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Send out your light and your truth! Let them guide me. Psalm 43:3

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A Case Study of the Impact of Musical Pattern Rehearsal on the Acquisition of Oral and Written Language Skills in a Young Child with Learning Differences

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Parents of preschoolers who attend Christian schools need to understand that earlier is not always better. In a culture constantly seeking faster cars and more intense entertainment, parents sometimes attach pride and personal identity to their child's performing a skill before other children do. These parents are impressed with programs that claim to teach paper and pencil activities to children as young as two and three. Parents compare the chronological age of students who learn certain skills rather than considering the developmental maturity that allows students to master those skills.

Literacy includes the development of communication skills as well as thinking skills. In *Learning to Read Naturally*, Jewel and Zintz (1986) stressed the importance of allowing students to mature physically before being required to demonstrate fine-motor control by writing on lined paper, reading small print, and completing work sheets. Drawing on the work of developmental specialists, Jewel and Zintz emphasized that the preschool's emphasis needs to be on communication between a child, his peers, and adult caregivers. Further, they stressed the need for children to enjoy reading, to enjoy books, and to enjoy the process of learning. Ironically, many teachers have interpreted this principle to mean that learning must be all fun and games. Not so. The joy of learning should come from a job well done, a skill mastered, and new skills and abilities recognized by the learner. The emphasis is placed on the deliberate selection of activities and experiences correlated to the student's cognitive maturity, physical maturity, and experiential background. The literate preschool classroom provides a vast array of exploration that develops the concrete memory needed to understand written words and phrases as reading proficiency increases. Character, work habits, and a heightened desire

to learn are more important outcomes of the Christian preschool experience than are sound and word mastery (Carwile, 2005)

Rhythm and rhyme in oral language results from organized sequences of sound that provide avenues for recognition of meaningful units as well as differentiation of similar words and phrases, much like the combination of musical elements creates a specific, memorable melodic phrase. The letter patterns in written language parallel the combinations of notes and rhythmic configurations in a score such that the reader must translate those symbols into meaning units, phrases, and messages. Historically, traditional preschool and primary programs have integrated nursery rhymes, sound songs, and rhythmic patterning to enhance the student's ability to distinguish similar and dissimilar sounds as readiness for translating letter patterns. The instructional elements involving music have even evolved into systems for teaching sound-symbol associations and beginning reading skills. In these programs, the focus is on the relationship between the music and the ability to remember elements of meaning presented in a musical format. Broadcasts for early learning stimulation integrate melody and units of meaning to enhance long-term memory and develop associations between sounds and symbols. Parents and teachers report that many students who have difficulty retaining academic information have little trouble singing commercials, jingles, or theme songs. The connection to the retained thought appears to be the elements of music, especially rhythm.

The relationship between learning disabilities and challenges in learning to read is well documented. Students clinically diagnosed with learning disabilities are often initially identified because they encounter difficulty in mastering beginning reading

skills. Indeed, at one time, initial difficulty in learning to read was identified as dyslexia and then specified as a learning disability. Hinshelwood (1917) identified an affliction described as "word blindness" that was based on an individual's inability to learn to read. He theorized that different areas of the brain were responsible for different sets of skills and that dysfunction in specified areas resulted in the loss of specific cognitive functions. Orton (1925) examined hemispheric imbalance as the causal factor for difficulty in specific neurological functions. His research implied that damage to the left hemisphere interfered with the ability to see and recognize words. Further he theorized that confusion could result from the transmission of impulses between the hemispheres and that confusion could result in delays in motor output. Following a host of other researchers, Werner (1961) began to examine the impact of learning on the brain's structure and to establish a research base supporting the premise that learning could occur in varying areas of both hemispheres. Vygotsky's work in the development of speech and thought (1962/1975) indicated patterns in the connectedness of language and thought as an outcome of interactive speech and laid the groundwork for the conceptualization of learning as a dynamic process requiring social contact, verbal interchange, and active learner involvement. Cruikshank (1989) projected that learning disabilities occurred at all levels of the intellectual spectrum and that basing research about learning disabilities on mentally retarded children was ineffective. This shift in thinking initiated the premise that students with learning disabilities could indeed learn and that learning is a function of the processes through which the learning was approached. With the application of technology to the study of the brain, researchers began to examine the chemical composition of cells, the composition of neurotransmitters, the transmission of

information along neuronal fibers, the magnetic fields accompanying transmission, and the function of blood flow in the electrochemical activity (Duane & Gray, 1991). The patterning and potential for mapping initiated multiple questions about the function and stimulation of each region and area of the brain, the interrelatedness of activity in and between hemispheres, and the potential for the brain to reorganize itself on the basis of experience or in response to injury. In recent years, Garner presented elements descriptive of varying aspects of intelligence (1997). His theory of multiple intelligences is evidenced by the propensity of success in certain sets of behaviors in contrast to challenges with other sets of behaviors. Garner proposes that individuals have one or more neurological areas that function more efficiently and therefore provide superior capacity. He further proposes that compensatory behaviors are to be expected, as weaker or damaged areas force adaptation and assimilation in other areas. In application to the processes of reading, the research base indicates that a learning disabled student can indeed learn to read and that varying areas of brain can integrate functions or compensate for dysfunctional areas.

The relationship between learning and musical instruction is multifaceted. Rauscher and Zupan (2001) explored spatial-temporal processes and spatial recognition. Verifying that spatial-temporal processes are used in tasks that require combining separate elements of an object into a single whole, Rauscher and Zupan provide the foundation for the correlation of the thought process for music and the thought process for reading. Playing a melody involves reconstructing a pattern in which the elements, the notes, are organized in a highly specialized spatial-temporal code. In the same manner, language involves reconstructing oral or graphic patterns in a specified manner that yields

meaning. Rauscher and his team further imply that children exposed to keyboard lessons improved significantly on the two spatial-temporal tasks administered regardless of group instruction and classroom environment. His pre test-post test results indicated that, after four months, students in the group who received keyboard instruction had significantly higher skill in the spatial-temporal tasks than did the group who had no music instruction. In follow-up study, Rauscher found an even greater difference after eight months of structured experiences. It should be noted that efficiency of pictorial memory did not differ and that the evidence supported group instruction as an effective strategy. Although Rauscher addressed the implications of the data to mathematics and did not translate the results for language, the indications that alpha and sound sequences could be equally impacted are apparent.

Peter Oswald's (2002) work with infants and their responses to musical qualities of their mother's voices validates the premise that musical elements are distinguishable in infancy. Rogers (2001) supports preschool as an optimal learning time and indicates that giving young children the chance to experience a variety of musical activities can aid and assist them in learning language skills, independence, and control of their "small world."

Leng and Shaw (1991) provide a neuroscientific framework for the relationship between music and spatial cognition. The researchers propose that certain neural firing patterns organized in a complex spatial-temporal code over large regions of the cortex are exploited by both musical and spatial reasoning tasks. According to this model, music training strengthens these common neural firing patterns.

Proponents of the controversial "Mozart effect" support theories that describe a significant positive relationship between listening to complex musical patterns and

improved neurological functioning. The most passionate of this group propose that long term processing of the complex patterns of classical music indeed raise the intellectual capacity as measured by psychological instruments. The neuropsychological basis for the measurable improvements in spatial-temporal reasoning supports the position that when both the left and right hemispheres are engaged in processing the music, the activity results in an increase in capacity and functioning. This effect is believed to be a causal factor in music participants receiving more academic honors and awards than non-music students, having higher incidences of As and Bs, and performing at higher levels on standardized measures of achievement (*1998 College -bound Seniors National Report*).

Musical training may not just be good for self-development but may actually help train the brain to carry out specific mental tasks essential to subjects such as science and mathematics. Children who received structured musical training were found to have improved their spatial reasoning by an average of 46% as compared to 6 % improvement in children without training (Rauscher, 1994).

Peter Suzuki postulates that music training can help an at-risk child become less at-risk. He reports that children take to music naturally, as is indicated by the musical quality of an infant's first sounds and toddlers who instinctively weave music into their activities. His research supports the prospectus presented by The National Association for Music Education that offers success in society, success in school, success in developing intelligence, and success in life as four basic areas in which music benefits young children. (2003). Suzuki describes the required music programs as key elements in the academic preparation of German and Japanese children. Further, in his testimony to the National Commission on Music Education, Suzuki credits the lack of a comprehensive

fine arts program as a causal factor in the underachievement of American children.

(1991)

Current attention in the field is focused on why some children succeed in academic tasks and others with similar abilities do not, how children with clinical disabilities succeed despite those disabilities, and what early childhood programs must do to enhance the success of all children. To move forward without leaving any group of children or any individual child without the skills necessary for literacy, for self-reliance, and for productive citizenship requires careful study to determine what experiences appear to be most beneficial to children who have succeeded despite the odds. The task becomes one of identifying and describing experiences that promote productive learning in diverse populations and especially in those populations who are challenged by neurological disabilities. This study offers repetitive, rhythmic rehearsals as one of those experiences and opens questions for future research and exploration.

Subject

The subject was a Caucasian male from a middle-class household in which both parents hold graduate degrees. He was selected for study based on his academic success despite his learning disability. The fourth and youngest sibling, the subject's birth was not remarkable. The incidences of childhood disease were within normal ranges with no signs of allergies or chronic infection. Developmental benchmarks were within normal ranges with systematic signs of advanced verbal capacity. Generative language proceeded rapidly from simple sentence to complex passages. The home environment was language enhanced with multiple sources of conversation, attention to daily experiences with literature and printed text, and play areas that promoted social setting role play.

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The subject and his family systematically attended classical recitals and concerts. The subject consistently verbalized a fondness for the cello and distinguished between sounds and patterns in varying types of music and instrumentation. At age three the subject began formal music instruction using the Suzuki technique. At the same time, he began attending a preschool program in a language rich environment sensitive to the developmental needs of children.

Evidences of exceptionality presented at age four. Fine motor skills such as cutting, directional line tracing and catching were significantly less mature than verbalizations and problem solving. Independently, right-handed and left-handed musical patterns were fluid. However, hands-together patterns, both simultaneous and harmonic, were extremely labored, arrhythmic, and disjointed. Classroom teachers described the subject's gross motor skills such as catching, skipping, hopping, and directionality as immature. Observations indicated that the subject demonstrated mixed dominance in hemispheric functions and no determinable visual dominance. Screening level assessment in a University-based tutorial activity indicated that the subject demonstrated verbal skills four or more years above that of his peers with few or no measurable reading and math skills.

In the primary years, the subject experienced a variety of successes and challenges in a private school setting. In first and second grades, developmental reading progress and spelling skills were rated by teachers as good. Teachers rated English skills and mathematics skills as superior. Penmanship was rated in the low range of satisfactory with commentary about neatness, alignment, and spacing by three of the four teachers. Transition to cursive writing was ineffective with combined letter structure maintained

through out the elementary grades. Verbal skills consistently presented as superior to nonverbal skills. Parallel screening in the tutorial process continued to indicate verbal skills significantly above age level with reading development at an average to below average level. Skills in mathematics appeared slightly stronger than reading skills.

At age seven, the subject continued to struggle to play piano selections with hands together. During a practice session, his mother observed unusual posturing as he worked to play a basic piece. Sitting at the piano, the subject turned his head and shoulders to the left, away from the keyboard, and looked at his fingers out of the right upper corner of his eyes. In this position he successfully played the piece. The posture was repeatedly implemented when attempting to play hands-together pieces. The struggle with piano became more and more difficult as those in his musical peer group achieved significantly more complex pieces than the subject. Musical recitals were eliminated during the second grade year and lessons ended at the end of that same year.

In the spring of the third grade year, the subject completed formal psychological assessment to verify or invalidate the suspected learning disability. Results indicated a twenty-point discrepancy between verbal and nonverbal skills with consistent evidence of verbal strength in the above average range of functioning (120 - 129) and nonverbal skills in the average level of functioning (100 - 107). Subtest performance was erratic with the most significant weakness in the pencil and paper skills.

During the intermediate grades, the subject participated in a therapy process designed by Kathleen Hopkins and supported by the National Institute for Learning Disabilities which included rhythmic writing, listening exercises, systematic sound-symbol association drill, transcribing drill, proofreading, translation skills (buzzer), and

mental math. (1996). Elements of this therapy focused on rhythm and patterns similar to those implemented in the piano lessons.

Structure of the Study

The qualitative case study is presented retrospectively with data supplied by school records and parental interview. The subject was not formally classified as learning disabled until third grade and deliberate interventive procedures were not implemented until after formal diagnosis. The purpose of the study is to pose research questions and therefore to stimulate additional research on the direct relationship between repetitive, rhythmic rehearsals and reading skills development.

Therapeutic Experience

The Suzuki method of piano instruction initially involved memorization of rhythmic patterns for right hand and left hand independently. Weekly individual lessons were supported by interactive practice by the subject and at least one parent. Practice sessions were completed four to five days of each week for approximately thirty minutes. Drills with repetitive rhythm patterns composed the opening of each lesson and practice session. The process of rehearsal involved single handed repetitions of each of four patterns:

Pattern A - "Mississippi Hot Dog" patterns of four eighth notes followed by two quarter notes.

Pattern B - "Run Pony, Jump Pony" patterns with one quarter note followed by two eighth notes.

Pattern C - "Mississippi, Mississippi" patterns with sequential eighth notes

Pattern D - "Twinkle" patterns with quarter notes and half notes performed with a rolling finger motion (Suzuki, 1995).

The patterns were repeated for each hand a minimum of once per session. Rehearsal and memorization of left hand and right hand elements of simple melodies followed the drill. The melodic elements could then be repeated in previously mastered selections and selections to be learned. Attention was given to the details of finger position, attentive behaviors, and systematic movements to produce a specific tonal quality. The technique focused positive reinforcement for productively produced movements and tones. The process was repeated for a period of five years coinciding with three-, four- and five-year old kindergarten experiences, first grade, and second grade. The patterns were repeated almost daily during the period in which reading skills were mastered.

Subsequent experiences included the therapeutic regime proposed by the National Institute for Learning Disabilities. Element one of the therapy, rhythmic writing, was most similar to the repetition of musical patterns. The technique requires the tracing of a horizontal figure eight, a vertical figure eight, and a combination of the two. As the subject traced the figures, he described the direction in which his hand was moving. During the process, the therapist would command the subject to "change." His response was to reverse direction and describe the event. The figures traced were large enough to force the subject to cross the midline of his body and stimulate hemispheric transfer. In addition, the therapist presented an oral computation problem for the subject to solve as he traced. Element 2 of the therapy process, "bluebook," included the memorization of sets of symbols and sound associations. Presented without visual context, the subject was required to memorize the elements of the book and to recall those elements on

command. The therapy required the subject to develop a strategy for visualizing the page and for reproducing it orally. Element 3 of the process, "buzzer" was based on Morse code. The subject looked at a Morse code card while the therapist buzzed a signal that represented the letters of a specific word. The subject was required to analyze the pattern of sound to determine the word buzzed. Element 4, dictation and copy, required the subject to listen and to translate sentence and paragraph dictation and record what he heard. The subject then copied specific text and proofread his translation. Element 5, mental math, required the subject to solve contextual problems and to compute developmentally appropriate problems without written stimuli. Ninety-minute therapy sessions were completed twice each week during the traditional school year with rhythmic writing practiced six days each week under parental supervision.

Academic Developmental Profile

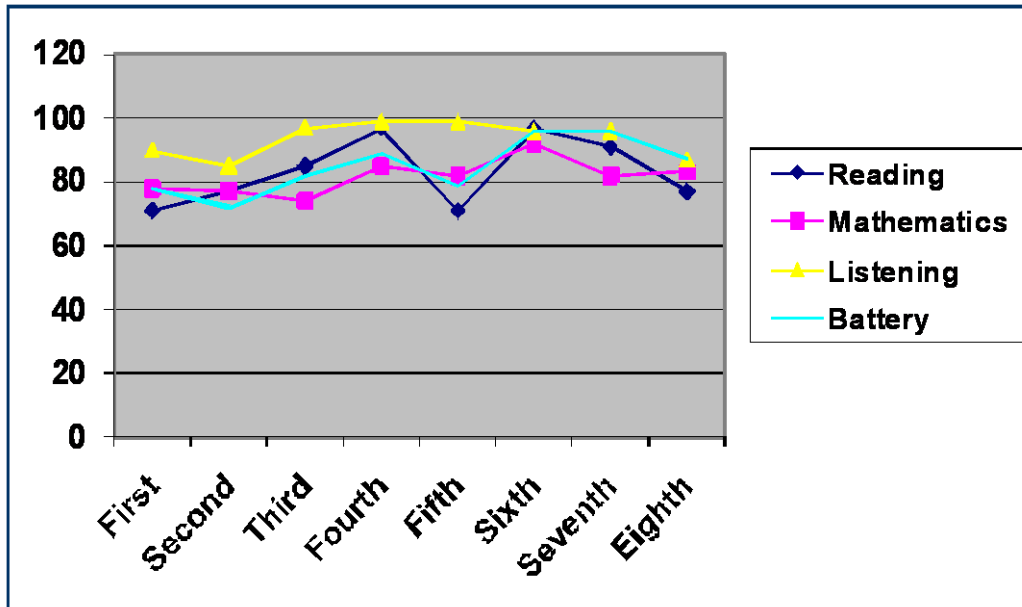
The subject's academic development, as indicated by annual achievement testing, is described in Table 1 in terms of national percentile rank and grade equivalents. Although achievement tests are not the best indicator of student performance, the instrument does offer a comparative element that is consistent from test session to test session. No accommodations were afforded the subject during the testing sessions and the results are believed to be indicative of his developmental patterns. The results are interpreted in terms of relative strengths and weaknesses rather than in comparison to peer groups or norming populations. Figure 1 indicates the relative strengths of reading, mathematics, listening and the total battery of the Stanford Achievement Test over the first eight years of school.

Table 1: Profile of Academic Development as Indicated by Annual Achievement**Testing**

	First Grade	Second Grade	Third Grade	Fourth Grade	Fifth Grade	Sixth Grade	Seventh Grade	Eighth Grade
Word Recognition /Vocabulary	71 2.3	74.6 3.8	83 6.2	94 PHS**	97 PHS* *	98 PHS* *	91 PHS**	84 PHS* *
Reading Comprehension	76 2.4	82 4.3	85 7.3	96 PHS**	53 6.2	94 PHS* *	84 PHS**	70 PHS* *
Total Reading	71 2.3	77 3.9	85 6.9	97 PHS**	71 7.4	97 PHS* *	91 PHS**	77 PHS* *
Mathematics Computation	69 2.3	56 3.0	76 4.5	77 6.6	83 10.0	99 PHS* *	91 PHS*	78 PHS*
Mathematics Application	71 2.4	87 5.0	70 6.1	87 9.7	78 8.8	92 10.6	74 PHS*	83 PHS*
Total Mathematics	78 2.5	77 3.9	74 4.8	85 7.6	82 8.9	92 PHS*	82 PHS*	83 PHS*
Language	57 2.1	87 4.8	83 6.9	92 PHS*	63 7.3	67 8.4	79 11.8	70 11.8
Spelling	57 1.9	29 2.4	59 4.2	79 7.2	35 4.9	46 6.4	26 6.0	24 7.1
Environment	73 2.7	72 3.7						
Social Science			93 8.6	77 7.0	87 9.9	89 PHS*	90 PHS*	95 PHS*
Science			66 4.7	85 9.0	77 8.7	83 10.8	70 PHS*	75 PHS*
Thinking Skills			87 7.1	92 9.8	72 7.8	88 PHS*	88 PHS*	78 PHS*
Listening	90 3.7	85 4.7	97 11.8	99 PHS*	99 PHS*	96 PHS*	96 PHS*	87 PHS*
Complete Battery	78 2.4	72 3.8	82 6.2	89 8.9	79 8.8	85 PHS*	85 PHS*	75 PHS*

* PHS – represents “post high school” according to the SAT scoring criteria.

Figure 1: Relative Strengths in Reading, Mathematics, Listening as Compared to the Total Battery



The patterns are relatively consistent with listening presenting as stronger than that Mathematics and Reading. Reading has the greatest pattern of deviance, peaking at the end of the fourth grade, following the first year of NILD Therapy and then dropping, although not significantly so, following the second year of therapy in fifth grade. The pattern, however, resumes with the sixth-grade assessment, with no notable difference in the areas of performance. Most significantly, the patterns indicate above average performance in each area tested from first to eighth grade.

Limitations:

The case study, completed following the diagnosis of the learning disability, is evidenced using a data form consistent over time but without controlled data collection. There is no assumption that the achievement test data is the most reliable measure of skill mastery. The limitations of the study include the lack of control over extraneous influences on the subject's academic progress. Additionally, the reflective data is less accurate than programmatic data. Because the data was formulated retrospectively, no conclusions can be drawn about the specific cause and effect relationships between the student's performance and the repetitive rehearsal of the patterns, however, the purpose of the study is to present questions that should be addressed by further study.

Observations:

The data indicates a developmental profile that is average to above average with spelling as the area of lowest demonstrated achievement. The data is not indicative of the typical profile of a learning disabled student, having only minor deviations of performance which could be attributed to a testing anomaly. The subject's developmental scores in the primary grades are similar in profile to those in the intermediate grades with a steady gain in proficiency. The expectation of the NILD therapy is that the subject would increase skill in academic areas as a result of the intervention (Hopkins, 1996). Therefore the increase in proficiency in the intermediate grades could be attributed to that intervention. The purpose of the case study, however, is a focus on the impact of the repetitive pattern rehearsal on the developmental reading skills in the preprimary and primary years. With the typical learning disabled profile, there is often a failure to learn to read or to master initial computational skills. More often, there is a substantial difference in the proficiency of the two areas. The subject's

primary level profile indicates very similar developmental progress with all areas except spelling, falling above the fiftieth percentile. The largest discrepancy is between the areas of listening and spelling. One might expect a subject with the vast discrepancy in verbal and performance skills to be unsuccessful in learning basic academic skills. The fact that the subject did indeed learn to read, to compute, and to understand environmental elements is indicative of a therapeutic effect similar to that experienced with formal therapy. During this developmental period, the rehearsal of musical patterns was the only experience described as systematic and potentially therapeutic.

Conclusions:

Conclusions drawn from this study are formulated as elements for exploration and study. The proposed impact of the repetitive rehearsal on the reading development is congruent with the findings in the literature although not statistically proven in this study. The resulting recommendation is a specific study to determine the impact of systematic musical pattern rehearsal by students with diagnosed learning disabilities as a therapeutic intervention strategy. Additional investigative study should be conducted to identify individuals within the population of students who began patterned music rehearsal at the preschool level and proceeded to demonstrate average to above average academic achievement despite diagnosed disability, to identify patterns of academic achievement in students with average abilities who systematically rehearse musical patterns, and to identify attributes of musical development in students who systematically rehearse musical patterns that are predictive of discrepancy in abilities and indicate potential learning dysfunction. The application of group participation in systematic rehearsal of musical patterns in the preschool setting should be explored as a

core component of the required curriculum for preschool programs. Variations on the study should include the implementation of keyboards, Orff instrumentation, and non-tonal instrumentation to determine the impact of the rhythmic patterns as compared to the tonal, melodic patterns.

A single case study does not provide direct proof of the impact of systematic rehearsal of musical patterns on the acquisition of oral and written language; however, it does provide evidence of a student who has achieved success in these skills and who participated in such rehearsal. The case lays a foundation for structured study to validate the hypothesis that the process enhances learning to the extent that musical patterning should become an integral part of every child's preschool experience.

Although the definitive research base prescribing exactly what should be taught at each level of the Christian preschool experience is somewhat limited, there is strong agreement concerning the negative long-term outcomes of insisting that children demonstrate skill before they are physically or cognitively ready. Children who are pushed to perform tasks for which they are not ready often develop emotional and physical barriers to learning. Lack of success leads to a weaker self-image and may result in a reduction of effort and motivation to engage in new learning. Physical challenges including eyestrain and hampered muscle growth may result from trying to read small print and attempting to write small letters on lined paper before the eye and hand muscles have matured. Children soon resist engaging in activities that are uncomfortable, and they mentally miss much-needed reading and language instruction. Most importantly, these children lose the desire to read and to learn. As they grow older, they do not read for

pleasure during leisure time, do not engage in spontaneous conversation, and do not voluntarily approach new learning opportunities (Carwile, 2005).

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