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ABSTRACT

A study examined whether listening to any music or to a particular type of music would have an effect on the spelling scores of first-grade students. Subjects were 19 first graders from the Edison, New Jersey, public school district. The study hypothesis was that no significant difference would exist between scores on spelling tests of students when they listen to music just prior to receiving instruction in the spelling of phonetically generalized words, whether that music be classical music (Mozart), baroque music (Vivaldi), or symphonic music using Disney theme songs rearranged in the styles of the composers from other periods. For the next 4 2-week periods, students received daily instruction: during the first period, no musical component was added; the next 3 2-week periods, 10 minutes of listening to music was added. Students were tested at the end of each 5-day cycle. Results indicated that data supported the study's hypothesis but, while listening to music prior to spelling instruction showed a statistically insignificant gain, there was greater achievement when they listened to Mozart than when they listened to Vivaldi or to symphonic versions of Disney themes. Findings suggest that anecdotal records, however, show that student motivation and interest were increased when a musical listening period was provided prior to spelling lessons, indicating that music has a facilitative effect upon learning. (Contains 6 tables of data; related research and 63 references are appended.) (CR)

Developing Musical/Rhythmic Intelligence To Improve Spelling Skills

By

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Submitted in partial fulfillment of the requirements for the degree of Master of Arts

Kean College of New Jersey

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Abstract

This was a study of the spelling achievements of nineteen first grade students from the Edison, New Jersey public school district. The students listened purposefully to music immediately prior to receiving spelling instruction. The purpose of the study was to investigate whether listening to any music or to a particular type of music would have an effect on the spelling scores of these first grade students. Results indicated that while listening to music prior to spelling instruction showed a statistically insignificant gain, there was greater achievement when they listened to Mozart than when they listened to Vivaldi or to symphonic versions of Disney themes.

Acknowledgement

I would like to thank Dr. Albert Mazurkiewicz, Chairperson of the Department of Communication Sciences at Kean College, for his guidance and patience as I completed this paper.

I thank my Creator for the many benefits bestowed that allowed me to pursue this goal.

I thank the administrators of the Edison,New Jersey public school district for allowing me to pursue the answers to my questions.

I give special thanks to the students in my first grade class for their enthusiasm in discovering whether listening to music can help them to become better spellers.

Dedication

This paper is dedicated to my family. My husband, Paul, has been my source of encouragement and emotional support throughout my years in graduate school, and particularly so in the time that it took to prepare this paper. I thank him.

I thank my daughter, Lora, for her patience and understanding, which gave me the freedom to pursue this goal.

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There appears to be a strong correlation between both phonemic awareness and phonological awareness and the development of spelling skills. Using current methodology to teach spelling has not assisted many young children to become accurate spellers. Noting theories of multiple intelligences raises questions about using the musical/rhythmic intelligence as an aid to developing phonemic and phonological ability.

Current research (Goswami 1990, 1996) suggests that spelling can effectively be taught using the phonemic segmentation of onsets and rhymes. In the past, using this phonemic segmentation method as outlined in the teacher's guide of A New View (Macmillan 1996) has not yielded success for first grade children on weekly spelling tests. Many students correctly spell the words in a task-specific way, but do not spell them correctly on weekly spelling tests.

In the past, while using as a basis for teaching a basal text that included specific instruction in phonics but no specific instruction in spelling, this researcher found anecdotally that the spelling skills of her first grade students to be adequate to assist progression along the continuum of stages of development from pre-phonetic to conventional spelling. In contrast, while in more recent years and while currently using a literature-based program that includes specific instruction in phonics and concurrent instruction in spelling, this researcher found anecdotally that the spelling skills of her first grade students to be slightly less adequate to assist their progress along the continuum of stages of development in spelling from pre-phonetic to conventional. The main difference seems to be that while using a literature-based program that includes a phonetic/spelling component, this researcher included a weekly spelling test upon which her students were unable to consistently achieve a passing score.

Although balanced literacy programs encourage an integration of all four of the language arts, it appears that speaking, reading and writing seem to develop concurrently, while listening seems to be the last to develop. Acknowledging that there are different levels of auditory processing (Darrow 1990) and a hierarchy of auditory processing (Sanders 1977) and different purposes for listening, this researcher questions whether listening to music purposefully might carry over to improved purposeful listening in other situations, such as in developing phonemic awareness.

Possibly the most difficult task that teachers of young children have is to catch and hold the attention of their students. The ability to attend to the spoken word seems to be the area of greatest difficulty and probably the greatest predictor of success. It is questioned whether or not helping children to listen purposefully to sounds of music can help them listen purposefully to sounds in words.

Research suggests that the use of music to influence consciousness is older than recorded history. Fazel (1989) notes that absolutely every culture throughout history has employed music to ease physical labor, inspire the mind, and cheer the spirit.

Other research indicating a strong link between music and learning has come from the work pioneered by Dr. Georgi Lozanov (1960) and continued by Ostrander and Schroeder (1979). Their focus has been the use of Baroque music to accelerate learning. More recently, Rauscher, Shaw and Ky (1993) have studied the effect of Mozart's music upon enhanced learning (1993, 1995). However, no evidence exists to determine the effects of music on learning to spell. To provide some evidence on this topic, the following study was undertaken.

HYPOTHESIS

It was hypothesized that no significant difference would exist between the scores on spelling tests of students when they listen to music just prior to receiving instruction in the spelling of phonetically generalizable words, whether that music be Classical music, Baroque music, or symphonic music using Disney theme songs rearranged in the styles of composers from other periods.

PROCEDURES

In the first week of the study, students were pre-tested on their ability to spell one syllable, short vowel words with either a consonant-vowel-consonant pattern or consonant blend-vowel-consonant pattern. For the next two weeks, students received daily instruction in two particular "word families" as indicated in the teacher's guide of A New View (Macmillan 1996). Five words were taught in both of the two week periods. No musical component was added. Students were tested at the end of both five day cycles. For the following two weeks, students again received daily instruction in two particular "word families" as indicated in the teacher's guide. Prior to the lessons, students listened to ten minutes of Classical music composed by Mozart. Students were tested at the end of both five day cycles. For an additional two weeks, students received daily instruction in two particular "word families" as indicated in the teacher's guide. Prior to the lessons, students listened to ten minutes of Baroque music composed by Vivaldi. Students were tested at the end of both five day cycles. For the final two weeks, students received daily instruction in two particular "word families" as indicated in the teacher's guide. Prior to the lessons, students listened to ten minutes of symphonic music using Disney theme songs rearranged in the styles of composers from other periods. Students were tested at the end of both five day cycles. Analysis of the weekly test results achieved at the end of each cycle of instruction were made using t tests of mean differences.

RESULTS

Mean scores, standard deviations and t-test results for the different listening conditions are presented in Tables I, II, III, IV, V, and VI.

As can be seen in Table I below, there was a 13.16 difference

Table I

Means, Standard Deviations and t of
no musical intervention vs listening to Mozart

Samples	Mean	Standard Deviation	t
No Musical Intervention	80.52	26.97	1.68
Mozart	93.68	20.87	

between the means of the samples in which no musical listening condition was provided prior to spelling instruction, as compared to when ten minutes of listening to Classical music composed by Mozart took place prior to spelling lessons. This difference was found to be statistically not significant.

Table II, below, indicates a 6.84 difference between the means

Table II

Means, Standard Deviation and t of
no musical deviation vs. listening to Vivaldi

Samples	Mean	Standard Deviation	t
No Musical Intervention	80.52	26.97	-0.81
Vivaldi	87.36	24.68	

of samples in which no musical listening condition was provided prior to spelling instruction, as compared to when ten minutes of listening to Baroque music composed by Vivaldi took place prior to spelling lessons. This difference is not statistically significant.

Table III, below, indicates a 13.76 difference between the

Table III

Means, standard deviations and t of no musical intervention and listening to Disney themes

Samples	Mean	Standard Deviation	t
No Musical Intervention	80.53	26.97	1.90
Symphonic Disney Theme	94.21	16.10	

means of samples in which no musical listening condition was provided prior to spelling instruction, as compared to when ten minutes of listening to symphonic music using Disney themes rearranged in the styles of composers from other periods took place. This difference is also statistically not significant.

Table IV, below, compares the results of ten minutes of

Table IV

Means, standard deviations and t of listening to Mozart vs. listening to Vivaldi

Samples	Mean	Standard Deviation	t
Mozart	93.68	20.87	0.85
Vivaldi	87.36	24.68	

listening to Mozart to ten minutes of listening to Vivaldi prior to spelling instruction. A 6.32 difference resulted, which is statistically not significant.

Table V, below, compares the results of ten minutes of

Table V

Means, standard deviations and t of listening to Mozart vs. listening to symphonic Disney themes

Samples	Mean	Standard Deviation	t
Mozart	93.68	20.87	-0.87
Symphonic Disney Themes	94.21	16.09	

listening to Mozart to ten minutes of listening to symphonic versions of Disney themes prior to spelling instruction. A .52 difference resulted, which is statistically not significant.

Table VI, below, compares the results of ten minutes of

Table VI

Mean, standard deviation and t of listening to Vivaldi vs. listening to Disney themes

Samples	Mean	Standard Deviation	t
Vivaldi	87.36	24.68	-1.01
Symphonic Disney Themes	94.21	16.09	

listening to Vivaldi to ten minutes of listening to symphonic versions of Disney themes prior to spelling instruction. A 6.84 difference resulted, which is statistically not significant.

CONCLUSIONS

Data from this study support the hypothesis that no significant difference would exist between the scores on spelling tests of students when they listen to music just prior to receiving instruction in the spelling of phonetically generalizable words, whether that music be Classical, Baroque or symphonic variations of Disney themes. Anecdotal records, however, show that student motivation and interest were increased when a musical listening period was provided prior to spelling lessons, indicating that music has a facilitative effect upon learning.

It is interesting to note the large (13.16) point difference between achievement when exposed to Mozart (and the lesser point difference when exposed to Vivaldi and symphonic Disney themes) prior to spelling instruction when compared to no intervention. Even though the differences were not statistically significant, they suggest a differential effect of various musical genre and also that, had the study been continued over a longer period of time, a greater gain might have been achieved by the Mozart treatment. Exploration of these suggestive findings is recommended for further study.

Musical/Rhythmic Intelligence and Spelling:

Related Research

THE BRAIN, HEMISPHERIC SPECIALIZATION AND PROCESSING STYLES

The human brain is amazing. It regulates all bodily functions and controls our most primitive behaviors. The brain is responsible for all of our activities, hopes, thoughts, emotions and personality. The brain is complex, with many lobes, layers, and fissures. The number of neurons, or nerve cells, in an average brain is thought to be a staggering one hundred billion, and in a single human brain, the number of possible interconnections between these cells is greater than the number of atoms in the universe. (Richards, 1993, p.1, citing Ornstein and Thompson, 1984)

The cerebrum of the brain consists of two hemispheres, the right and the left. These hemispheres are connected by the corpus callosum, a bundle of commissural nerve fibers that serves as a facilitator for communication between the two hemispheres. The corpus callosum is the largest fiber pathway in the brain. It covers about four inches and forms a bridge of about three hundred million nerve fibers, which become myelinated as we mature and gain experience. In the process of myelinization, the outer parts of neurons develop a waxy coating that insulates the wiring and facilitates rapid and clear transmissions. (Richards, 1993, p. 1 and 2, citing Healy, 1990)

Each hemisphere contains a motor strip as well as a sensory area; these areas are symmetrical. The left side of the brain receives sensory information from and controls movement on the right side of the body. The right side of the brain receives sensory information from and controls movement on the left side of the body. The brain is not totally symmetrical, however, and many specialized functions are centered primarily in one hemisphere or another. For example, the speech and hearing centers are generally on the left side of the brain, just above the ear. The left hemisphere tends to be more involved and more proficient in language and logic, whereas the right hemisphere is more involved in controlling spatial activities and gestalt thinking. It is an oversimplification to assume that the two hemispheres are separate systems, like two individual brains. Although each hemisphere is specialized to handle different tasks, the task division between the two hemispheres is not absolute, and they constantly communicate with each other. Neither hemisphere is completely idle while the other side is active. Most activities involve both hemispheres interacting with each other. (Richards, 1993, p.2, citing Healy, 1990)

The cortex is the surface of the cerebrum and functions as a control panel for processing information at three levels: receiving sensory stimuli, organizing them into meaningful patterns so that we can make sense out of the world, and associating patterns to help develop abstract types of learning and thinking. (Richards, 1993, p.2, citing Healy, 1990)

Given the asymmetrical nature of the hemispheres of the brain, it is not surprising that each deals with information in different ways. It has become popular to refer to people by their processing tendency, yet as human beings, we all use both hemispheres; no one is completely a right-hemisphere or a left-hemisphere processor unless he or she has severe physiological damage. We may refer to a person as a "right-hemisphere processor" or a "left-hemisphere processor" because, in many tasks, one or the other hemisphere takes control and acts in charge. (Richards citing Cherry, 1989)

People who visualize very well usually process information in the right hemisphere; their comprehension takes place by seeing pictures. They are called visual learners. Those who comprehend by hearing, auditory learners, usually process information in the left hemisphere. Those who do not specifically localize their comprehension usually are haptic learners; they learn by experience. They tend to be right-hemispheric or to alternate from one side to the other. When we talk about a right- or left-hemispheric person, we are talking about learning preferences based on the functional differences between the hemispheres. (Richards citing Vitale, 1982)

A summary of research about processing styles indicates the following processing characteristics typical of each hemisphere. The left hemisphere is linear and works with details rather than wholes; is concrete and precise; is sequential and systematic; is logical and uses planning; is verbal and processes language or meaning; is more auditory than visual; is reality based; is automatic and recalls automatic codes; has temporal awareness of time in the past, present and future; and is practical and concerned with cause and effect. The right hemisphere works with wholes rather than parts; is metaphoric and symbolic; is random and informal; is intuitive and spontaneous; is nonverbal and responds to body language; is more visual than auditory; is fantasy oriented; is responsive to novelty; is nontemporal and does not always consider time; is original and is concerned with ideas and theories. In short, the left hemisphere is more in control of symbolic and language activities and processes more details, whereas the right hemisphere is used to process haptic, spatial and global information. (Richards, 1993; Cherry, 1989; Vitale, 1982; Stevens,1984, Healy, 1987, 1990)

A balance usually exists between the hemispheres, with each taking control of the tasks it handles best and with the hemispheres working together as a coordinated unit. A task may have several components, and each hemisphere will handle the components that require the strength of that hemisphere. Some brains find certain processing modes more comfortable, so they tend to approach certain tasks with a preferred style, either more global and holistic or more analytical. It is very similar to handedness. Most of us are more comfortable using our dominant hand and are more efficient using it in various tasks. We are, however, quite capable of using both hands together, and in many situations we rely on the nondominant hand. Similarly, both hemispheres work in tandem and constantly integrate processing styles as the hemispheres deal with different aspects of a problem. (Richards, 1993)

In general, the left brain codes and processes messages in language. It thinks by "talking to itself" as it manipulates numbers and words, and it plans logically. It does not have a sense of space, but is constantly aware of time and refers to an inner clock for much of its evaluation and organization. (Stevens, 1984) The left brain breaks information into small, manageable pieces. It places these pieces into an order that helps organize and categorize material. It deals with this information in a very systematic manner, incorporating sequencing and step-by-step processing. In music, it attends to notations and lyrics. It helps language processing by ordering sounds and words, using function words, and mediating fine distinctions between words. The left brain stores factual information, and it reaches conclusions through reasoning and by being systematic, without feeling or emotions. (Richards, 1993)

The right brain is primarily nonverbal and intuitive. It deals directly with reality through a mode of thinking that uses visual images and metaphors rather than words or numbers. It has a highly developed awareness of space, and much of its thinking involves imagining, imagery, or placing objects in space. The right brain takes in data as whole units and organizes information by seeking relationships and by recognizing similarities between wholes. It prefers analogous leaps to step-by-step processing. In music, it picks up the melody, and melodies frequently "float around" in the person's mind while he or she is engaged in other activities. The right brain helps process language through interpreting body language, prosody, and understanding the overall meaning. It produces sudden insights that serve as stepping stones to help it feel its way to conclusions by use of hunches or trial and error. It uses intuition by being sensitive, imaginative, and whimsical. (Richards, 1993)

Research on the development and specialization of the brain has opened the way to understanding how children learn. Research on lateralization and specialization of the hemispheres has important implications for the ways we teach children. (Vitale, 1982)

Noting the differences in the functions of the two hemispheres of the brain, one might question whether music can be used to enhance different types of learning. Research suggests differing points of view about this. Gardner (1983), whose beliefs about specific intellectual competencies has evolved into theories of multiple intelligences, asserts that musical thinking involves its own rules and constraints and cannot simply be assimilated to linguistic or logical mathematical thinking. He asserts that while linguistic and musical expression and communication had common origins neurologically several hundred thousand or perhaps even a million years ago, investigators have demonstrated beyond a reasonable doubt that the processes and mechanisms subserving human music and language are distinct from one another. The mechanisms by which pitch is apprehended and stored are different from the mechanisms that process other sounds, particularly those of language. He notes that linguistic abilities are lateralized almost exclusively in the left hemisphere in normal right-handed individuals, whereas the majority of musical capacities, including the central capacity of sensitivity to pitch, are localized in most normal individuals in the right hemisphere. In most tests with normal individuals, musical abilities turn out to be lateralized to the right hemisphere. For example, in tests of dichotic listening, individuals prove better able to process words and consonants presented to the right ear (left hemisphere), while they are more successful at processing musical tones when these have been presented to the right hemisphere. But Gardner (1983) notes a complicating factor. When these dichotic listening tasks are presented to individuals with musical training, there are increasing left hemisphere and decreasing right hemisphere effects. Specifically, the more musical training the individual has, the more likely he will draw at least partially upon the left hemisphere mechanisms in solving a task that the novice tackles primarily through the use of right hemisphere mechanisms.

Gardner (1983) asserts that an image of musical competence crossing the corpus callosum as training accrues must not be taken too far. It is not found with every musical skill. Even musicians perform chord analysis with the right, rather than with the left hemisphere. It is not exactly clear why increasing left hemisphere effects are found with training. While the actual processing of music may change loci, it is also possible that the mere affixing of verbal labels to musical fragments brings about apparent left hemisphere dominance for musical analysis. Trained musicians may be able to use "formal" linguistic classifications as aids where untrained subjects must fall back on purely figural processing capacities.

Gardner (1983) stresses the surprising variety of neural representations of musical ability found in human beings. He notes that while every normal human being is exposed to natural language primarily through listening to others speak, humans can encounter music through many channels: singing, playing instruments by hand, inserting instruments into the mouth, reading musical notation, listening to records, watching dances, or the like.

According to Gardner (1983), none of the claims with respect to musical breakdown suggest any systematic connection with other faculties such as linguistic, numerical, or spatial processing. Perhaps once we have refined the proper analytic tools for studying various forms of musical competence, we may find that it is even more lateralized and localized than human language. Recent studies converge on the right anterior portions of the brain with such predictability as to suggest that this region may assume for music the same centrality as the left temporal lobe occupies in the linguistic sphere.

Gardner (1983) notes that although language and music are separate intellectual competencies, and neither are dependent upon physical objects in the world, both can be elaborated to a considerable degree through exploration and exploitation of the oral-aural channel.

While musical intelligence has its own developmental trajectory and its own neurological representation separate from language, certain music abilities may be closely tied to spatial and mathematical capacities. Gardner (1983) notes that the study of music shares the features of the study of mathematical proportions, special ratios, and recurring patterns. He notes that there are "high math" elements in music and that in order to appreciate the operations of rhythms in musical work, an individual must have some basic numerical competence. He notes also that performances require a sensitivity to regularity and ratios, and an appreciation of basic musical structures and how they can be repeated, transformed, embedded, and played off one against another. (Gardner, 1983)

Research offers differing points of view about whether music can enhance learning. Research teams at the University of California at Irvine have performed multiple experiments to determine how music can enhance brain function. The following are descriptions of some of their experiments.

The first experiment sought to determine if short term causal enhancements of spatial-temporal reasoning could be invoked by merely listening to music. Mozart's music was chosen because of its complex, highly structured and non-repetitive character. Three listening conditions were established for thirty-six undergraduate students. They listened to the first ten minutes of Mozart's Sonata for Two Pianos in D Major, (K.448), or to a relaxation tape for ten minutes, or to ten minutes of silence. Performance was improved for those tasks immediately following the first listening condition, the Mozart sonata, which was labeled "The

Mozart Effect." The students scored eight to nine points higher on the abstract/spatial reasoning IQ subtest of the Stanford-Binet Intelligence Scale than they scored after they listened to taped relaxation instructions or silence. This facilitation lasted only ten to fifteen minutes. (Rauscher, Shaw and Ky, 1993)

In a follow-up study, seventy nine undergraduate students were tested for five consecutive days. All students were issued sixteen paper folding and cutting items on the first day of the experiment, and then were divided into three groups with equivalent abilities. They also issued sixteen short-term memory items, which were three subtests in the spatial reasoning portion of the Stanford-Binet Intelligence Scale. The researchers chose the paper folding and cutting task because it best fit their concept of spatial-temporal pattern development. (Rauscher, Shaw and Ky, 1995)

Each paper folding and cutting task was projected for one minute. On days two, three, and four, the three groups were separated, and then participated as follows: On each day, the Silence group sat in silence for ten minutes and were then tested with sixteen new paper folding and cutting items; the Mozart group listened to ten minutes of Mozart's Sonata in D. Major (K.448) and were tested with the same sixteen paper folding and cutting items as the Silence group. The Mixed group listened to ten minutes of something different every day. On Day 2 they heard a minimalist work by Philip Glass; on Day 3 they heard an audio-taped story; and on Day 4 they heard a dance (trance) piece. They were tested on the same paper folding and cutting items as the other groups after each of these conditions. The results of this experiment reproduced the original findings of the Mozart enhancement with respect to silence, and indicated that repetitive music produced no enhancement of spatial-temporal reasoning. Further, these enhancements were not only highly significant, but were quantitatively very large. (Rauscher, Shaw and Ky, 1995)

These experiments established the causal enhancement of spatial-temporal reasoning by listening to specific music. Their proposed mechanisms for this short-term enhancement of spatial-temporal reasoning by listening to music include the following: first, that listening to music helps "organize" the cortical firing patterns so that they do not wash out for other pattern development functions, particularly the right hemisphere processes of spatial-temporal task performance; second, that music acts as an "exercise" for exciting and priming the common repertoire and sequential flow of the cortical firing patterns responsible for higher brain functions; third, the cortical symmetry operations among the inherent patterns, are enhanced and facilitated by music. The researchers question whether the cortex's response to music is the "Rosetta Stone" for the "code" or internal language of higher brain function. (Rauscher, Shaw and Ky, 1995)

Predictions from their structured neuronal model of the brain led the University of California team to test the hypothesis that music training for young children enhances spatial-temporal reasoning. Previous research by Leng and Shaw (1991) suggested that music training of young children, whose cortices are highly plastic, should produce long-term enhancement of spatial-temporal reasoning. They tested seventy-eight pre-school children, who all received group singing lessons. One control group received private piano keyboard lessons, another control group received private computer lessons, and a third control group received no lessons.

Four standard, age-calibrated spatial reasoning tests were given at the beginning and at the end of the study; one test assessed spatial-temporal reasoning and three tests assessed spatial-recognition reasoning. A highly significant improvement of large magnitude was found for the piano keyboard group in the spatial-temporal reasoning test, Object Assembly. No significant improvement was found on tests of spatial-recognition reasoning, such as matching, classifying and recognizing similarities among objects. The control groups did not improve significantly on any of the tests. This experiment was not able to determine the temporal duration of the enhancement of spatial-temporal reasoning, but it was at least one day, (Rauscher, Shaw, Levine, Wright, Dennis and Newcomb, 1994), which is considered long term by memory research standards. (McGaugh, 1966)

This theoretical and empirical research has suggested a relationship between musical and spatial reasoning abilities. Leng and Shaw's neural model (1991) provides a neurobiological argument for a causal link between music and spatial-temporal reasoning. Spatial-temporal reasoning involves maintaining and transforming mental images in the absence of a physical model and is required for higher brain functions such as chess, math and engineering.

Musical cognition, it is argued, should also require these temporal sequences of neural activity. (Leng and Shaw 1991) A fundamental property of these evolving patterns of neural activity is that they can be readily strengthened through experience or learning. (Shaw, Silverman and Pearson, 1985; Shenoy, Kaufman, McGrann and Shaw, 1993). Although higher brain functions are typically associated with specific, localized regions of cortex, all higher cognitive abilities draw upon a wide range of cortical areas. (Petsche, Richter, VonStein, Etlinger, Fitz, 1993)

While the earlier research indicated that listening to music could improve spatial reasoning for short periods, it appears that studying music could enhance spatial reasoning for longer periods, particularly for very young children. Their findings are compelling and the implications for education are great, but Rauscher cautions that the results are preliminary; more study is needed to determine if the effect is true in older children, and how long the effect lasts. Rauscher notes, "It is important to involve children in music, the more the better." Rauscher indicates that school administrators need to hear the message that musical training is crucial to all children. (Martin, 1994) Rauscher also suggests that, "Other tasks which depend upon spatial-temporal processes, such as chess, geometry, sculpture, and the computer game Tetris, will probably also be enhanced by music training." (Rayl, 1995)

Gardner is quoted as saying the research on the Mozart Effect is "very provocative." He states that the findings could challenge his theory that musical and spatial abilities are independent, and wonders if it's "the music per se that's bringing about these higher performances" or whether any complex discipline, like karate, might do the trick. (Holden, 1994)

LISTENING

Although balanced literacy programs encourage an integration of all four of the language arts, it appears that speaking, reading and writing seem to develop concurrently, while listening seems to be the last to develop. An understanding of how students develop listening skills also requires an understanding of the sense of hearing. It is the sensory experience of hearing that makes the perception of both language and music possible. Darrow (1990) notes that the ability of individuals to use their hearing for the purpose of listening varies. Good hearing does not necessarily insure skilled listening; conversely, poor hearing does not necessarily indicate an inability to listen. While music listening is not totally dependent upon one's ability to hear well, hearing certainly plays a significant role in the perception of music.

Much can be said about listening and music teaching from taking a close look at the relationship between hearing and language learning; some of the most popular approaches to music education are based on the aural principles of language acquisition. (Darrow, 1990) A child learns by hearing and listening. Hearing and listening go hand in hand; hearing is a physical function, whereas listening is a learned behavior. (DiSogra, 1996) Listening is a mental process and hearing is a physical process. The roles of both hearing and listening cannot be overestimated in the acquisition of spelling skills and the act of purposefully attending to music. It is the sensory experience of hearing that makes possible both the perception of music and phonological awareness. (Darrow, 1990)

Research on hearing in the left brain versus the right brain indicates that speech perception and language are left brain hemisphere functions, while nonspeech sounds, music, and acoustical contours are right brain hemisphere functions. The connecting bridge between each side of the brain is the corpus callosum. Auditory information from each ear arrives in each hemisphere for interpretation. Speech information is directed into the left side, and nonspeech is directed to the right side. There are auditory tracts or pathways from the ears, through the brain stem and up into the left and right sides of the brain. (DiSogra 1996)

Young children develop language strictly from auditory exposure to the sounds around them, and they often accomplish their music learning by listening to music and from communicating with others about the music. Both listening skills and oral communication skills are acquired through the sense of hearing. Hearing is the sense upon which we are most dependent for nearly every aspect of our daily existence. (Darrow, 1990)

From the perspective of a language practitioner, DiSogra (1996) notes that there are five components of auditory processing: **Frequency** or pitch, which is the clarity of the message; **intensity**,which is the volume or loudness of the message; rate, the speed at which you are spoken to; symmetry, the balance or equality between left and right ear; timing, the arrival of the message in the brain for interpretation.

Auditory processing goes beyond these five components. According to Keith, (1988) the auditory processing abilities important to the learning process are ten-fold. They are:

1. Discrimination, the ability to differentiate among sounds of different frequency, duration and intensity.
2. Localization, the ability to localize the source of the sound;
3. Auditory attention, the ability to pay attention to auditory signals, especially speech, for an extended time;
4. Auditory figure ground, the ability to identify a primary speaker from a background of noise;
5. Auditory discrimination, the ability to discriminate among words and sounds that are acoustically similar;
6. Auditory closure, the ability to understand the whole word or message when part is missing;
7. Auditory blending, the ability to synthesize isolated phonemes into words;
8. Auditory analysis, the ability to identify phonemes or morphemes embedded in words;
9. Auditory association, the ability to identify a sound with its source;
10. Auditory memory and sequential memory, the ability to store and recall auditory stimuli of different length or number in exact order.

From the perspective of a music educator, Darrow (1990) notes the properties of sound. Sound consists of vibrations that travel in waves; sound waves can vibrate at different speeds as they travel: the faster the wave vibrates, the higher the pitch. Frequency is the number of vibrations produced per second and is measured in Hertz. The frequency of a sound is a physical reality, while pitch is our subjective judgment of its frequency. The duration of sound has to do with its continuance in time. The aural discrimination of varying lengths of sound is the basis of rhythm perception. Intensity is the amount of energy in a sound wave. Intensity is a quantitative measurement of sound; loudness is our subjective judgment of this measurement.

Music is generally more intense than conversational speech and employs many more frequencies than normal speech sounds. The discriminations that we make during music listening are made by the brain. It is the function of the ear to collect the stimuli and deliver them to the brain. This cognitive skill can be a function of innate intelligence or of very good auditory training. Training the ear to listen requires first an analysis of the desired auditory task, second, the structuring of successive approximations to the desired goal, and third, regular and systematic evaluation of the child's auditory skill level. (Darrow, 1990)

Nearly all auditory tasks can be broken down into four very basic levels of aural processing:

1.**Detection**, in which the listener determines the presence or absence and initiation or termination of a specified sound stimuli.
2. **Discrimination**, in which the listener perceives differences in the sound stimuli, (such as fast and slow or high and low).
3. **Identification**, in which the listener appropriately applies labels (such as forte or piano and woodwind or brass) to the sounds, and
4. **Comprehension**, in which the listener makes critical judgments regarding the sound stimuli, such as judgments concerning form, harmony, or texture. (Darrow, 1990)

Most children develop detection and discrimination skills through normal interaction with the environment. It is the third and fourth levels of auditory processing, discrimination and comprehension, that require the attention of the music educator. (Darrow, 1990)

Darrow notes that there are a number of other listening behaviors that are subsumed within these four basic levels of auditory processing. These additional listening behaviors are prerequisites to auditory comprehension. To indicate these listening behaviors, Darrow (1990) refers to Sanders' (1977) hierarchy of auditory processing, which is a useful tool in developing sequential listening objectives for grade school to high school age students. Sander's hierarchy supports Keith's list of auditory processing abilities. While this hierarchy was developed with the processing of speech in mind, Darrow notes that speech and music contain many common properties although perhaps identified by different names. In music, reference is made to intonation, tempo, accent and rhythm; the speech counterparts of these terms are inflection rate, stress, and speech rhythm. As was the case with first levels of auditory processing, proficiency at the first four levels of Sander's hierarchy is usually acquired naturally. The remaining six levels of auditory processing should provide a guide for music listening experiences.

Sander's (1977) hierarchy of auditory processing, with notes regarding its relevance to music education, is as follows:

1. **Awareness of acoustic stimuli**: Is the child aware that music is in the environment?

2. **Localization**: Can the child identify the location of the musical sound source?

3. **Attention**: Can the child attend to the music over time?

4. **Discrimination between speech and nonspeech**: Can the child discriminate between music and nonmusic sounds?

5. **Auditory discrimination**: Can the child discriminate between the timbre of different instruments, or can he or she locate the entrance and exit of specific instruments within the total music context, showing figure/ground discrimination?

6. **Suprasegmental discrimination**: Can the child make discriminations about the expressive qualities of the music (dynamics, tempo, and phrasing).

7. **Segmental discrimination**: Can the child make discriminations about changes in pitch?

8. **Auditory memory:** Can the child remember what instruments were heard?

9. **Auditory sequential memory:** Can the child remember in what order the instruments were heard?

10. **Auditory synthesis:** Can the child make critical judgments regarding form, texture, and harmony?

Listening is an important skill. To summarize, we might note that there is little, unfortunately, that we can do to improve a child's ability to hear, but there is much we can do to improve his or her ability to listen. Our goal is to increase the amount of information received through the sense of hearing. We do this by teaching children to interpret the sounds they hear. Listening, like any other skill, must be practiced through regular, sequential listening exercises. The child must develop a focused and analytical attention to sound in order to acquire good listening habits. The ear is a valuable listening device, and music is a powerful medium through which listening skills can be taught, practiced, and rewarded. (Darrow, 1990)

PROGRAMS THAT HAVE USED MUSIC TO ENHANCE LEARNING

There are programs that have used music to enhance learning; several are noted here.

In the Hungarian "singing schools," based on the work of Zoltan Kodaly, children sing every day. By the third grade, there are few children who cannot sing on pitch or make beautiful sounds. It has been noted that Hungarian students have also excelled in math and science as a result of their on-going musical training. (Campbell, Campbell and Dickinson, 1996)

The research of psychiatrist and educator Dr. Georgi Lozanov in Sophia, Bulgaria, suggests that music strongly influences our ability to relax, rejuvenate, and concentrate. Lozanov's work also suggests that music integrates the emotional, physical, and cognitive dimensions of the learner, as well as accelerates the quantity of information learned and retained. (Campbell, Campbell and Dickinson 1996). Identified in this country by other names such as Suggestology, Suggestopedia, Superlearning and Suggestive Accelerative Learning and Teaching (SALT), Lozanov's research also focused on methods to increase memory and the human's reserve capacities through the constant connection of "paraconsciousness" with consciousness. (Lozanov & Gateva, 1981)

Lozanov (1989) asserted that theories basic to accelerative learning include using suggestion as an instructional tool, the use of music as an integral part of instruction, and whole brain learning. Positive verbal suggestions are necessary to communicate expectations to students. Music is prescribed for use with all elements of suggestopedic instruction; if the whole brain can be involved in the learning process, through music, relaxation and suggestion, learning occurs in geometric proportions.

Ostrander (1982) asserts that this rapid learning system can be used to learn any kind of factual information, which is left-brain learning. The logical mind can suddenly perform with stupefying ability because the body and right-brain abilities are in harmony, are lending their support. In all Superlearning, no matter which part of the whole is featured, be it left-brain, body, or right-brain, the others are there, harmonizing and supporting.

Lozanov determined that a very particular kind of music was the most effective in enhancing the learning power of the mind. He described this type of music as "largo Baroque." Baroque music was composed in the sixteenth to eighteenth centuries by such masters as Bach, Vivaldi, Telemann, Corelli, and Handel. The term "largo" refers to the speed or tempo of the music. "Largo" means "slow." Lozanov found the most effective music to be Baroque concertos played in 4/4 or 3/4 time at a rate of sixty beats per minute. (Lozanov, 1989)

Discrepancies exist among research completed in the United States. According to Nelson's (1991) review of the research, there is a positive effect on learning and retention because of the use of suggestive-accelerative learning and teaching. Stock and Daines (1989) found that accelerative learning "highlights the interactions of mind and body that seemed to lead to peak performance and accelerated learning." Other studies showed significant gains from pretest to posttest for students taught using the suggestive-accelerative methodology or significant differences in posttest scores for students taught using suggestive-accelerative methods when compared to students taught with other techniques. (Odendaal, 1989; Garcia, 1988; Moon et al 1988; DuBabcock, 1988; Voci-Reed, 1987; Prichard and Taylor, 1974-1985; Schuster, Prichard and McCullough, 1976-1978; McGinty, 1987).

In contrast, other studies noted by Nelson (1991), yielded inconclusive results regarding the effects of suggestive-accelerative learning and teaching methods. For example, Portes and Foster (1989) found significantly positive effects for reading but only marginal differences were found for mathematics. In studies conducted by Anderson and Render (1987) and Schuster (1988), there were no significant differences found for the experimental groups being taught with suggestive-accelerative learning. In fact, Anderson and Render (1987) found that the control group scored significantly better than the experimental group. In another study, Schuster (1988) concluded that experienced instructors are necessary to achieve significant gains in achievement.

Nelson (1991) investigated the effects of suggestopedic accelerative learning and teaching on the spelling achievement, attitudes toward school, and memory on forty-eight fourth-grade students in two self-contained classrooms. Her study, conducted over eighteen weeks, compared a control group that received traditional spelling instruction and an experimental group that received instruction supplemented by suggestive accelerative learning and teaching techniques, including mind calming exercises, dramatic presentations, use of classical and Baroque music, review presentations and ungraded quizzes. The experimental group obtained significantly higher spelling scores and higher attitude scores following instruction incorporating suggestive-accelerative methods. In terms of memory, however, the score was not significantly greater for the experimental group. Nelson concluded that suggestive accelerative learning and teaching techniques do have facilitative effects on the spelling achievement of elementary school students and that student motivation and interest were increased through the incorporation of these techniques.

The Learning to Read Through the Arts (LTRTA) program is an integrated approach to elementary curriculum in which the arts are used as the main stimulus for all learning. In LTRTA, the arts are the primary vehicle for teaching reading, writing, thinking and communication and for integrating science, social studies, and other content areas. The effective integration of the content areas in this program creates a learning environment that makes all children want to learn and has proven consistently successful with at-risk children. Although specific statistical data was not available, it should be mentioned that in annual measurements of academic achievement through its twenty years of operation, students in the LTRTA program have repeatedly demonstrated exemplary growth as recognized by the United States Department of Education, the New York State Education Department, and the New York City Board of Education. (Collett 1991)

Collett (1991) asserts that it is the music curriculum that provides the developmental and sequential aspects of teaching. Viewed from the LTRTA perspective, a well-taught, sequential music curriculum not only results in music learning that has inherent value, it also gives students the chance to listen, think, react, see, touch, and move. Instruction in music skills, music appreciation, and music history also provides a wealth of learning strategies that enhance children's analyzing, synthesizing, and evaluation skills. The students learn to process information and transfer knowledge through these concrete, kinetic, and cognitive experiences.

Shuler (1991) notes the special role of music education in helping at-risk students. Defining at-risk students as those who are in danger either of dropping out of school or of graduating without mastering the knowledge and skills that are necessary to be effective citizens and contributors to the economy, Shuler notes the critical role music plays in motivating students. Predicting a potential success rate of 98% if students can receive the right kind of instruction that utilizes their preferred learning style, their preferred sensory modality, and using their musical intelligence, Shuler presents an appeal to place arts at the center of the curriculum. He cites the Ashley River Creative Arts Elementary Magnet School in South Carolina as one example of a school in which students receive significant amounts of instruction in the arts and experience a curriculum in which the study of other subjects is integrated through their arts experience. Students at the school consistently earn the highest scores in their county on standardized tests of achievement in reading and other traditional academic subjects, and also far outpace the norms for their state.

Excellent results have been achieved at other arts-centered elementary schools, including the Key School in Indianapolis. (Shuler 1991). One of its founding principles is the conviction that each child should have his or her multiple intelligences stimulated each day. Thus, every student at the Key School participates on a regular basis in the activities of computing, music, and "bodily-kinesthetics," in addition to theme-centered curricula that embody the standard literacies and subject matter. (Gardner, 1993)

RHYME AND SPELLING

While music has been linked to memory and spatial reasoning, research suggests that rhyme may be closely connected with the acquisition of literacy skills, particularly reading and spelling. Older methods of phonics instruction that focus on letter-sound correspondences, decoding individual letter sounds and then blending the sounds together to make words, appear useless because students either can't remember the rules or can't make enough sense of them to apply the rules when reading and spelling. (Wagstaff, 1995) Skills and strategies taught only through drill and practice do not transfer easily to more meaningful reading and writing situations. (Collins, Brown, & Newman, 1989) Even when taught in context through effective techniques, individual letter-sound correspondences are highly unreliable. This is because the sounds that letters make often depend on the letters that surround them. The syllable itself, and the parts within it, are therefore more reliable than individual letter-sounds, producing more consistent sounds across different words. It may be more effective for readers to focus on a portion of the word that is bigger than individual phonemes. (Wagstaff, 1995)

Current research suggests that spelling and reading can effectively be taught using the phonemic segmentation of onsets and rhymes. These larger onset and rhyme units are intersyllabic units that are smaller than words and syllables but larger than phonemes. (Wagstaff, 1995; Adams, 1990; Goswami, 1991, 1996)

Adams (1990) contends that the path of phonological awareness, or the way in which learners become aware of sounds and symbols proceeds from larger units to smaller units, thus enabling learners to recognize and manipulate sentences before words, words before syllables, and syllables before phonemes. Because onsets and rhymes are larger units than phonemes, they should be easier to use and attend to than phonemes.

Further research supports the use of onsets and rhymes to teach both reading and spelling. Children's phonological awareness, especially their awareness of rhyme, is known to be important for later reading development, but indicates that the exact nature of the connection between phonological skills and reading is not yet known. One possibility is that when children analyze written words in reading, they find it relatively easy to learn about spelling sequences within these words that reflect phonological categorizations such as rhyme. This hypothesis implies that learning to read words is not a purely visual process, and the related research indicates that intrasyllabic phonological knowledge does seem to play a role in learning about spelling sequences in reading. (Goswami, 1991)

Goswami (1996) notes that teaching children the correspondence between onsets and rhymes is the best way to develop phonemic skills and that paying attention to the spelling patterns for rhyme units in words can dramatically reduce the unpredictability of English spelling patterns. Since spelling-sound correspondences in English are largely consistent and predictable at the onset-rhyme level, a good way to begin teaching children about the alphabet is to use a "word families" approach. Giving children a strategy of making analogies in reading supports the development of decoding skills. According to Goswami, (1996) to make an analogy in reading, you use the rhyme from a word that you know to decode a word that you don't know. Goswami's research has shown that many children use analogies in reading spontaneously, without being taught. These children tend to have good phonological skills, particularly at the onset-rhyme level. To encourage all children to use analogies when they read, we need to first develop their phonological knowledge of onsets and rhymes, and secondly teach them how to use analogies.

Lerner (1993) notes that one language problem that learning disabled students may experience is lack of phonological awareness, defined as a recognition that words are made up of sound elements of phonemes, which represent the sounds of speech. Phonological awareness typically appears to be developmental in children. An awareness of the phonological system permits the student to gain entry into an alphabetic system. Written English is an alphabetic system, with written letters of the alphabet representing speech sounds.

Research studies with other alphabetic languages also show a linkage between a lack of phonological awareness and poor reading. Such studies have been conducted in American English, British English, Swedish, Spanish, French, and Italian. Collectively, these studies have several implications. The studies imply that the skills of phonological awareness can be taught to children, and that as early as possible, teachers should help children to become aware of the sounds in speech. Nursery rhymes, word play, and word games help children understand segmental structure, first in words, then in syllables, and finally in phonemes. The studies imply that children should learn the letters of the alphabet as well as the letter names and their sounds. The sounds of the words can be taught by helping children learn to segment syllables into phonemes and words into syllables. (Mann 1991; Liberman and Liberman, 1990)

Students who have been trained in phonological awareness were more successful in reading and spelling than control groups who received other kinds of training. (Bradley and Bryant 1985). Further research (Bryant, Bradley, Maclean and Crossland, 1989) suggests that there is a strong relationship between early knowledge of nursery rhymes and success in reading and spelling. They had already established that there are strong links between children's early knowledge of nursery rhymes at three years of age and their developing phonological skills over the next year and a quarter (Maclean, Bryant and Bradley, 1987). This raised the question of how knowledge of nursery rhymes can have such an effect. Their answer is that knowledge of nursery rhymes enhances children's phonological sensitivity which in turn helps them to learn to read. Nursery rhymes in particular are related to the child's subsequent sensitivity to rhyme and phonemes, but action rhymes, word games and lullabies also affect their linguistic development. They may help syntactic or semantic development, even though the language in them is as simple, syntactically or semantically, as anything they would hear in other contexts. (Bryant, Bradley, Maclean and Crossland, 1989).

The conclusions of this longitudinal study are worthy of note because they show a strong link between an entirely informal experience early on the child's life and a formal educational skill which the child must acquire some years later. When parents introduce their child to nursery rhymes, it is most unlikely that eventual success in reading is in their minds. The results of the study make it clear that this early knowledge of nursery rhymes may play a considerable role in preparing the child for reading and spelling. Their evidence suggests that the pathway is through the child's growing sensitivity to the component sounds in words. They note two steps to their theory. First, their scores of the nursery rhyme test predicted success in phonological tasks over two years or more and do so even after their initial levels of phonological sensitivity have been controlled. Secondly, the relation between nursery rhyme knowledge and reading and spelling disappear when subsequent rhyme scores, which predict reading and spelling very well, are entered in the equation. They concluded that they have evidence for a model which takes the form that nursery rhymes enhance phonological sensitivity (rhyme and phoneme detection) in general, which in turn enhance reading. (Bryant, Bradley, Maclean and Crossland, 1989)

Spelling in this study was a different matter. Rhymes are an essential ingredient of the connection between nursery rhymes and spelling. This is probably because in rhyme, the phonological unit is grosser and less specific than it is in phoneme detection tasks. But the authors also had evidence that children with reading problems make better progress in spelling, though not in reading, if they can rhyme. (Bradley and Bryant 1978). Why should rhyme play such a specific part in the connection with spelling? One possibility is that rhyming skills are especially important because they make it easier for children to learn about sequences of letters and especially about sequences shared by words which also rhyme. The results suggest that this sort of learning might be more important for spelling than for reading. The authors conclude that there is a causal relationship, that familiarity with nursery rhymes enhances children's sensitivity to the component sounds in their language and that this in turn affects their progress in reading and spelling. The longitudinal data are completely consistent with this causal claim. If their hypothesis is right, then extra experience with nursery rhymes should make children more successful in phonological tasks and it should help them to learn to read and spell.(Bryant, Bradley, Maclean and Crossland, 1989)

RATIONALE FOR DEVELOPING MUSICAL/RHYTHMICAL INTELLIGENCE

Research suggests that it is advantageous for classroom teachers to include music and rhythm in their everyday instruction rather than assign that task solely to the music practitioner. Lazaar (1991) suggested that the effect of music and rhythm on the brain creates the greatest consciousness alteration of all the intelligences. Acknowledging that there exists a diversity of learning modalities leads us to approach the idea of the seven intelligences. Recognizing that some students are visual learners, others are auditory learners, and still others are kinesthetic learners has led to a movement to present materials in manners representing all three modalities. (Sundberg, 1994)

Dr. Howard Gardner, Co-Director of Project Zero and Professor of Education at Harvard University, has for many years conducted research on the development of human cognitive capacities. He has broken from the common tradition of intelligence theory which adheres to two fundamental assumptions: that human cognition is unitary and that individuals can be adequately described as having a single, quantifiable intelligence. In his study of human capacities, Gardner (1983) established criteria by which to measure whether a talent was actually an intelligence. Each intelligence must have a developmental feature, be observable in special populations such as prodigies or "idiots savants," provide some evidence of localization in the brain, and support a symbolic or notational system.

Gardner (1983) proposes a revisionist theory of human intellectual competencies, a theory which challenges the classical view of intelligence. In brief, Gardner posits that while most people possess the full spectrum of intelligences, each individual reveals distinctive cognitive features. According to Gardner, we possess varying amounts of at least seven intelligences and combine and use them in highly personal ways. Restricting educational programs to focus on a preponderance of linguistic and mathematical intelligences minimizes the importance of other forms of knowing. Thus many students who fail to demonstrate the traditional academic intelligences are held in low esteem and their strengths may remain unrealized and lost to both the school and society at large.

Not only did Gardner's research reveal a wider family of human intelligences than previously believed, but also generated a pragmatic definition of the concept of intelligence. Instead of viewing human "smartness" in terms of a score on a standardized test, Gardner (1983) defines intelligence as the ability to solve problems that one encounters in real life, the ability to generate new problems to solve, and the ability to make something or offer a service that is valued within one's culture.

According to Gardner (1983) the seven intelligences are as follows:

<u>Linguistic intelligence</u> consists of the ability to think in words and to use language to express and appreciate complex meanings. Authors, poets, journalists, speakers, and newscasters exhibit high degrees of linguistic intelligence.

Logical-mathematical intelligence makes it possible to calculate, quantify, consider propositions and hypotheses, and carry out complex mathematical operations. Scientists, mathematics, accountants, engineers, and computer programmers all demonstrate strong logical-mathematical intelligence.

Spatial intelligence instills the capacity to think in three-dimensional ways, as do sailors, pilots, sculptors, painters, and architects. It enables one to perceive external and internal imagery, to recreate, transform, or modify images, to navigate oneself and objects through space, and to produce or decode graphic information.

Bodily-kinesthetic intelligence enables one to manipulate objects and fine-tune physical skills. It is evident in athletes, dancers, surgeons, and craftspeople. In Western societies, physical skills are not as highly valued as cognitive ones, and yet elsewhere the ability to use one's body is a necessity for survival as well as an important feature of many prestigious roles.

Musical- rhythmical intelligence is evident in individuals who possess a sensitivity to pitch, melody, rhythm, and tone. Those demonstrating this intelligence include composers, conductors, musicians, critics, instrument makers, as well as sensitive listeners.

Interpersonal intelligence is the capacity to understand and interact effectively with others. It is evident in successful teachers, social workers, actors, or politicians.

Intrapersonal intelligence refers to the ability to construct an accurate perception of oneself and to use such knowledge in planning and directing one's life. Some individuals with strong intrapersonal intelligence specialize as theologians, psychologists, and philosophers. (Gardner 1983; Campbell, Campbell and Dickinson 1996)

This writer opines that there is great merit to this theory and acknowledges that there are at least seven intelligences. Why, then, would educators choose to focus on the musical/rhythmic intelligence? There are quite a few reasons, both academic and nonacademic, to teach music, rhythm and rhyme within the regular classroom; the following are some of those reasons.

According to Lazaar (1991), of all forms of intelligence identified thus far, the consciousness-altering effect of music and rhythm on the brain is the greatest. Once students access the musical/rhythmic intelligence, they can experience a great capacity for change in mood or receptivity to instruction.

Music is undoubtedly one of the oldest art forms, utilizing the human voice and body as natural instruments and means of self-expression. It is an art that comes into the world with us. We live with our mother's heartbeat for nine months before we are born. We live with the rhythms of our own heartbeat and respiration and the more subtle rhythms of metabolic and brain wave activity. We are all inherently musical and can develop this capacity in ourselves and in others. (Campbell, Campbell and Dickinson, 1996)

The early childhood years appear to be crucial to musical growth. There appears to be a critical period of sensitivity to sound and pitch between the ages of four and six. During that time, a rich musical environment can provide the basis for later musical ability. (Campbell, Campbell and Dickinson, 1996).

Gardner (1983) asserts that any normal individual who has had frequent exposure to music can manipulate pitch, rhythm, and timbre to participate with some skill in musical activities, including composing, singing, or playing instruments. Others assert that the foundations for such interests can be laid at an early age. Music in the home and early school environment provides an important basis for these musical experiences which can later be integrated throughout a school's curriculum. (Campbell, Campbell and Dickinson, 1996)

Because of the strong connection between music and the emotions, music in the classroom can help create a positive emotional environment conducive to learning. Music can also be used to heighten the suspense, sadness, tragedy, or joy of stories from great literature and history. Music can be used or created to express humor. (Campbell, Campbell, and Dickinson, 1996) Quiet songs calm and comfort overstimulated children; dancing to silly songs can discharge energy more effectively than reminders to sit still. Teachers can create a climate of joy, understanding and acceptance with songs. Putting the routines of the day into a song can take the edge off the endless pressure of getting groups of children from one place to another with a minimum amount of chaos.

(Handy, 1994) Musical quiet times can reduce the levels of tension, anxiety, and mood swings, and increase concentration and retention. Listening to a solemn or ceremonious piece of instrumental music with strong and simple melody lines can lead children to an inner quiet and relaxation that results in increasing achievement. (Frey, 1980)

Many, if not most children and adults, enjoy rhythm and melody and like to hear music or participate in musical activities. Individuals without any prior exposure often enjoy learning through musical methods or appreciate music in the learning environment as they work on non-verbal tasks. (Campbell, Campbell, and Dickinson, 1996)

Handy (1996) adds to this rationale for teaching music, rhythm, and rhyme to children in the regular classroom. She asserts that each of us possess some degree of musical capabilities, and this musical/rhythmic intelligence is a language-related intelligence that starts with the degree of sensitivity an individual has to the pattern of sounds and the ability to respond emotionally to these sound patterns.

Music serves multisensory learning; only 22% of children learn best through the auditory channel, yet primary teachers give 70% of their information through talking, which leaves a serious gap to be filled. Music helps to fill that gap. (Handy, 1996)

Songs can teach. When music is part of the daily classroom experience, favorite songs become a valuable resource. The words to songs are internalized and stored, later to be retrieved and used as a guide to reading and writing. When oral music is accompanied by a visual presentation, children are able to make a singing-reading connection; words to a song are no longer just words. They represent clues that assist children to unlock print in other contexts. Matching the print to what they hear and see as they sing helps children develop phonemic awareness and they begin to make an association between the sound and symbols; this creates a sense of meaning. (Handy, 1994)

Purposeful movement to music allows students to engage the kinesthetic modality and allows the brain's hemispheres to work together, utilizing and strengthening several intelligences simultaneously. When songs are presented with visual aids and motions, the auditory tasks are supported with visual/spatial and bodily/kinesthetic input. The objective is to accommodate all the learning styles represented in the classroom by providing a multidimensional model. (Handy, 1994)

Music strengthens listening skills. As noted before, listening can be divided into distinct parts requiring different types of processing once the auditory signal is received by the brain. Auditory filtering and auditory focusing, both behaviorally observable behaviors, involve an individual's ability to, in a rather noisy setting, focus on the main message while filtering out the competing incoming messages. Planning music lessons intended to "shape" the auditory task with increasingly difficult levels by making subtle changes in the presentation requires more filtering and thus more focusing. A type of song well suited to this task of auditory filtering and focusing is a round, a short, rhythmic chant or song with different voices entering at intervals. Chaining songs that build on themselves strengthen auditory memory and auditory sequencing. (Handy, 1994)

Singing and rhythm help to enhance the development of auditory discrimination skills, including integration of letter sounds, syllabification, and pronunciation of words. Choral reading is a rhythmic activity that helps children develop fluency and rhythm in reading while providing children with a degree of safety that helps them gain confidence in their skills. Rhythmic chanting in unison of poems, action rhymes and spelling words helps develop auditory sequence abilities. Children can say their spelling word and chant each letter, or chant in syllable patterns, or chant the letters to the beat of a metronome. (Richards, 1993)

Music, particularly singing, is a social activity, and participation strengthens social bonds with other children in the classroom. Music can build a sense of community by participation in theme-based singing assemblies for the entire school. (Handy, 1996) There are many reasons to include music in our schools.

Is it possible to use music to enhance learning? In this paper, I have presented research gathered while attempting to determine if it is possible. I have presented a description of the brain, its hemispheric specializations and its relationship to processing styles. I have noted several points of view related to hemispheric specialization and their implications to using music to enhance learning. I have compared the manner in which hearing and listening affect the auditory processing of language and music. I have described the theory of multiple intelligences and its implications to music's ability to enhance learning. I have presented several programs that have used music to enhance learning, and a rationale for using music and rhythm to enhance learning in the regular classroom.

In closing, this writer would like to offer a personal opinion. I believe that music ought to be a part of every child's life. There appears to be a relationship between musical development and general cognitive development, and music seems to enhance learning in many ways. Research on specialization of the brain's hemispheres indicates to me that frequent and sequential instruction that develops musical/rhythmic intelligence is a worthwhile way for classroom teachers to enhance learning, perhaps leading closer to the goal of meeting each child's individual needs. While the enhancement may or may not be testable in quantifiable ways, music learning and language learning do seem to support each other. Music in the classroom helps to create a positive climate and that climate is conducive to all learning.

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