the proper vocal enunciation of high-utility words in music lyrics and performing them consistently from song to song.
Orthographic Awareness	Knowing that letters and diacritics represent the spoken language. Understanding that the writing system of a language involves a specific connection between the sequence of letters, characters, or symbols, including spelling patterns that are used to recognize familiar chunks in words. Spelling includes variable and sometimes complex but mostly predictable rules.	Knowing that music symbols represent musical language. Understanding that scales are a series of patterns that are the basis for melody. In Western culture, learning a notation system that has rules about the sequences of pitches and organization of rhythms that occur in predictable ways. Knowing that pitched and nonpitched instruments are scored differently.	Combining the elements of alphabetic knowledge and music symbol-reading knowledge. Knowing rules for the use and placement of music and text symbols in written music.
Cueing Systems	Gathering meaning from words, phrases, or sentences surrounding a word (context). Determining that	Gathering meaning from musical phrases and melodic phrases, including placement of accidentals, rhythmic	Given a particular style, period, culture and composer, noting that music and music text sound and look

	material sounds "right" based on multiple clues (syntax). Noting that material looks "right" (graphophonic). Noting that material makes sense (semantic).	devices, etc. Noting that music sounds and looks "right" based on the rules of a given culture. Noting that music makes sense given the style, period, and composer.	"right" and make sense.
Fluency	Clear, easy written or spoken expression of ideas; freedom from word identification problems that might hinder comprehension in silent reading or the expression of ideas in oral reading; automaticity.	Effortless music performance; freedom from technical problems that might hinder the musical correctness of a performance; automaticity. The ability to execute the musical aspects of a performance smoothly, easily, and readily.	Effortless, independent execution of text and music symbols. The ability to perform in a technically flawless manner.

(Hansen, Bernstorf 20)

Transfer of Learning Between Music Reading and Language Reading

Based on the similarities between processes that have been discussed in this chapter, there is a strong case for the transfer of learning between reading music and reading language. Transfer of learning can be defined in several ways. Martin Gardiner, a researcher at Brown University's Center for the Study of Human Development, uses the term "mental stretching." He defines it as "changes in the representation and organization of a particular aspect of thinking that improves the way we think about distinctive kinds of information or specific kinds of mental tasks" (74). Gagné's definition is simpler, stating that transfer occurs when previous learning is applied to a new problem (74).

Transfer requires the ability to discriminate, one of the basic skills of learning. The more acute the ability to discriminate becomes, the more new learning can take

place. As learning progresses, multiple discriminations are called for, resulting in increasingly "complex learning activities" (Gagné 95). Combinations of new intellectual skills result in an increase of higher-order capabilities. These capabilities are not limited to specific skills. Gagné states that with the accumulation of these capabilities, specific intellectual skills will "generalize through the mechanism of learning transfer to the learning of many other skills and to the solving of many previously unencountered problems" (134).

Conditions for the transfer of learning are optimal when there is a similarity in the processes involved (Weinberger *Question of Transfer* 1). The processes do not have to be identical. Gardiner describes this as "thinking within different domains," where the learner discovers analogies between processes that enable creative ways of considering problems (82).

Research Basis for Transfer

Though the processes of music reading and language reading are not perfectly analogous, enough commonalities exist between them to indicate the possibility of transfer of learning. Data to corroborate this transfer has been presented by a number of researchers.

Gardiner has shown a relationship between improvement in pitch discrimination to improvement in math and word attack skills, based on data from the Minneapolis project and the New England Conservatory's Learning Through Music programs. He also found that positive, though weaker, connections existed between rhythm skills and math and reading skills (82).

Cutietta reports on a number of different studies comparing the two processes. H. Pelletier did a study where the reading ability of third graders who were taught to play string instruments was compared to a control group that did not receive the instrumental instruction. After twenty-five weeks it was found that the experimental group was 1.9 months ahead of the control group in reading ability. When the low-ability readers from each group were compared, the experimental group was 3.5 months ahead of the control group. Pelletier concluded that teaching music reading in the "formative stages of learning to read will enhance the reading ability of the students" (*Fall 1995* 27).

Robitaille and O'Neil's study involving instrumental instruction compared the Comprehensive Tests of Basic Skills scores of fifth graders taking instrumental lessons with those who did not take lessons. Instrumental students in the Albuquerque schools scored higher in every section of the test than their counterparts, with the highest gains in math and reading subtests. Those who participated in instrumental music for a longer period of time had higher gains than those who participated for shorter periods (Cutietta, *Fall 1995* 30).

The phenomenon of transfer does not seem to be limited to instrumental instruction. Jorja Turnipseed studied first grade students who were given specific instruction in critical listening to classical music, comparing their reading skills to a control group that did not receive the instruction. The experimental group exhibited a higher ability to discriminate when hearing similar words such as "latter" and "ladder." Their grades in reading were also higher than those of the control group (Cutietta, *Winter 1996* 26).

Weinberger reports on a study by Maria Spychiger of the University of Fribourg, Switzerland which concluded that "children who took a curriculum which increased music instruction at the expense of language and mathematics became better at language and reading but no worse at mathematics" (*Question of Transfer* 2). Spychiger attributed the transfer of learning to the similarity between the processes of reading language and reading music, although she did not suggest which specific aspects of either process were responsible for the transfer.

A study which featured Kodály training for first grade students produced "significantly higher reading scores" for the experimental group receiving the training than the control group who had no special training. Kodály music training specifically emphasizes music literacy, utilizing a variety of teaching methods across learning domains. The experimental group did not actually learn to read music during the study, but did learn to listen and discriminate between musical ideas (Weinberger, *Music and Cognitive Achievement* 1). This corresponds with both Gagné and Gordon, who theorize that multiple discrimination learning contributes to the ability to generalize skills to other areas of learning.

The differences in reading ability between music students and non-music students have been shown to have a long term effect as well. In a review of Scholastic Achievement Test (SAT) scores from 1987 to 1993, the College Entrance Examination Board found that those students who had taken either a music appreciation or performance class scored higher on the verbal portion of the test than those who had not taken any music classes. As with the Robitaille and O'Neil study, the longer a student

participated in music, the greater the differences in scores. The implications are that "even one year of music study leads to higher scores on the SAT" (Cutietta, *Winter 1996* 27-28).

Older students were also the subjects of a study carried out by P. H. Wood in 1990. He tested approximately 7500 university students, comparing their scores on the *Nelson-Denny Reading Test* by their major area of study. It was found that those students majoring in music and music education scored higher on the test than students in any other area of study. Those who were members of the orchestra had the highest scores overall. Wood concluded that "years of studying music notation transferred to traditional language reading for these students" (*Fall 1995* 30).

Summary

This chapter gave a background on theories of learning as they apply generally and also specifically to the subjects of reading language and reading music. It then discussed the various theories of how skills are acquired in both disciplines, and made a comparison between the intellectual skills and processes involved in them. This comparison is a basis for proposing that transfer of learning of cognitive skills is possible between these processes based on their similarities.

The question that still remains unanswered is "Which skills are specifically transferred from one discipline to another?" Some believe that it is necessary to "determine which aspects of music account for which transfer effects" (Weinberger, *Question of Transfer* 2). As mentioned in the introductory chapter, much of the research to date attempts to isolate individual components of the two processes and compare them.

Also, many of the studies have been limited to young children and for relatively short periods of time. As a result there is a lack of consensus regarding the full effect of transfer between music and reading (Weinberger, *Question of Transfer* 3).

This lack of consensus may be due in part to those efforts to break down the processes into their individual components. The principle behind Gestalt theory, that the whole is more than the sum of its parts, suggests that it is the whole process of what happens in the brain when learning music that has the effect of positive transfer. This is the reasoning which has led this author to conduct the descriptive study outlined in the next chapter.

CHAPTER III

THE DESCRIPTIVE STUDY

The previous chapter outlined evidence for a transfer of cognitive and intellectual skills between the two processes (Cutietta, Weinberger). This study explores the relationship between learning to read music at an early age, close to the age when an individual learns to read language, and language-reading skills as an adult.

This chapter describes the materials used to gather data and the procedures for recruiting test participants and administering the test. The data obtained from the tests along with the methods used to analyze it are presented. There is also a discussion of some of the incidental findings of the test.

Materials Used

The instruments used in this study were the *Nelson-Denny Reading Test,* Form G from The Riverside Publishing Company, Itasca, Illinois and a music experience questionnaire designed by the researcher. The *Nelson-Denny Reading Test* assesses achievement in three areas, vocabulary, reading comprehension, and reading rate. Its general purposes are to identify students who require extra help with their reading skills, diagnose specific areas of need, and predict academic success at both the high school and college levels (Brown, et al). It contains two subtests, Vocabulary and Comprehension, and the Reading Rate score is determined as part of the Comprehension test. Raw scores for each portion of the test were converted to scale scores for statistical purposes according the *Manual for Scoring and Interpretation* provided with the test. For the purposes of this study, the Total, Comprehension, and Rate scale scores were used. The

Vocabulary scale score was not considered on its own, although it was used in computing the total scale score.

The other part of the study was a music experience questionnaire designed by the researcher (see Appendix A). Along with demographic information, the questionnaire determined the nature and length of formal music instruction received by study participants. There were also some questions dealing with continued participation in music activities after formal instruction ended that were not considered with the other statistical information.

Procedure

A sample of the music experience questionnaire was distributed to and reviewed by approximately twenty members of the Association of Wisconsin Area Kodály Educators at their annual meeting. They suggested clarifications in wording for some of the questions.

Following this, letters were sent to eighty-four of the researcher's acquaintances who were thought likely to qualify to participate in the study. In order to qualify, a participant had to be at least fifteen years old and have taken at least six months of music lessons, either privately or in a small group setting. Twenty-five individuals responded positively, and a pilot study test was administered to those who responded. A more detailed description of the pilot study group is given with the presentation of the data.

Over the course of several months, letters of inquiry were next sent to area church choir directors and high school band and choir teachers to determine their interest in the study. A formal letter of request was sent to the administrators of those teachers who

were willing to participate. This letter informed them of the details about the study as well as the use of the *Nelson-Denny Reading Test* to make sure that this test was not being used in their high schools. Samples of the letters used appear in Appendix B. As a result, three high school groups and several church groups were organized and scheduled. Details about each group and the conditions under which the test was administered are given along with the data for each one. A total of 147 individuals participated in the study.

Each group's test scores were entered on a separate spreadsheet created using Microsoft Works. The Pearson product-moment correlation was calculated for the Total, Comprehension, and Rate Scale Scores as compared to the age at which lessons were begun. The groups' scores were combined on an additional spreadsheet to be analyzed as one large group.

Presentation of the Data

Pilot Study Group A (Table 1)

This group of twenty-five was tested in two separate sessions, on succeeding Sunday evenings at 7:30 p.m. The testing site was the fellowship hall of a large church in the city of Sheboygan, Wisconsin. Test participants were seated at tables and chairs. The lighting in the room was adequate, but not bright, and the temperature was comfortable. Those tested ranged in age from fifteen to seventy-one. Two tests had to be excluded from the study because incomplete information was given on the accompanying questionnaire.

Table 1—Test Scores for Group A

Age at lessons	Total SS	Vocab SS	Comp SS	Rate SS	Age now
9	239	243	228	198	15
10	228	236	215	201	44
11	242	243	235	232	55
10	235	254	212	224	68
9	219	239	197	208	39
10	230	250	206	171	59
6	229	252	212	224	48
8	241	243	231	198	45
6	220	243	193	193	69
11	241	254	222	188	64
10	247	252	235	201	51
10	217	247	184	180	63
13	220	247	190	193	53
7	223	230	212	198	26
4	234	239	225	183	24
8	241	247	228	218	60
15	237	250	219	224	64
8	255	258	243	232	50
5	256	258	247	228	21
10	217	225	206	183	51
5	252	250	247	198	27
9	213	247	178	180	71
10	232	258	203	180	69
r =	**-0.219**		**-0.3076**	**-0.0125**	

Study Group B (Table 2)

Group B was a high school choir class in a community of approximately 2300. Fifty-two students were tested, but twenty-seven had to be excluded from the study because they had not had private or small group music lessons. The students sat in chairs without tables or desks. Lighting in the room was good and the temperature was comfortable. There was a small amount of external noise emanating from practice rooms and the hallway, but the students taking the test were quiet and remained on task.

Table 2—Test Scores for Group B

Age at lessons	Total SS	Vocab SS	Comp SS	Rate SS	Age now
11	236	229	238	201	18
12	220	217	219	180	18
8	235	244	223	171	18
11	200	203	198	171	17
8	194	204	185	213	16
11	192	221	166	236	15
12	197	200	194	213	16
12	204	173	160	204	16
12	218	221	213	171	15
15	170	185	147	236	18
6	191	201	182	213	16
8	239	235	238	232	15
10	219	222	213	175	15
11	199	201	198	208	15
12	209	206	210	188	17
6	213	208	216	198	17
10	194	195	194	198	17
8	204	191	216	180	16
11	225	217	229	188	16
12	219	219	216	175	17
8	167	172	166	166	17
15	202	193	210	204	17
12	210	209	210	180	17
6	214	216	210	183	17
r =	**-0.1251**		**-0.1735**	**0.1286**	

Study Group C (Table 3)

Group C was a group of eight ladies ranging in age from forty-three to sixty-five. Testing was administered at 8:00 p.m. in a fellowship hall at a church in a small rural community. The lighting was not ideal for reading, but sufficient, and the room temperature was comfortable. The participants sat at tables and chairs.

Table 3—Test Scores for Group C

Age at lessons	Total SS	Vocab SS	Comp SS	Rate SS	Age now
9	249	250	241	213	53
7	258	258	251	201	65
8	245	253	232	180	57
8	248	258	232	218	49
8	253	258	241	198	50
9	243	248	232	218	43
8	247	257	232	213	50
9	258	258	251	228	50
r =	**-0.2941**	**-0.1205**		**0.548**	

Study Group D (Table 4)

Group D was also a group from a church in a small community. These five ranged in age from seventeen to eighty-one. The participants had tables and chairs, good lighting, and a comfortable room temperature. The test was administered at 7:30 p.m.

Table 4—Test Scores for Group D

Age at lessons	Total SS	Vocab SS	Comp SS	Rate SS	Age now
8	227	234	216	224	50
10	202	216	188	201	79
7	230	253	204	193	82
8	256	257	248	208	50
12	250	247	248	188	17
r =	**0.0527**		**0.2804**	**-0.47**	

Study Group E (Table 5)

Group E was another high school choir class, this time in a neighboring community of approximately the same size as Group B. Thirty-one students and one instructor took the test. The test site was a study hall with tables, chairs, and good

lighting. This group tended to be noisier than Group B, and there were at least four students who did not take it seriously, filling in patterns on their answer sheets. Those tests were discarded without scoring. The class period began at 1:20 p.m. and lasted only forty-five minutes, so there was just barely enough time to administer the test.

Table 5—Test Scores for Group E

Age at lessons	Total SS	Vocab SS	Comp SS	Rate SS	Age now
14	179	185	176	198	16
14	210	201	216	228	18
6	179	172	188	180	16
10	192	213	172	188	17
7	234	229	235	241	15
9	231	232	226	241	17
12	189	208	172	188	17
8	175	200	154	218	15
8	186	195	179	166	15
8	199	224	176	183	25
r =	**-0.084**		**-0.0459**	**0.1084**	

Study Group F (Table 6)

This group consisted of a junior-senior band class from the same high school as Group E. It was administered to forty students at 9:23 a.m. in the band room. There were no tables, but students were able to use music stands to write on. The lighting and temperature were both good. The time constraints of the class period were a problem as with the last group, but this class took the test more seriously. No tests had to be discarded.

Table 6—Test Scores for Group F

Age-lessons	Total SS	Vocab SS	Comp SS	Rate SS	Age now
12	197	190	204	193	18
11	210	211	207	218	17
11	153	146	166	180	18
12	202	193	210	254	16
10	207	196	216	204	17
13	222	229	213	224	16
12	217	219	213	198	16
9	210	221	198	224	17
11	199	211	188	208	17
11	196	201	191	218	18
11	221	229	210	193	17
8	229	235	219	193	18
8	229	222	232	218	18
11	252	253	245	259	18
11	225	227	219	188	16
8	196	211	182	188	16
6	163	175	157	244	17
7	185	196	176	208	17
12	182	185	182	208	17
8	227	227	223	224	17
11	217	235	198	224	16
11	204	221	188	224	17
9	249	253	238	218	16
9	204	203	204	198	17
12	217	216	216	218	17
13	173	183	166	224	17
12	213	214	210	218	17
11	232	227	232	208	17
12	215	211	216	193	18
12	224	232	213	208	16
12	219	229	207	218	16
10	181	195	169	175	16
12	227	226	226	188	17
r =	**0.0989**		**0.1549**	**-0.0227**	

Study Group G (Table 7)

This group consisted of five individuals from several different communities who were unable to attend scheduled test sessions. It was administered at various times and locations that were convenient to both the participant and the researcher. In most cases the test was administered at the home of the participant. This was done to increase the sample size in age groups above high school age.

Table 7—Test Scores for Group G

Age at lessons	Total SS	Vocab SS	Comp SS	Rate SS	Age now
6	243	252	229	188	43
9	219	219	216	201	16
7	144	138	157	183	23
11	199	198	201	193	26
11	222	222	219	198	27
r =	**0.0884**		**0.1679**	**0.6697**	

Study Group H (Table 8)

The test was administered to this group in two separate sessions at a church in a community of approximately 52,000. Both sessions took place at 7:15 p.m. in the fellowship hall of the church. There were fourteen adults, middle-aged and older. The participants had tables and chairs, good lighting, and a slightly cool room temperature.

Table 8—Test Scores for Group H

Age at lessons	Total SS	Vocab SS	Comp SS	Rate SS	Age now
7	242	247	232	232	38
11	182	191	176	224	72
8	241	255	223	193	67
8	230	250	207	213	65
9	237	247	223	183	48
7	252	257	241	228	50
6	253	255	245	204	44
13	218	231	204	175	52
9	242	250	229	224	68
26	213	234	191	183	59
6	250	255	238	218	67
r =	**-0.5524**		**-0.6531**	**-0.5224**	

Study Group I (Table 9)

This was another community group that took the test in a high school library at 6:30 p.m. There were five individuals in this group ranging in age from twenty-two to sixty-one. They used tables and chairs, and the lighting in the library was adequate though not bright. The test took place on a very windy, cold evening, but the room temperature was comfortable.

Table 9—Test Scores for Group I

Age at lessons	Total SS	Vocab SS	Comp SS	Rate SS	Age now
8	253	255	245	204	44
9	250	257	238	204	53
6	246	255	232	193	51
7	238	242	229	193	22
8	244	247	235	218	25
9	239	239	235	224	61
r =	**0.1153**		**0.4872**	**0.7375**	

Study Groups J, K, and L (Tables 10, 11, 12)

These groups were all taken from the same population. The groups consisted of twenty-two students and faculty from Silver Lake College's summer music program.

Several sessions were held on different days and at different times. In each session the test was administered in a classroom with tables and chairs, good lighting, and a comfortable temperature.

Table 10—Test Scores for Group J

Age at lessons	Total SS	Vocab SS	Comp SS	Rate SS	Age now
5	247	244	245	198	37
16	250	250	245	198	57
9	244	252	232	188	25
4	254	253	248	204	37
8	250	257	238	204	54
8	222	213	229	188	39
7	244	245	238	201	27
7	253	252	248	204	31
r =	**-0.0386**		**-0.1138**	**-0.2518**	

Table 11—Test Scores for Group K

Age at lessons	Total SS	Vocab SS	Comp SS	Rate SS	Age now
7	241	242	235	188	25
8	252	253	245	193	29
7	256	258	248	236	47
10	233	250	213	198	32
8	252	250	248	204	30
11	255	255	248	193	49
9	242	244	235	193	56
r =	**-0.167**		**-0.2873**	**-0.3969**	

Table 12—Test Scores for Group L

Age at lessons	Total SS	Vocab SS	Comp SS	Rate SS	Age now
8	246	258	229	193	51
11	235	253	213	183	32
11	255	255	248	224	47
12	250	250	245	201	47
9	215	234	194	171	48
5	250	252	241	213	31
5	245	247	238	204	27
r =	**-0.049**		**-0.0844**	**-0.1529**	

Data for all the groups was combined onto one spread sheet and the product-moment correlation for Total, Comprehension, and Scale Scores was calculated. The scores are presented here as scatter plots.

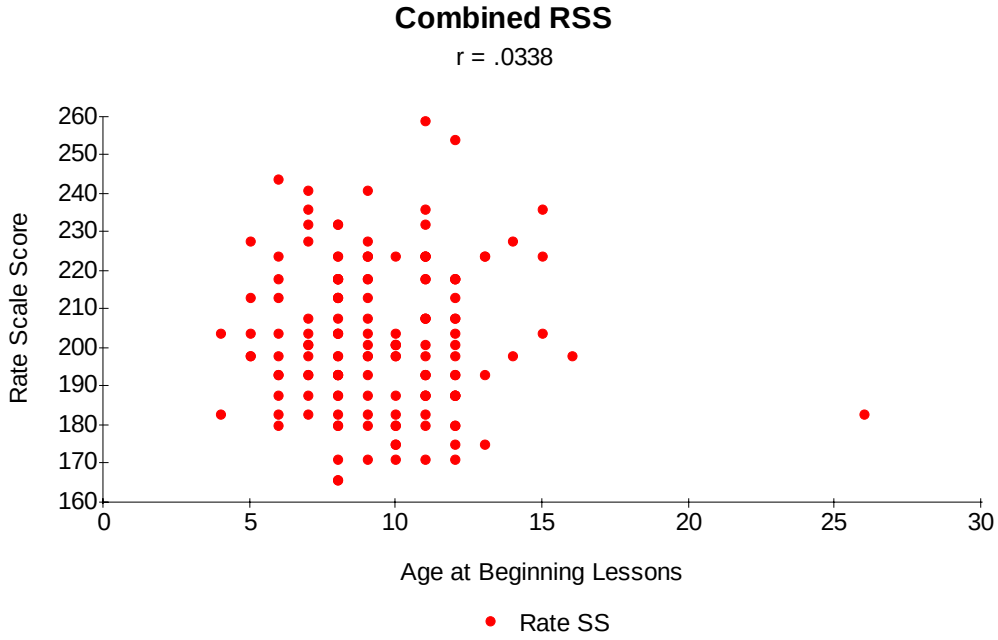
Chart 1


Combined TSS
r = -.2759
Total Scale Score
260
240
220
200
180
160
140
0
5
10
15
20
25
30
Age at Beginning Lessons
Total SS

Chart 2


Combined CSS
r = -.2775
Comprehension Scale Score
260
240
220
200
180
160
140
0
5
10
15
20
25
30
Age at Beginning Lessons
Comp SS

Chart 3


Combined RSS
r = .0338
Rate Scale Score
260
250
240
230
220
210
200
190
180
170
160
0
5
10
15
20
25
30
Age at Beginning Lessons
Rate SS

When each group was converted from a spreadsheet to a scatter plot, it became evident that several groups had at least one outlier. The combined group scores were sorted by the age at which subjects began music lessons and the mean for each of these age groupings was calculated. From this the standard deviation of the total scale score for each grouping was derived (Table 13). Outliers were identified as those scores which were more than two standard deviations from the mean total scale score for each age grouping. This resulted in the elimination of six subjects from the total combined group.

Table 13—Standard Deviations and Means Sorted by Age at Beginning Lessons

Age-lessons	Total SS--mean	St. Dev.	Comp SS--mean	Rate SS--mean
4	244	10	236.5	193.5
5	250	3.85	243.6	208.2
6	218.27273	28.76	209.27273	203.45455
7	230.76923	30.98	223.53846	208.15385
8	229.43333	24.89	219.83333	201.7
9	233.5	15.6	221.94444	206.33333
10	216.71429	18.46	201.85714	191.35714
11	217.04348	24.9	210.21739	206.91304
12	213.95	16.58	209.2	199.2
13	208.25	20.4	193.25	204
14	194.5	15.5	196	213
15	203	27.36	192	221.33333
16	250	0	245	198
26	213	0	191	183

The resulting scatter plots and correlation coefficients are displayed in Charts 4, 5, and 6.

Chart 4

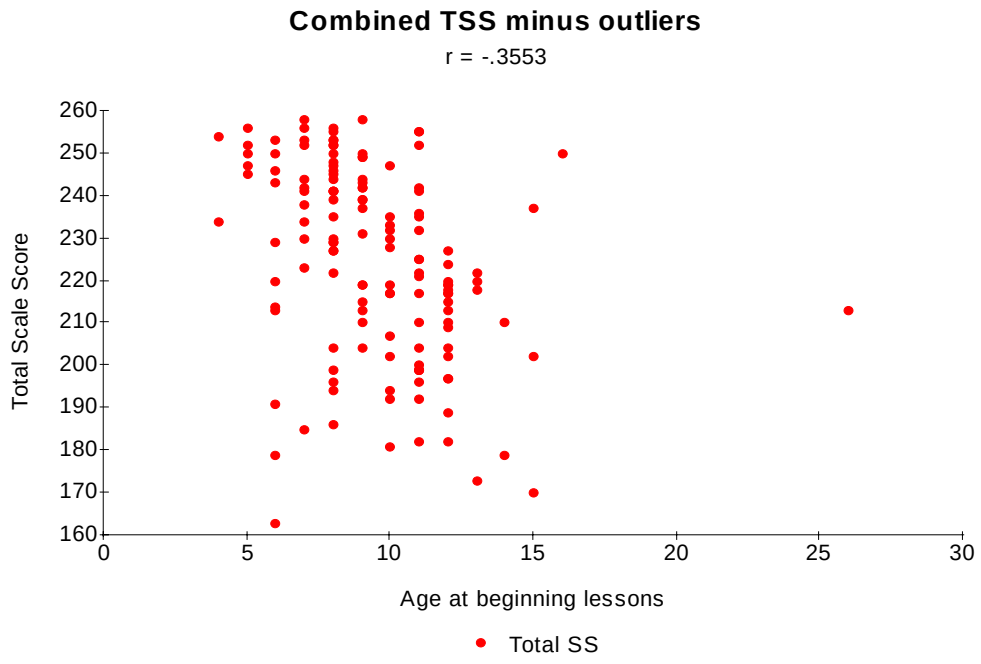


Chart 5

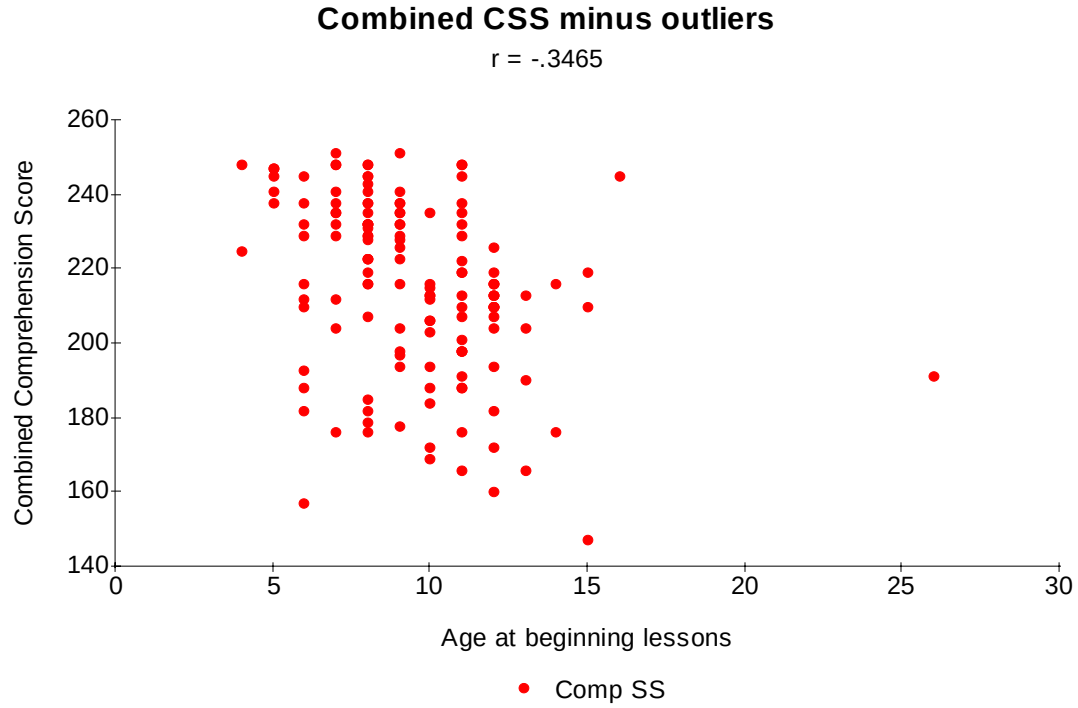
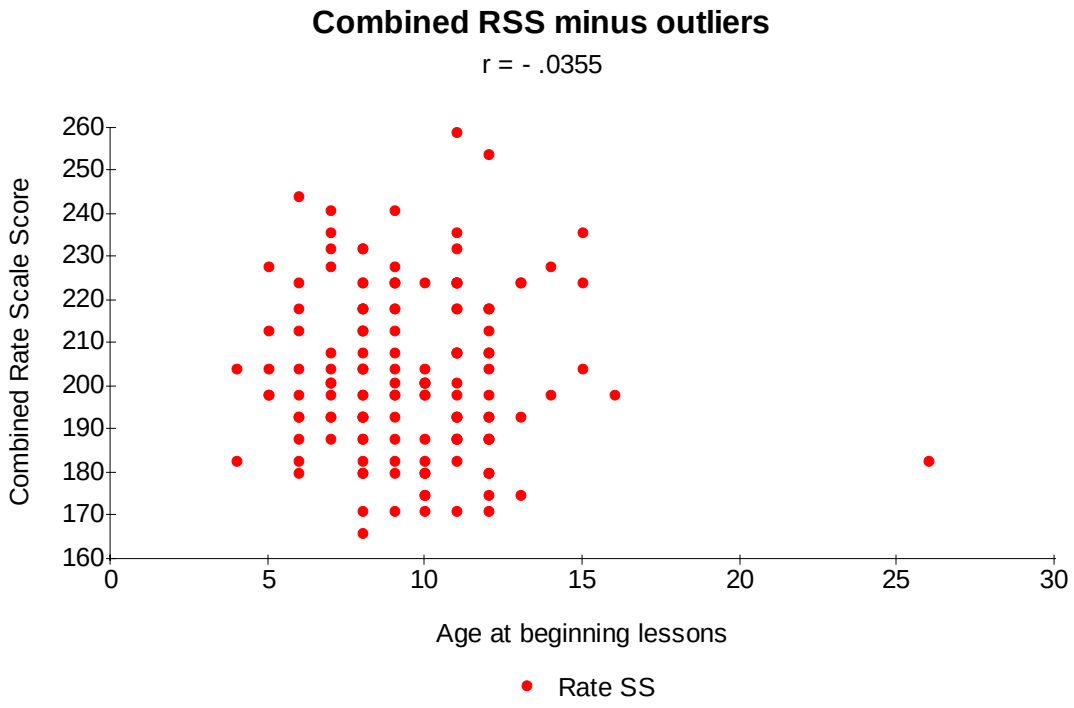


Chart 6



The mean scores for each age grouping are compared in the series of scatter plots labeled Charts 7, 8, and 9. Outliers are included in this set of data.

Chart 7

Chart 8

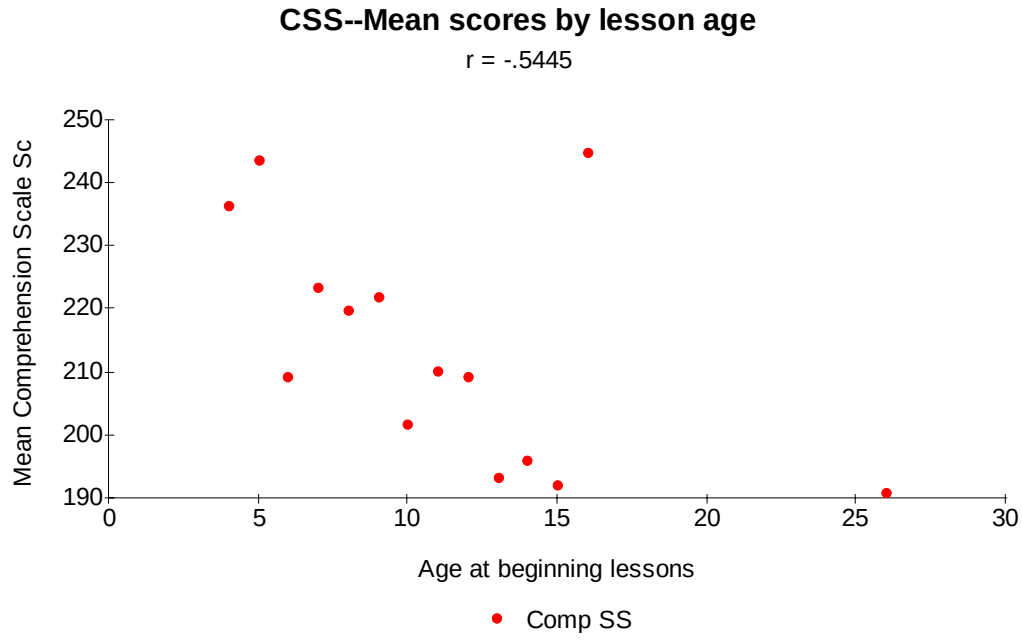


Chart 9

Next the data was analyzed by grouping the subjects into age cohorts. Test subjects were sorted by the age at the time of the test and each age cohort compared for total, comprehension, and rate scale scores. They are presented in the scatter plots labeled Charts 10 through 27. Outliers are included in these groupings.

Chart 10

Chart 11

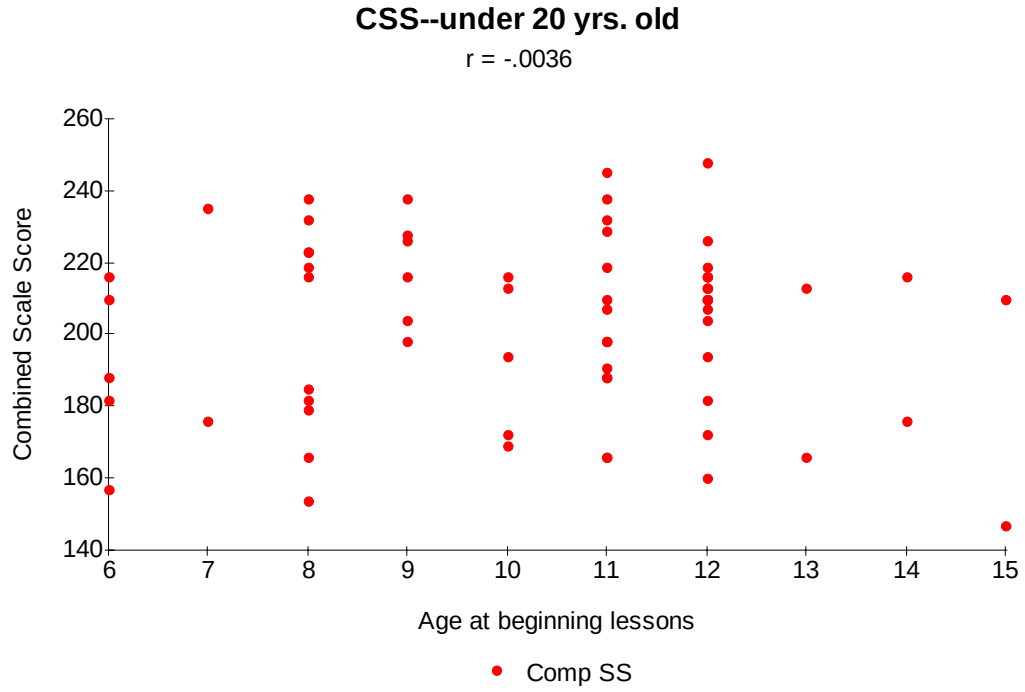


Chart 12

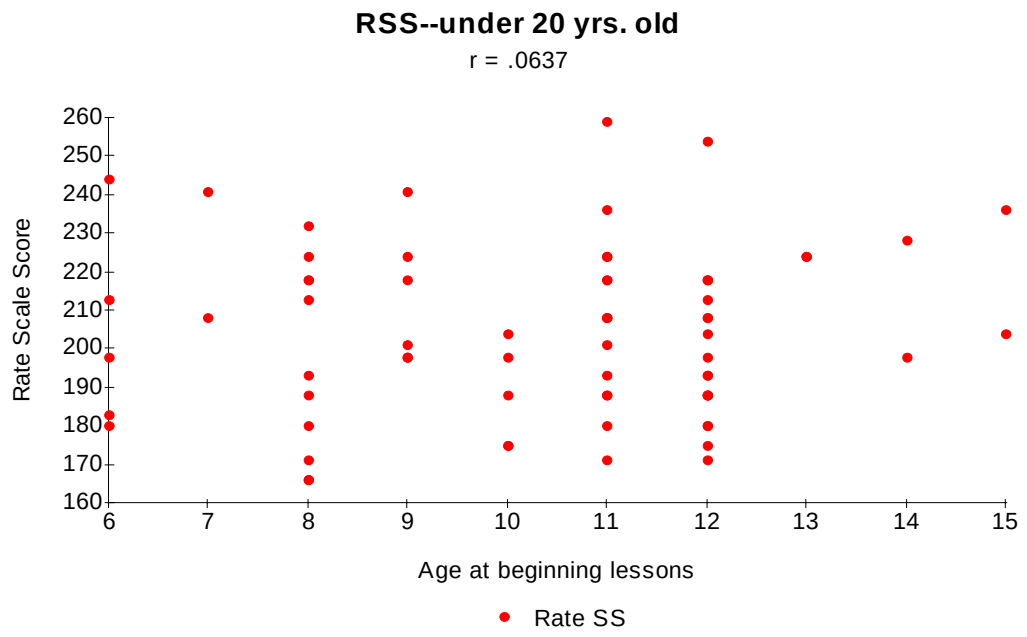


Chart 13

Chart 14

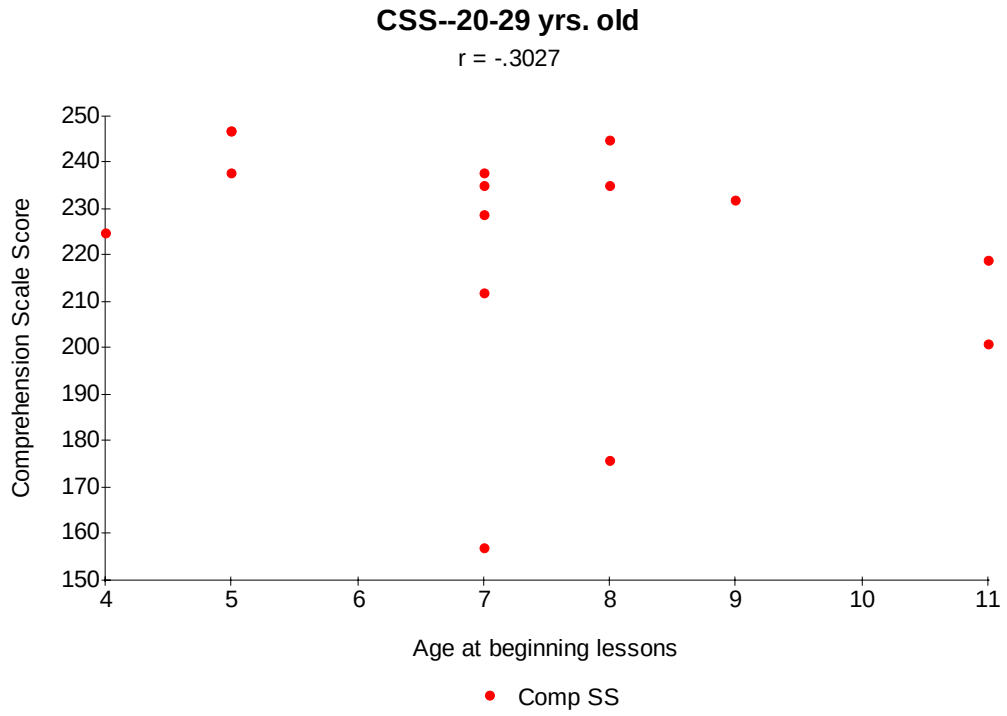


Chart 15

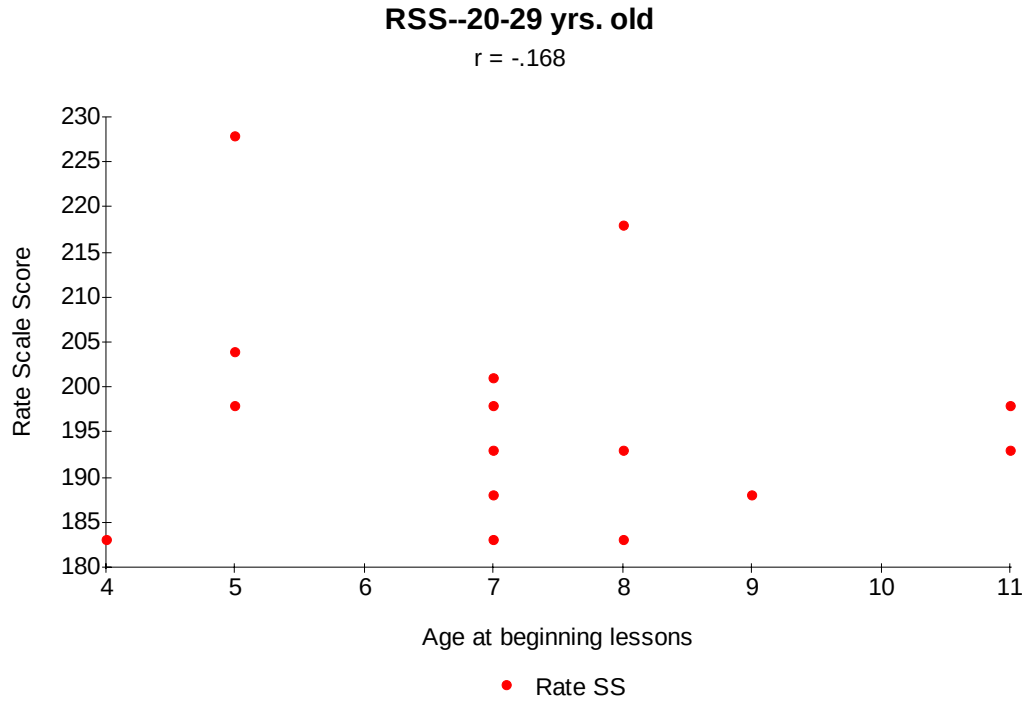


Chart 16

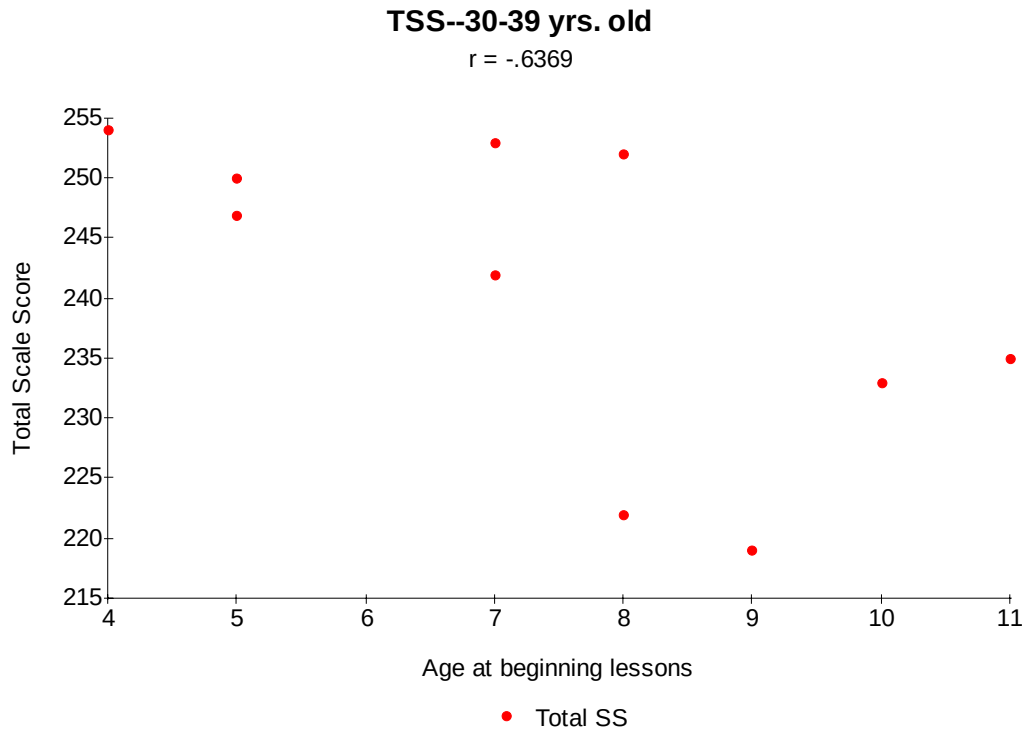


Chart 17

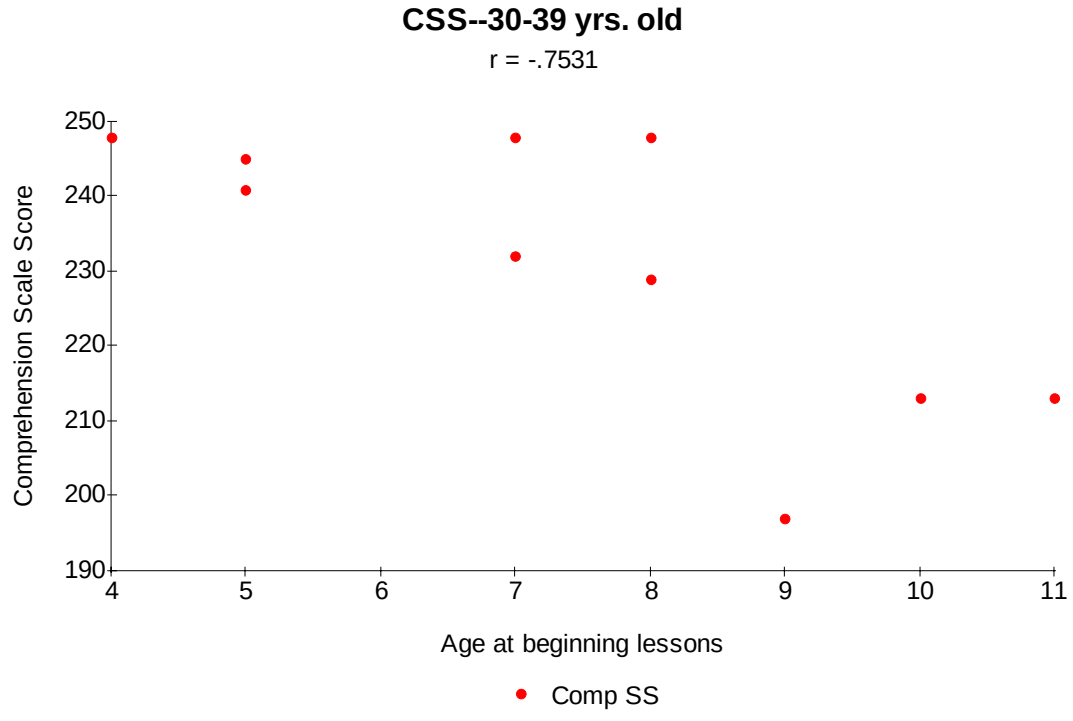


Chart 18

Chart 19

Chart 20

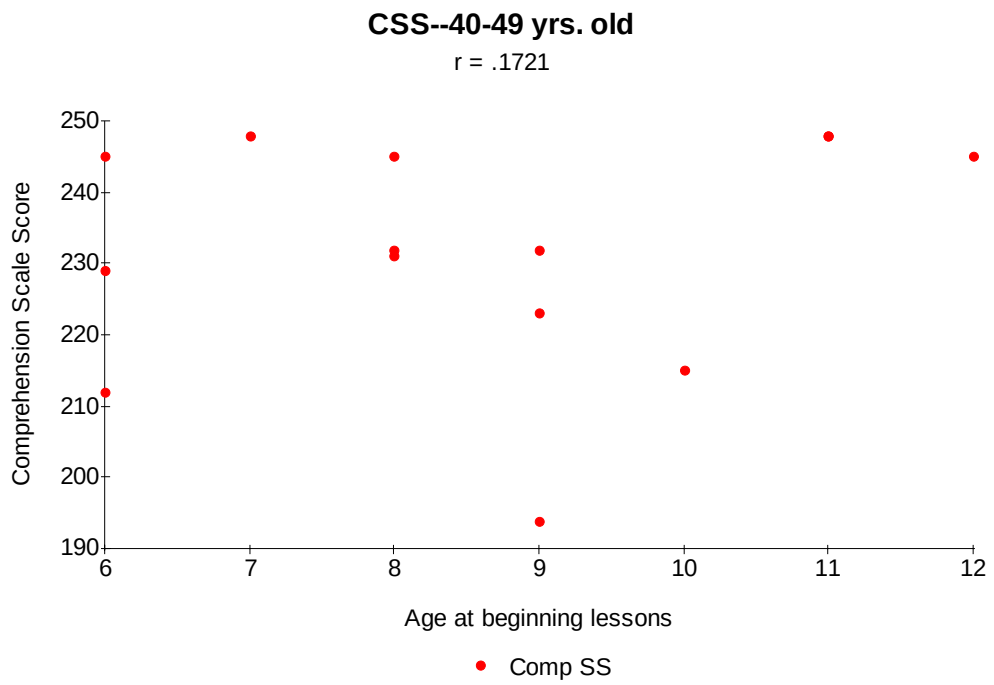


Chart 21

Chart 22

Chart 23

Chart 24

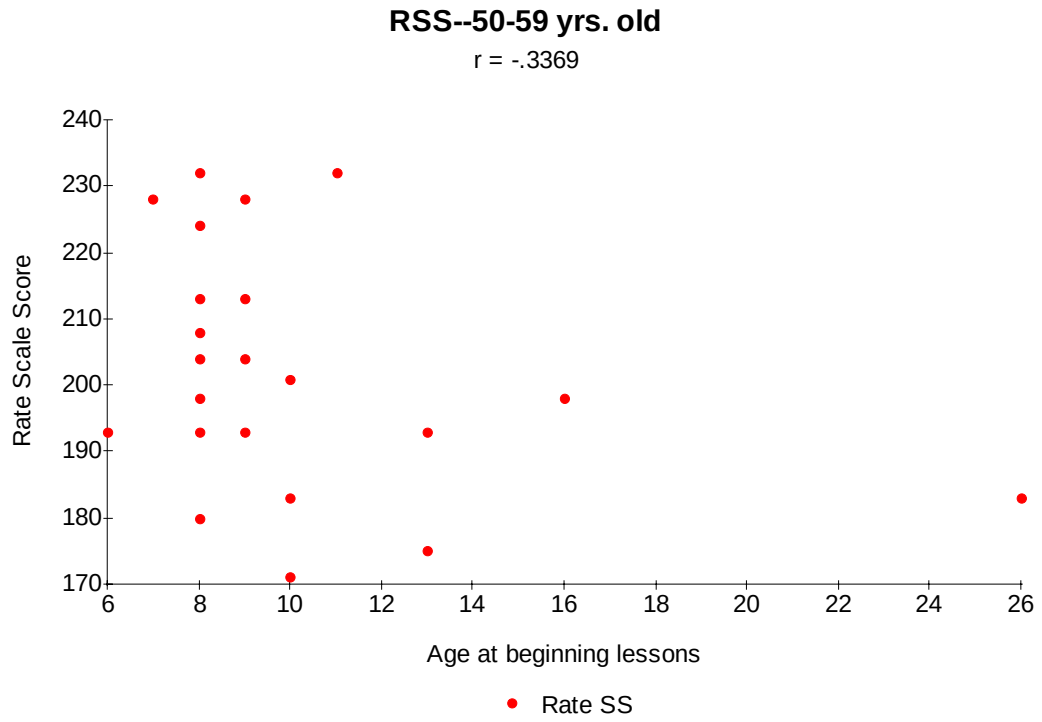
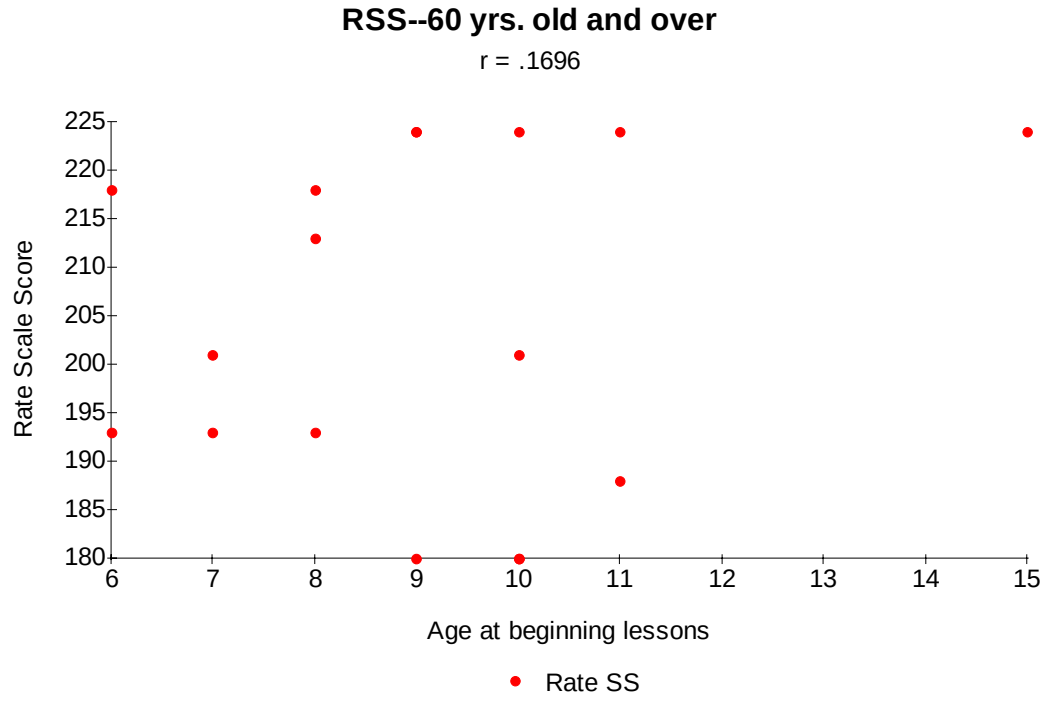


Chart 25

Chart 26

Chart 27



When scores were averaged by age cohorts and compared to each other, the results displayed in Charts 28, 29, and 30 were found.

Chart 28

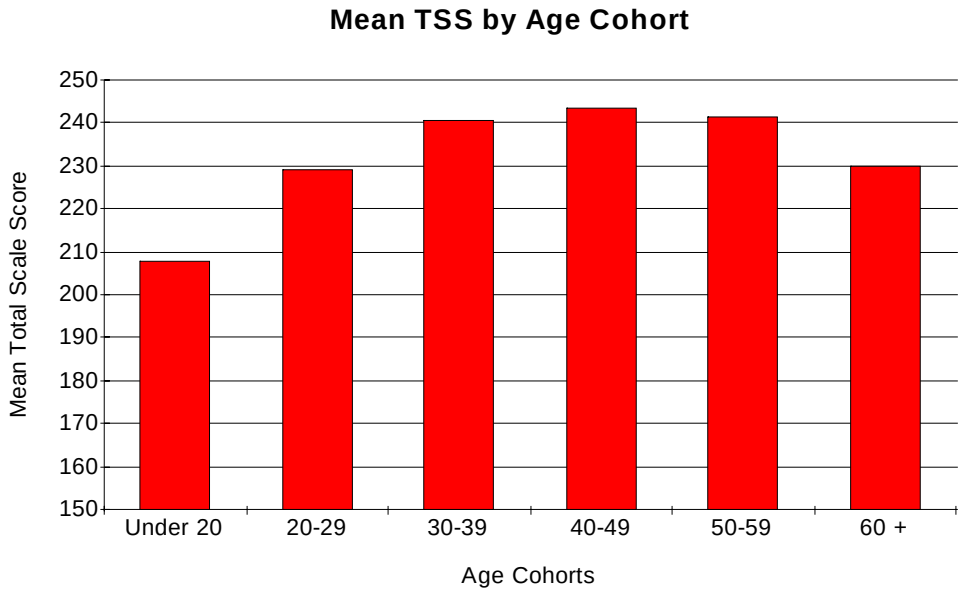


Chart 29

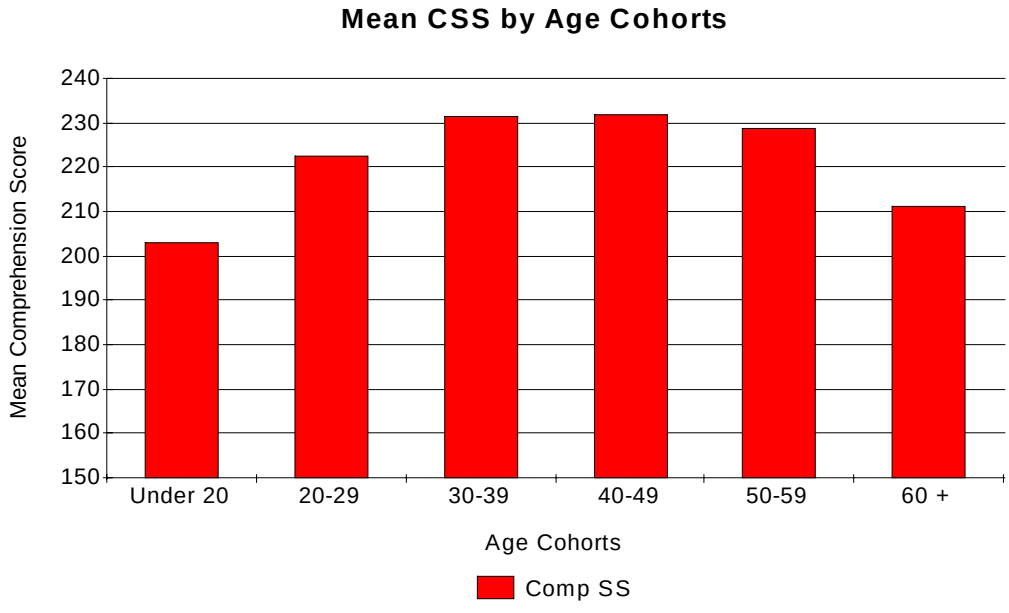
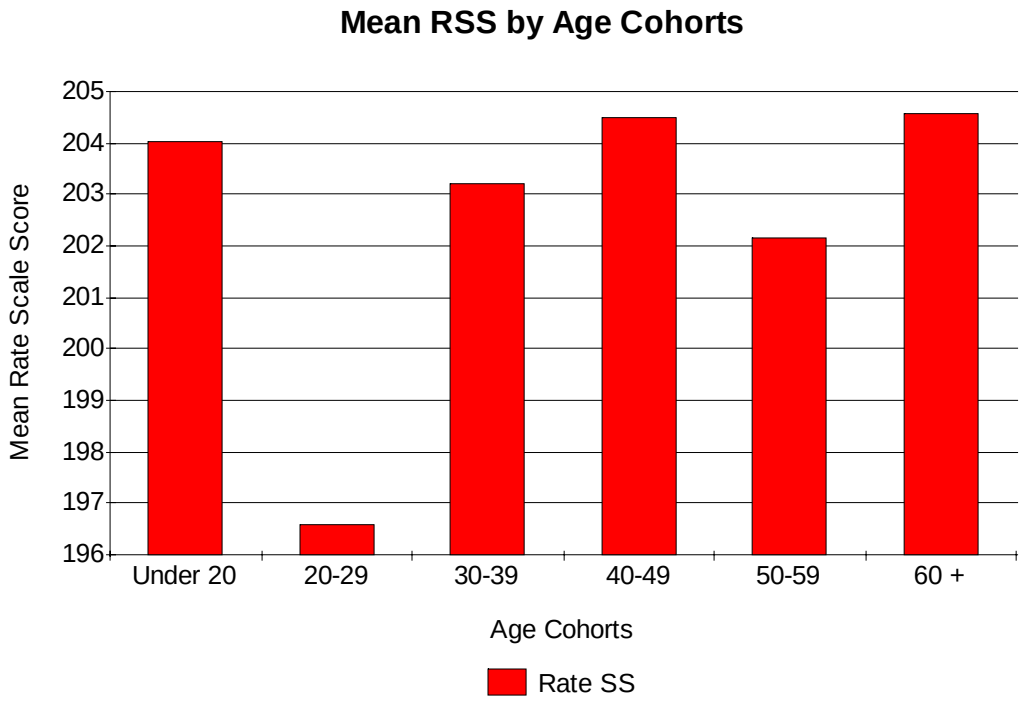


Chart 30



Incidental Findings

As the data was compiled and analyzed, there were some incidental findings that became apparent which will be presented in this section, even though they are not relevant to the subject of the study.

The average age at which each age cohort began music lessons is presented in Table 14.

Table 14

Age Cohort	Age at Lessons	Number in group
Under 20	10.33	69
20-29	7.27	15
30-39	7.4	10
40-49	8.57	14
50-59	10.09	22
60 +	9.06	17

Subjects reported taking lessons for a range of six months to twenty-three years. The median number of years that lessons were taken was six years, with the mode also being six years as reported by twenty-nine subjects. The mean number of years that lessons were taken was 7.14 years.

Those subjects who took private lessons instead of or in addition to group lessons outnumbered those who only took group lessons by almost two to one, with ninety-six taking private lessons and fifty-one taking group lessons. The mean scores for each category were compared and are listed in this Table 15.

Table 15

	TSS	CSS	RSS
Group	212.78	205.61	203.47
Private	228.88	235.32	202.8

When the groups were further broken down into those under twenty and those twenty and older, the differences are less significant, as illustrated in the following Table 16.

Table 16

	TSS	CSS	RSS
Group--under 20 years old	206.73	201.58	204.63
Private--under 20 years old	209.72	204.55	203.17
Group--20+ years old	234.82	220.27	199.27
Private--20+ years old	237.16	225.27	202.64

The next chapter presents further summary and conclusions of the data presented in this chapter.

CHAPTER IV

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Chapter I presented the need to establish a connection between reading language and reading music. Chapter II gave an overview of theories of learning in general and cognitive learning in particular and how they apply to both processes. It then went on to show the relationship between those two processes based on the cognitive and intellectual skills used for each. This relationship provides the basis for transfer of learning between the two processes. Chapter III presented a descriptive study which was designed to look for a possible relationship between the age at which one learns to read music and language reading proficiency as an adult.

Clarification and Summary of the Data

The *Nelson-Denny Reading Test* was administered to one hundred forty-seven participants in twelve groups. These groups varied in number from three to fifty-two. The individual group findings were reported on in Chapter III. These results were quite varied, possibly due to the diversity of each group. Out of a possible thirty-six correlations, twenty-three showed a negative tendency and thirteen showed a positive tendency as illustrated in Tables 1-12. Of the negative correlations, one was significant at the .05 level and seven were significant at the .01 level. None of the positive correlations were statistically significant.

All the results were combined into one set of data and scatter plots made of the total, comprehensive, and rate scale scores. The total and comprehension scale scores illustrated in Charts 1 and 2 showed negative correlations of r = -.2759 and r = -.2775,

respectively. While those are relatively weak correlations, the results are statistically significant at the .01 level due to the larger sample size of 147. The rate scale score showed a non-significant relationship (Chart 3).

The scores were grouped by the age at which lessons began and the mean scores calculated for each age grouping. The standard deviation for each mean total scale score was then used to identify outliers in each age grouping (Table 13). When these outliers were removed and the combined scores graphed again, the total scale score showed a negative relationship of r = -.3553 and the comprehension scale score a negative relationship of r = -.3465 (Charts 4 and 5). While still relatively weak, the large sample size of 141 causes these results to be statistically significant at the .01 level. The rate scale score remained nonsignificant (Chart 6).

The negative relationships strengthened when the mean scores by lesson age were graphed. The mean total scale score showed a moderate negative relationship to the age at which lessons began of r = -.4498 and the mean comprehension scale score showed a stronger negative relationship to lesson age of r = -.5445 (Charts 7 and 8). The mean rate scale score increased to a weak negative correlation of r = -.2861.

The results were also grouped by age cohorts to approximate what might be found in a long-range study of the relationship. The largest age cohort, those under twenty years old, showed no significant relationship in either total, comprehension, or rate scale scores (Charts 10, 11,12). The twenty to twenty-nine year-old cohort showed a moderate negative relationship in both total and comprehension scale scores of r = -.3053 and

r = -.3027, respectively. Although these correlations were moderately strong, they were not statistically significant due to the smaller sample size. The rate scale score for this age cohort was a weak negative relationship of r = -.168 (Charts 13, 14, 15).

The age cohort of thirty to thirty-nine years old showed the highest level of significance. In this cohort the total scale score was a strong negative relationship of r = -.6369, which was significant at the .05 level. The comprehension scale score showed an even stronger negative relationship of r = -.7531, which was significant at the .01 level. The rate scale score showed a moderate negative relationship of r = -.4085 but was not statistically significant (Charts 16, 17, 18).

The forty to forty-nine year old age cohort did not conform to the pattern of the other age cohorts. The test results of this group showed no significant results, with the total scale score relationship of r = .0919, the comprehension scale score r = .1721, and the rate scale score r = -.1651 (Charts 19, 20, 21). This was the only age cohort for whom the rate scale score relationship tended more to the negative than did the total and comprehension scale scores.

The age cohort of fifty to fifty-nine years old returned to the previous pattern established by the other age cohorts. The total scale score displayed a strong negative relationship of r = -.5825 and the comprehension scale score a strong negative relationship of r = -.557, both of which were significant at the .01 level. The rate scale score showed a moderate negative relationship of r = -.3369 but was not statistically significant (Charts 22, 23, 24).

The final age cohort was open-ended to keep the number of subjects in the groupings as similar as possible. This cohort included those sixty years old and over. Their total and comprehension scale scores showed a weak negative relationship of r = -.2676 and r = -.2251, respectively. The rate scale scores for this group showed a weak positive relationship of r = .1696 (Charts 25, 26, 27). None of these scores was statistically significant.

The mean scores by age cohorts were compared to each other in Charts 28, 29, and 30. These charts show that the highest mean scores in total and comprehension scale scores occurred in the forty to forty-nine year old age cohort, with the lowest scores in the under twenty cohort. The mean rate scale scores followed a completely different pattern, however, with the highest scores shown in the over sixty age cohort, followed closely by the forty to forty-nine cohort and then the under twenty age cohort. The lowest rate scale scores occurred in the twenty to twenty-nine year old age cohort.

The average age at which lessons were begun for each age cohort is shown in Table 14. Those cohorts with the highest total and comprehension scale scores, the thirty to thirty-nine year-olds and the forty to forty-nine year-olds, also had some of the lowest average age for beginning lessons. The average lesson age for these groups was 7.4 years old and 8.57 years old, respectively. Only the twenty to twenty-nine year-old cohort had a lower average lesson age of 7.27 years old. The under twenty year-old age cohort had the highest average lesson age of 10.33 years old and the lowest total and comprehension scale scores.

Finally, the test results were categorized according to whether the participants had taken private lessons or group lessons only. The results in Tables 15 and 16 show slightly higher total and comprehension scale scores for those taking private lessons and almost equal rate scale scores for either group. The difference was even smaller when scores were further grouped according to those under 20 years old and those 20 years old and over. It is reasonable to conclude that group lessons may be just as effective as private lessons in providing the opportunity for transfer of learning.

Conclusions of the Study

By comparing the age at which individuals learned to read music with their language reading proficiency, this researcher believed it was possible to show that simultaneous instruction in both processes would provide optimal conditions for transfer of learning. The researcher's hypothesis was that those who began music lessons at an earlier age would score higher on a test of reading proficiency.

Although the correlations for the combined group total and comprehension scale scores were only moderately negative, they were both statistically significant at the .01 level. Those findings would seem to support this hypothesis. Though a measure of significance cannot be applied to the mean total and comprehension scale scores of the combined group, the moderate negative correlations also lend some support.

The comparisons of the scores by age cohorts showed mixed results. Two of the age groups, those 30-39 and 50-59, did show significant negative correlations. The scores of the age cohorts of 20 to 29 and 60 and over, while displaying moderate negative

correlations, were not statistically significant. The under 20 age cohort and the 40 to 49 age group showed results that were non-significant.

It could be supposed that those under twenty years old, most of whom were still in high school, were still in the process of developing their skills. The researcher believes that the 40 to 49 year-old age cohort was skewed by several subjects. When looking at the scatter plots for this group (Charts 19, 20, 21), it is evident that there is a concentration of scores that follow a definite negative slope. If the sample had been larger, individual scores may have had less of an effect on the correlation.

The results of dividing the scores by age cohorts could be looked at from two different perspectives. It could be surmised that this would simulate a long-term study, which is what the researcher had in mind. The strongest relationships occurred between the ages of thirty and fifty-nine, taking into account the aberration found in the 40 to 49-year old cohort. With this perspective, it would seem that the highest benefit to reading comes after a period of time, peaking sometime around the thirties to forties.

Taking a different perspective, one might also assume that the difference in scores by age cohorts reflects the differences that have taken place in educational practice over the span of the sixty-plus years covered by this sample. Chapter II discussed the differences in approach between the skills-oriented, language-experience, and balanced literacy reading programs. Given the fact that these different approaches were not concurrently prominent, this second perspective is probably more likely to be accurate.

This perspective notwithstanding, it does seem significant that the highest total and comprehension scale scores were achieved by the 30 to 39 and 40 to 49 year-old age

cohorts, with average beginning lesson ages of 7.4 and 8.57 years (Table 14, Charts 28 and 29). Only the 20 to 29 year-old cohort had a lower beginning lesson age of 7.27 years. The lowest of these scores occurred in the under 20 years-old cohort, which also had the highest average beginning lesson age of 10.33 years. This also seems to support the theory that there is a relationship between reading proficiency and early music lessons.

This relationship is not a causal one, of course. As stated in the delimitations in the first chapter, there are many other variables which can impact an individual's ability to read well. That this relationship does exist is supported by other research. Harry E. Price, editor of the Journal of Research in Music Education states that when children begin keyboard or string instrument lessons by age seven, there is an increase in the connective tissue between the two sides of the brain, resulting in their being "well-equipped to process new patterns" (Wilcox 32).

In addition, a recent study at Stanford University underscores the importance of this age period for studying music. In a study of adult musicians who began playing an instrument by age seven and continued playing into adulthood, it was found that there was a change in the way the brain processed certain aspects of language that was not present in non-musicians (*Teaching Music*, February 2006 21).

Age seven was also a key age in Wisbey's study of pitch discrimination ability. Her research on the ability of children to learn absolute pitch showed a drop in that ability sometime after the age of seven. She concluded that "the earlier training began the more positive was the learning of absolute pitch" (91).

Implications

The implications of this type of research are that providing some kind of music lessons at an early age can contribute to a child's success in reading that will have lasting benefits. It does not seem to matter whether they are group lessons or private lessons, but only that they begin early. Based on the similarities outlined between the cognitive and intellectual skills of both processes, the music lessons should focus on literacy and contain a balance between production and perception of music.

Recommendations

There is certainly need for additional research in this area. Following are recommendations for future studies.

- Similar relationship studies could be expanded. Larger samples would give more conclusive results, and other variables such as the duration of lessons or whether lessons were instrumental or vocal could be factored in.
- A true long-term study with a single group of participants would give an indication of the lasting benefits of music lessons.
- More research could be done on the parallels between speech development and musical development in children.
- On a practical level, a study of which specific teaching methods in music best support the cognitive and intellectual processes involved in reading music would be very helpful to the music education community.

Among the problems that future researchers would need to overcome is the problem of recruiting subjects to participate in a study. This researcher spent much time

and effort in recruitment. Because the test was standardized, many potential participants had difficulty finding the time to take the test when it was being administered.

Another frustration in the process was the amount of tests that had to be discarded because test subjects did not follow directions or fill out the questionnaire completely. The questionnaire could have been even more specific about how to answer certain items, such as the age when lessons were begun. While scoring tests, this researcher at times wondered what the relationship might be between reading scores and the ability to read and follow directions correctly. Not all of the information gained from the questionnaire was used, so it could have been more concise.

In summary, this researcher believes that conceptual music learning which emphasizes literacy reinforces the processes of learning outlined by such theorists as Gagné. It is logical to assume that every time a student employs those connective processes, he or she will become more proficient at them. Beginning to use those processes at a developmentally appropriate time will also reinforce that learning. As stated by Bruner, "massive general transfer can be achieved by appropriate learning, even to the degree that learning properly under optimum conditions leads one to 'learn how to learn' " (qtd. in Gordon, *Psychology of Music Teaching* 60). This "learning how to learn" is the ultimate goal of every educator, regardless of the subject he or she teaches.

APPENDIX A

Supplemental Material

MUSIC EXPERIENCE QUESTIONNAIRE

(Please answer questions as accurately as possible, mark NA where questions do not apply.)

1. Did you take private music lessons, either vocal or instrumental? ____Yes ____ No

2. Did you take group music lessons as part of a school music program? ____Yes ____ No

3. How many were in your group music lessons? _____

4. What instrument(s) did you study? _____

5. At what age did you begin these lessons? _____ Private _____Group

6. How long did you take music lessons? _____ Private _____ Group

7. Did you have music as a separate class in elementary school? ____Yes ____ No

8. Where did you learn to read music?
   - ____ Elementary general music class
   - ____ Private or small group music lessons
   - ____ Don't remember

9. Did you continue to participate in a music activity after completing formal training?
   ____Yes ____ No

10. In what activity did you or do you now participate? (Check all that apply.)
    - ____ Professional instrumental group
    - ____ Professional vocal group
    - ____ Teaching private music lessons
    - ____ Teaching music in a school setting
    - ____ Organized instrumental group, nonprofessional
    - ____ Organized vocal group, nonprofessional
    - ____ Individual activity such as playing or singing solos, accompanying
    - ____ Playing or singing for personal enjoyment

11. How long have you engaged in this activity?
    - _____ Professional instrumental group
    - _____ Professional vocal group
    - _____ Teaching private music lessons
    - _____ Teaching music in a school setting
    - _____ Organized instrumental group, nonprofessional
    - _____ Organized vocal group, nonprofessional
    - _____ Individual activity such as playing or singing solos, accompanying
    - _____ Playing or singing for personal enjoyment

12. Demographic information: Gender: _____ Age: _____

APPENDIX B

Correspondence

July 11, 2005

Lynne Zimmermann
W2129 Wilson-Lima Road
Oostburg, WI 53070
920-564-3697

To Whom It May Concern:

I am a graduate student getting my Master's Degree in Music Education at Silver Lake College, Manitowoc, Wisconsin. For my thesis I am doing research to look for a correlation between the age at which an individual learns to read music and his/her language reading proficiency as an adult. I plan to use the Nelson-Denny Reading Test as a measure of speed and comprehension in reading.

In addition to being a graduate student, I am also a licensed teacher in the state of Wisconsin with a double certification in K-12 General Music and Secondary Choral Music. I am employed by the Plymouth Joint School District. My qualification form has been cosigned by my advisor at Silver Lake College, Dr. Lorna Zemke.

Thank you,

Lynne S. Zimmermann

xc

January 23, 2006

Lynne Zimmermann
W2129 Wilson-Lima Road
Oostburg, WI 53070

Mr. John Hocking
Cedar Grove-Belgium High School
321 N. 2nd Street
Cedar Grove, WI 53013

Dear Mr. Hocking,

I am enrolled in the Master of Music Education program at Silver Lake College in Manitowoc, Wisconsin. I am preparing to do research for my thesis, which will be an investigation of a possible relationship between the age that an individual learns to read music and his/her language reading proficiency as an adult. As part of my research, I am looking for individuals, age 15 and up, who would be willing to fill out a short questionnaire about music experiences and also take a standardized reading test. I will be using the Nelson-Denny Reading test, which measures speed and proficiency. I anticipate the questionnaire and test will take approximately 50-55 minutes to complete.

I am writing to ask about the possibility of administering this test to the band and choir classes in your high school. I have spoken with «Teacher» to confirm «pronoun» willingness to participate in this project. I do not plan to collect any names or other personal information on the test participants, other than age and gender, so the results will be completely anonymous. I am able to come to your school building at a time that is determined to be convenient to your school schedule. I would like to complete this portion of my research sometime during the 2005-06 school year.

I believe that observing first hand how research is conducted would be a valuable experience for your students. Thank you for your consideration of this request. I can be reached at 920-564-3697 or zimcnt@aol.com.

Sincerely,

Lynne S. Zimmermann

cc: tp/zh

REFERENCES

BOOKS

Barnhart, Clarence L., ed. Thorndike-Barnhart Comprehensive Desk Dictionary. Garden City, NY: Doubleday & Company, 1958.

Gagné, Robert M. The Conditions of Learning and Theory of Instruction. 4th ed. New York: Holt, Rinehart and Winston, 1985.

Gordon, Edwin E. Learning Sequence and Patterns in Music. Chicago: G.I.A. Publications, Inc., 1977.

Gordon, Edwin E. The Psychology of Music Teaching. Englewood Cliffs: Prentice-Hall, 1971.

Hargreaves, David J. The Developmental Psychology of Music. Cambridge: Cambridge University Press, 1986.

Peters, G. David and Robert F. Miller. Music Teaching and Learning. New York: Longman, Inc., 1982.

Politoske, Daniel T. Music. Englewood Cliffs, NJ: Prentice-Hall, 1988

Sloboda, John A. The Musical Mind: The Cognitive Psychology of Music. Great Britain: Oxford University Press, 1985.

Smith, Frank. Understanding Reading 3rd ed. New York: Holt, Rinehart, and Winston, 1982.

Weaver, Constance. Reading Process and Practice. Portsmouth, NH: Heineman, 2002.

Wisbey, Dr. Audrey S. Music As the Source of Learning. Baltimore, MD: University Park Press, 1980.

Woolfolk, Anita E. Educational Psychology 7th ed. Boston, MA: Allyn and Bacon, 1998.

Zemke, Dr. Lorna. The Kodály Concept—Its History, Philosophy, and Development. Champaign, IL: Mark Foster Music Company, 1977.

Zintz, Miles V., and Zelda R. Maggart. The Reading Process: The Teacher and the Learner. Dubuque, IA: Wm C. Brown Publishers, 1989.

ARTICLES

Abeles, Hal. "A Guide to Interpreting Research in Music Education." Handbook of Research on Music Teaching and Learning. MENC 1992. 227-243.

Cutietta, Robert A. "Does Music Instruction Help a Child Learn to Read?" General Music Today 9.1 (Fall 1995) : 26-31.

Cutietta, Robert A. "Language and Music Programs." General Music Today 9.2 (Winter 1996) : 26-31.

Davidson, Lyle and Larry Scripp. "Surveying the Coordinates of Cognitive Skills in Music." Handbook of Research on Music Teaching and Learning. MENC 1992. 392-471.

Douglas, Sheila, and Peter Willats. "The relationship between musical ability and literacy skills." Journal of Research in Reading 17.2 (1994) : 99-107.

Ediger, Dr. Marlow. "The Psychology of Reading Instruction." Reading Improvement 41.3 (2004) : 157-164.

Gransee, Corrinne Anne. "Reading Literacy and Musical Literacy Instruction Share Similar Educational Principles." Kodály Envoy 31.3 (2005) : 4-8.

Greenberg, Marvin. Rev. of "The Application of Language Reading Skills to the Teaching of Music Reading in Elementary Schools," by June Freeman Stern. Bulletin of the Council for Research in Music Education 41 (1975) : 45-53.

Gruff, P. "Music and Reading are Related…Says Who?" Music Educators Journal 63.5 (1977) : 38-41.

Hahn, Lois. "Music Reading and Language Reading: Correlations in Processes and Instruction." Bulletin of the Council for Research in Music Education 93 (1987) : 41-48.

Hansen, Dee, and Elaine Bernstorf. "Linking Music Learning to Reading Instruction." Music Educators Journal. September 2000: 17-21+.

Hargreaves, David J. and Marilyn P. Zimmerman. "Developmental Theories of Music Learning." Handbook of Research on Music Teaching and Learning. MENC 1992. 377-391.

Hodges, Donald A. "The Acquisition of Music Reading Skills." Handbook of Research on Music Teaching and Learning. MENC 1992. 477-471.

Manning, Maryann. "Phonemic Awareness." Teaching K-8. Nov./Dec. 2005: 68-69.

McMahon, Olive. "The Relationship of Music Discrimination Training to Reading and Associated Auditory Skills." Bulletin of the Council for Research in Music Education 59 (1979) : 68-72.

McPherson, Gary E. "Factors and Abilities Influencing Sightreading Skills in Music." The Journal of Research in Music Education 42.3 (1994) : 217-231.

Metsala, Jamie L., et al. "Effective Primary Grades Literacy Instruction = Balanced Literacy Instruction." The Reading Teacher 50.6 (1997) : 518-521.

Newlin, Georgia A. "What Does Highfalutin Research Have to Do With Inner Hearing in *My* Music Classroom?" Kodály Envoy 32.3 (2006) : 32-33.

Reynolds, Geoffrey. "Learning Theories Impact on Music Education, Part 1." Kodály Envoy 31.4 (2005) : 36-37.

Reynolds, Geoffrey. "Learning Theories Impact on Music Education, Part 2." Kodály Envoy 32.2 (2006) : 36-37.

Reynolds, Geoffrey. "Learning Theories Impact on Music Education, Part 3." Kodály Envoy 32.4 (2006) : 36-37.

Schaffer, Robbin. "Kodály Method Shown Successful in Significant Study." Kodály Envoy 23.3 (1997) : 5-6.

"Stanford Confirms Playing Music Stimulates the Brain." Teaching Music 13.4 (2006) : 21.

Wilcox, Ella. "Straight Talk About Music and Brain Research." Teaching Music 7.3 (1999) : 29-35.

CURRICULUM

Philipak, Barbara. Recorder Karate. Wauwautosa, WI: Plank Road Publishing, 2006.

DISSERTATION

Movsesian, Edwin A. "The Influence of Teaching Music Reading Skills on the Development of Basic Reading Skills in the Primary Grades." Diss. University of Southern California 1967.

ELECTRONIC RESOURCES

Akin, Jeane. "A Study of Evidence that Music Education is a Positive Factor in K-8 Student Academic Achievement." Diss. California State University, Sacramento, CA. 1987. Retrieved from the internet 7/2003.

Brualdi, Amy C. "Multiple Intelligences: Gardner's Theory." ERIC Digest [Online Journal]. September 1996. http://www.ed.gov/databases/ERIC_Digests/ed410226.html

Burgess, Stephen. "Shared Reading Correlates of Early Reading Skills." Reading Online 5(7). 2002 International Reading Association Inc. http://www.readingonline.org/articles/burgess/index.html

Campbell, Jay R., Catherine M. Hombo, and John Mazzeo. "NAEP 1999 Trends in Academic Progress: Three Decades of Student Performance." National Assessment of Education Progress. August 2000. http://nces.ed.gov/nationsreportcard//pubs/main1999/200469.asp

Chang, Carrie. "Relationship Between Music Learning and Language Reading? Review of Literature." ERIC ED 440375. 2000.

Cope, Peter and Hugh Smith. "Policy Change in a Research Vacuum: Who don't we know more about the teaching and learning of musical instruments?" Paper presented at the Scottish Educational Research Association Annual Conference, September 1997. http://www.leeds.ac.uk/educol/documents/000000374.htm

Gardiner, Martin F. P.H.D. "Music, Learning, and Behavior: A Case for Mental Stretching." Journal for Learning Through Music Summer 2000: 72-93 http://www.music-in-education.org/1-6musiclearning.pdf

Gorman, Christine. "The New Science of Dyslexia." TIME 20 July 2003 http://www.time.com/time/magazine/printout/0,8816,465794,00.html

Grandin, Temple, Matthew Peterson, and Gordon L. Shaw. "Spatial-Temporal versus Language-Analytic Reasoning: The Role of Music Training." Arts Education Policy Review July/August 1998: 11-13 http://www.educationthroughmusic.com/musicbrain.htm

Kirsch, Irwin S., et al. "Executive Summary of Adult Literacy In America: A First Look At The Results Of The National Adult Literacy Survey." National Center for Education Statistics. Retrieved from the internet 7/2005. http://nces.ed.gov/naal

Lamb, Susannah J. and Andrew H. Gregory. "The Relationship between Music and Reading in Beginning Readers." Educational Psychology 13.1 (1993). MasterFILE Premier Database.

May, William V. "The Effects of Music Instruction: Separating Hopes, Dreams, and Reality." The Texas Music Educators' Association, 2003. http://www.tmea.org/027_Magazine/Special_Edition/effectsof musicinstruction_r.htm

"NAEP Scores Improve With Reading Investment." Press Release, International Reading Association. 14 July 2005. http://www.reading.org.downloads/resources/releases/pr_naep.pdf

Skilters, Dr. Jurgis. "Gestalt Theory and Linguistics—Introduction." Society for Gestalt Theory and its Applications. Retrieved from the internet 6/2006. http://gestalttheory.net/linguistics/intro.html

Venn, E.C., and M. D. Jahn. "Linking Literacy and the Arts." Teaching and Learning in Preschool: Using Individually Appropriate Practices in Early Childhood Literacy Instruction. Newark, DE: 2003. 152-165. http://readingonline.org/newliteracies/lit_index.asp?HREF=venn/

Warner, Jennifer. "Rhythm Problems May Be Root of Dyslexia." WebMD Medical News, 24 July 2002.

Weinberger, Norman W. "Can Music Really Improve the Mind? The Questions of Transfer Effects." MuSICA Research Notes: V VI, I 2. Spring 1999. http://www.musica.uci/mrn/V6I2S99.html

Weinberger, Norman W. "Music and Cognitive Achievement in Children." MuSICA Research Notes: V I, I 2. Fall 1994. http://musica.usi.edu/mrn/V1I2F94.html

Weinberger, Norman W. "Sight-Reading Music: A Unique Window on the Mind." MuSICA Research Notes: V V, I 1. Winter 1998. http://www.musica.uci.edu/mrn/V5I1W98.html

MASTER'S THESIS

Krahn-Triebensee, Tanya. "The Effect of Direct Instruction in Phonemic Awareness on First Graders." Master's Thesis, Cardinal Stritch University, 1999.