An Investigation into the Nonmusical Effects of Rhythm in Elementary Students with Reading Disabilities

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Introduction

A wealth of research in the last decade indicates a relationship between the study of music and academic success and there is evidence to suggest that music experiences have significant benefits for students with reading disabilities. A study was undertaken to investigate these potential benefits of music experiences for children who struggle with reading. The study was designed as part of Ph.D. in Inclusive Special Education Course 129.765 field experience requirements, with hopes that this preliminary study would launch future efforts to complement and extend prior research into the effects of music experience on the learning and life skills of children with reading disabilities.

The first criteria to be considered before beginning this study included a determination of potential need for reading interventions alternative to conventional approaches used in Canadian schools, the importance of research investigating alternative approaches to reading, and the possible usefulness of music experiences to children with reading disabilities. A starting point for examining these criteria was a 2004 report on an international survey of reading for fifteen year-olds, representative of cumulative reading and literacy skills acquired through ongoing schooling to the point of testing (Willms, 2004). Canada participated in the Programme for International Student Assessment (PISA) in the spring of 2000. PISA 2000 focused on reading and included surveys of science and mathematics skills. The surveys were administered to fifteen-year-olds in every province in Canada and were used to provide comparisons among participating member countries of The Organization for Economic Cooperation and Development (OECD). The good news for Canada is that “Fifteen-year-old students in Canada fared exceptionally well on this assessment compared with students in other OECD countries” (Willms, 2004, p. 6), ranking second in reading out of 27 participating OECD countries. The bad news for literacy among
Canadian youth is the disproportionate number of Canadian youth scoring at the low end of the literacy scales in some international testing (Willms, 2004). Although Canada is a leader in reading literacy, there is a large performance gap between low and high socio-economic status (SES) backgrounds, a large performance gap in reading between students born outside of Canada and those born in the country, and between males and females. The difference between males and females in reading performance was almost 30 points translating to nearly one full year of schooling (Willms, 2004).

Willms (2004) notes that the Canadian report on PISA found “significant variation among the ten Canadian provinces in their literacy skills” (p. 7). While Canada as a whole ranked in the top group of OECD countries, not all provinces did so, and this provincial variation is consistent with findings of earlier Canadian studies (Willms, 2004). Although reading tests scores for Manitoba were only slightly below the Canadian average, several key findings are of particular interest to educators in Manitoba.

Manitoba’s school profile shows that there is considerable variation among schools in their socioeconomic intake. Most of the schools serving students in the middle of the SES range performed quite well, [in reading tests] although there is considerable variation. Manitoba also has a number of schools that have very low SES intakes, and these schools did not score well compared with other schools with comparable intake. (Willms, 2004, p. 31).

The performance gap in reading between students born outside of Canada and those born in the country is particularly large in Manitoba. This gap will conceivably widen; in 2000 the Manitoba government announced a plan to double immigration to 10,000 people annually (Chisholm, 2004). Manitoba’s immigrant population has risen 60% since 1998, mainly from the Asia-Pacific
Similar findings indicate a significant student population is not being served well in our schools. In a 2003-2004 profile of student learning and performance in Manitoba (Manitoba Education, Citizenship and Youth, 2005) 35% of all Grade Three students were not meeting expectations for oral reading skills, and 39% were not meeting expectations for reading comprehension. These combined statistics suggest that Canadian and Manitoba schools are not adequately meeting the needs of all children. There seems to be a significant population who struggle with reading and for whom alternative approaches in teaching reading might be appropriate. Therefore, there is a need for reading interventions as alternatives to conventional approaches used in Canadian and Manitoba schools, and research investigating alternative approaches to reading is potentially important. The next criteria to be examined are the possible usefulness of music experiences to children with reading disabilities.

Related educational, musical, and neuroscientific theory and research indicate the exciting potential for the arts to engage learning across curricular areas for all students, regardless of ability or disability.

The past several decades have been tremendously exciting in the fields of cognitive psychology, human development, special education, second language learning, brain-based learning, and reading. A common area of research from these domains is the arts and their contributions to human learning. (Gangi, 2004, p. 13).

The power and potential of the arts to facilitate and engage learners in the development of reading skills is unfulfilled in most elementary schools across Canada despite many efforts by Canada’s leading educators and support from the large and growing body of literature that
indicates a positive connection between academic learning and experiences in the visual arts, drama, art, dance, and particularly music. Eisner is a name that is recognized throughout the world as a strong and highly regarded advocate for arts at the center of school curricula. In various books, Eisner makes a persuasive case for the complex cognitive development that is unique to learning in the arts and the ways in which the child’s sensory system is engaged through experiences in the arts (Eisner, 2002). Eisner presents convincing observational and theoretical evidence “for the importance of arts education and the need for it to move from the periphery to the center of curriculum. He maintains that the arts have specific and unique contributions to make to cognitive development. Eisner’s case is compelling” (Harris, 2003, p. 1).

“More than ever before, research studies and theoretical contributions provide a comprehensive view of why the arts are an integral component of education for all learners, especially children” (Edwards, 2002, p. vii). This comprehensive view of the importance of the arts for children’s learning includes claims for positive effects for student engagement, attitude, enthusiasm, joy for learning, student motivation, self-concept and self-esteem, improved cognition and higher order thinking skills, listening skills, spatial reasoning, socialization, facilitation of second language learning, creativity, and imagination.

Morin (2004) reviews three prominent and often-quoted reviews of research examining the relationship between arts experiences and academic achievement, and totaling over 250 major studies. Morin concludes that this body of research “produced interesting results though with varied quality. The evidence indicates that well-crafted, arts-rich learning experiences are linked to positive academic effects across a range of areas” (Morin, 2004, p. 2). Eisner similarly notes the varied quality of research in this field and addresses the research aimed at proving not merely
links to positive academic effects, but actual transfer of learning effects from arts experiences to other subject areas. Eisner states that a careful review of the literature demonstrates “that really good studies of such transfer are scarce, and that where they exist, in general they do not provide convincing evidence (as yet?) that transfer occurs” (Eisner, 2002, p. 219). Winner (2000) adds another voice of caution regarding the lack of evidence to support causal links between arts and academic achievement. Causal evidence for a transfer of learning effects from arts experiences to other domains may be scarce or nonexistent, but there is mounting evidence for the positive relationship between learning through the arts, including the first national Canadian arts education research project, the largest study of its kind to date in Canada.

This well-designed three-year study, with a sample size of over 6000 students, examined effects on student achievement and attitude of an arts education program called Learning Through the Arts™ (LTTA™). Upitis and Smithrim (2003) report “that involvement in the arts contributed to engagement in learning” (p.2), and they note statistically significant modest positive effect for tests of computation and estimation. “Nearly all parents (90%)—regardless of school type—reported that the arts motivated their children to learn…By the end of the three-year period, there were significantly more LTTA teachers, as compared to teachers in other types of schools, who believed that the arts were an effective way to teach language, science, and math” (Upitis & Smithrim, 2003, p. 2). The growing body of research connecting the arts and achievement and engagement in learning has inspired curriculum reform throughout the world. “During the last decade North American schools, from Regina to Los Angeles, have been devising new curriculum using the arts as content centers and teaching tools” (Cornett & Smithrim, 2001, p. 2). Music experiences play an important part in these new curricula and are
well-represented in the sizeable body of research on the relationship between arts experiences and academic achievement.

“Over the past decade there has been an explosion in research activities on music perception and performance, and their correlates in the human brain” (Peretz, & Zatorre, 2003, p. v). Schön, Magne, and Besson (2004) note the neuroscientific research that highlights strong similarities between language and music processing and state that language and music processes have elicited similar positive variations in brain electrical activity in experiments reproduced over time. The evidence that music and speech share cortical areas and mechanisms (Patel & Peretz, 1997) suggests that “music and speech might be closely related in early development” (Anvari, Trainor, Woodside, & Levy, 2002, p. 112). Other findings (Koelsch, Gunter, et al., 2002; Wallin et al., 2000; Platel et al., 1997) support the hypothesis for a common origin of music and language in the human brain which has implications for the importance of music to language acquisition. Children process syntax in music before they process syntax in language and “musical elements pave the way to linguistic capacities earlier than phonetic elements” (Koelsch, Grossman et al., 2003, p. 689). The evidence from neuroscience observing the electrical correlates of music-syntactic processing as occurring earlier than syntactic language processing supports the belief that “musical elements of speech play a crucial role for the acquisition of language (Trehub et al., 2000; Papousek, 1996; Jusczyk et al., 1992; Jusczyk & Krumhansl, 1993; Trainor & Trehub, 1992)” (Koelsch, Grossman et al., 2003).

The neurological research is born out in over three decades of educational research investigating the connections between music and language. Research is beginning to confirm the strength of those relationships and the links between music and rhythm and reading skills in a variety of ways (Hansen, Bernstorff, & Stuber, 2004, p. viii). Sloboda (1985) observes that
although music and language vary across cultures, they share significant cognitive characteristics. “Both evolve over time and involve a meaningful use of sound patterns. Throughout the world people use sound patterns to create words, motives, scales, ragas, and drones” (Aiello, 1994, p. 42). Aiello notes that in the African culture, drums are used both as musical instruments and as speech surrogates, and the instruments “reproduce the intonation of the words and the rhythms of spoken texts” (p. 43). Language and music are equally important communicators in the African culture. Sloboda (1985) adds that music and language also share similar perceptive, auditory, and cognitive brain mechanisms. Whatever relationships proposed for language and music, “the amazing point, however, is that the definition given for music will often apply to language as well, and vice versa. This is striking when we consider the comparison between language and music from both a structural and a functional perspective” (Besson & Schön, 2003, p. 271).

Research by Lamb and Gregory (1993) suggests that some auditory processing skills used in language such as segmenting and blending sounds, are similar to the rhythmic and melodic skills necessary for music perception. Lamb and Gregory (1993) found a positive relationship between reading ability and musical sound discrimination and propose that musical sound discrimination is essential to children’s phonemic awareness. Armstrong (2003) cites studies that link important aural skills developed in music study to the ability to read words (Bryant, MacLean, Bradley, and Crossland, 1990; Shaywitz et al., 1998).

Douglas and Willats (1994) also find a positive relationship between musical ability and literacy skills and discover an association between rhythmic ability and reading. Their study shows a significant correlation between rhythm and reading indicating that the ability to process rhythmic aspects of music may help stimulate a similar response to language. “Researchers from the University College in London (Goswami, et al., 2002) found that children who read very well
for their age had a strong ability to spot rhythms and beats. Researchers concluded that an awareness of beat and rhythm could influence the way children process speech patterns” (Tankersley, 2003, p. 27).

Recent research by Overy (2000; 2003a; 2003b) and Wolff (2002) establishes links between music timing skills and the development of language and literacy skills for children with reading disabilities. Wolff investigates the relationship between timing precision and rhythm in developmental dyslexia in a series of studies. Findings (Wolff, 2002) indicate that children with dyslexia have timing difficulties keeping a beat under varying circumstances as well as difficulties representing simple motor rhythms by finger tapping and speech patterns. Overy examines the relationship between dyslexia and music (Overy 2000; 2003a; 2003b) and links aspects of phonological awareness, auditory perception, and rapid temporal processing, with timing difficulties in the domain of language, suggesting that music might provide a valuable support tool for children with dyslexia. In a study measuring musical timing skills related to dyslexia, Overy hypothesizes “that music training may be able to remediate such timing difficulties, and have a positive effect on fundamental perceptual skills that are important in the development of language and literacy skills (Overy 2000, cited in 2003b, p. 18). Overy notes, “Perhaps surprisingly, there have been few suggestions for the remediation of such timing deficits, outside of the domain of speech” (Overy, 2003b, p. 19).

Overy (2003) and Wolff (2000) hypothesize that timing difficulties in language and music are a key factor for children who struggle with reading. Their research suggests that music may provide an important remediation tool for children with reading disabilities. This cumulative body of research supports the possible usefulness of music experiences to children with reading
disabilities, the final criteria to be considered before embarking upon the investigation of the
“Nonmusical Effects of Rhythm in Elementary Students with Reading Disabilities”.

Method

Permission to carry out this study using both qualitative and quantitative methods was
granted by the Education and Nursing Research and Ethics Board of the University of Manitoba.
A variety of sites were explored prior to application for Ethics Approval and cooperating teachers
and sites were determined as possibilities for carrying out this study. A Developmental
Education Learning Assisted Center (DE/LAC) program was chosen for the study site as a
sample of convenience because of the willing support from the classroom teacher and because
this program met all the requirements outlined in the Ethics application.

The DE/LAC program is defined as a Special Education Behavior Support Program that
is part of a large city school division. It is a well established program and has been running out
of its present location for eighteen years. The present classroom teacher has been heading this
program for nine years. The DE/LAC facilitates students between the ages of eight and thirteen,
residing within the school division, but acceptance into the program is by referral and dependent
upon numbers. Referral is based on severe to profound behavior issues as well as academic
delay. The classroom is self-contained, not graded, and does not integrate with the rest of the
school. The students in this classroom follow modified curricular plans in the form of
Individualized Education Plans. They do not receive either phys-ed specialist time or music
specialist time and none of the students had previous music experiences at school. Only one
student had any prior music experience outside of the school. This student had at one time taken
piano lessons for a short period. Six children including males and females ranging in age from 8
to 12 years from the DE/LAC program were selected as participants. The student participants
were identified and tested as reading at least two or more grades below level, using the Brigance Diagnostic Comprehensive Inventory of Basic Skills to measure oral reading, sight words, and comprehension, administered by the classroom teacher. This inventory was used as the baseline data for the study. Baseline data on rhythmic competency was obtained using researcher-designed tests of beat awareness and beat competency. These tests were used as the pretest of a one-group pretest-posttest design. Qualitative measures included observational field notes recorded during the field experiences, and interview data with the classroom teacher, coded and analyzed for themes and patterns.

A music intervention for reading skills was developed using elements of beat and rhythm to enhance language materials found in the classroom. Language materials were drawn from the Fry list of the First Hundred most common words and the hundred most common words found in classroom materials and from books in current use in the classroom. The researcher analyzed curricular and classroom materials provided by the teacher to design instruction in beat and rhythm experiences meaningful and related to classroom learning or materials. Music and language learning experiences were scaffolded to be developmentally appropriate for both language and music learning and to target and gain meaning in both music and language as suggested by Wright (2003). Merely deciding to keep a beat to a song about dancing pumpkins at Halloween might be an entertaining music experience, but would not necessarily provide meaningful connections to the language of the classroom, the goal of the rhythmic intervention.

Direct rhythmic intervention instruction was approximately 20 hours over six months for each student and approximately twice a week for 30-45 minutes usually between 1:00 and 2:00 in the afternoons. Intervention happened with whatever classroom groupings were most convenient
on the day of the visit. Classroom groupings varied according to student needs, behaviors, and attendance, and ranged from one on one instruction to whole class instruction.

Rhythmic instruction was designed to be sequential and related to the provincial curriculum document for Grade One and Two music. The sequence for the development of beat awareness and beat competency was drawn from respected sources in the field of music education including Goodkin (2004) and Frazee (1987). Beat awareness and beat competency were facilitated through beat keeping skills in which the student first matched and then performed the beat through tapping, patting, clapping, playing instruments, moving to the beat, drawing the beat, and responding to the beat and subdivisions of the beat through the stimulus of words, song, or instruments either live or recorded. Beat and rhythm skills were designed to facilitate the students’ ability to distinguish between the steady beat and the beat subdivisions of text, song, or instrumental selections live or recorded.

Speech pieces and songs were initially constructed from words with one sound per beat. When students seemed secure using words with one sound per beat, experiences were constructed using pieces that incorporated one and two sounds or silences per beat. These sounds were first explored using speech, song, and nonlocomotor activities, progressing to locomotor activities moving to the sounds of the words, playing the sounds of the words on a variety of instruments, and finally visually representing them with musical symbols. By the end of the intervention, students were able to apply learning in beat, rhythm and language to the creation of student compositions using words, music symbols and musical instruments of the children’s choice. At the conclusion of the intervention, the same tests used for pretests were administered as posttests by the classroom teacher and researcher.
Results

Results of the Brigance Diagnostic testing indicate that at pretesting all children were two grades or more below level ranging from below pre-primer to lower third grade. All students with one exception showed improvement in the Brigance tests after posttests. Results of the beat and rhythm testing indicate that none of the children were able to demonstrate consistent beat competency during pretests, but at the time of posttests, all children with one exception were able to demonstrate beat competency. The student who did not show improvement in reading tests was the same student who did not show improvement in tests of beat competency.

Data from field notes and one interview was examined according to procedures for data analysis and interpretation suggested by Bogdan and Biklen (2003). Seven themes were identified.

Theme one: Student enjoyment of music experiences.

This was the strongest theme to emerge from study data. The classroom teacher often remarked how much the children enjoyed their music experiences. The teacher said that the children asked every day if it was a “music day.” One student walked into class first thing in the morning and said, “I dreamed about that song.” The students seemed to look forward to music activities and participated fully with the exception of one child. There were smiles and laughter and faces lit up with enjoyment during music activities. Music experiences seemed to promote positive behaviors as the children did not want to risk jeopardizing their fun.

Theme two: Nonmusical outcomes of musical experiences.

The music experiences seemed to motivate and engage most students. The children viewed these experiences as enjoyable. Reading certain words or sentences that seemed hard from a book seemed much easier when set to a chant or song. On one occasion a student was
looking at a book previously used for a music activity. After looking at it for a bit, he slammed
the book down on the table. The researcher said to him, “You can read that book—it’s the same
words we were using in your Arctic piece [one of the music experiences].” The boy answered,
“But we were just playing then. That was fun. This is reading. *** this stuff.” By the end of the
music intervention, every child except one was able to use musical symbols to represent sounds
of one and two syllable words, although not all could represent those sounds in alphabetic
representation.

Music activities seemed to bring most children a sense of pride, accomplishment and
confidence. Although there were occasions when the music activity created conflict as a result of
having to share or take turns, it also facilitated cooperative learning and working together on
many occasions. Students were able to pass a ball, pie, or stone around the circle when part of a
music activity. One child who had few academic successes was so proud of being able to write
music like the group Fifty Cents, and a caregiver reported that another boy filled the walls of his
room with the music compositions he wrote.

Theme three: The power of the beat.

It was astonishing how quickly the children became attached to the beat; it seemed to
serve as an anchor for most children. Students became very secure with the beat and it wasn’t
long before they would automatically keep the beat to a chant or song by patting it on their
bodies, without ever being instructed to do so.

Theme four: Adult support in the classroom.

The music experiences could not have been successful without the support from the
teachers in the classroom. Right from the beginning, the classroom teacher announced the
researcher/music instructor as something special, as a “treat” for them. Even if the researcher’s
arrival was interrupting other activities, the classroom teacher would always be welcoming and tell the children excitedly that it was music time. The classroom teacher’s positive, supportive and encouraging attitude was the model for the rest of the adults in the room. The educational assistants would often play the games right along with the children, and always tried to facilitate success for the students in their music activities. One of the education assistants helped to make and photocopy visuals for music times.

Theme five: Teacher perception of the importance of music experiences to students with reading disabilities.

When the classroom teacher was asked in the final interview if the beat and rhythm experiences were important and valuable, the teacher answered, “Oh, absolutely!—it’s amazing what it can do!” The classroom teacher thought the music experiences were essential to the children and asked that we continue after the study ended.

Theme six: Rhythm and language experiences support individual needs, abilities, and interests of students with learning disabilities.

Students were provided with opportunities to become involved in their own learning. A variety of instructional and learning strategies were used to support different needs, backgrounds, and abilities of students. Groupings were flexible, as were instructional plans and materials, and modifications were made to support learning. Students chose instruments that were appealing to them and participated in the rhythm activities according to their ability. There was no right or wrong way to participate in the rhythm activities. This was a multi-age classroom but it was quite possible to design music activities that were appropriate for a variety of ages and levels. Certain children preferred particular instruments or activities and seemed to enjoy the opportunity
to choose. Lessons evolved to meet the needs of students while facilitating outcomes of beat and rhythmic instruction related to language and curricular materials.

Theme seven: Musical outcomes of the rhythm experiences.

All students except one achieved beat competency and rhythmic awareness. Most students progressed from no or few prior music experiences to meeting all curricular requirements for rhythm as outlined in the provincial curricular documents for Grade 2. It was exciting to observe the children progress from little or no music experience and hesitant and uncertain participation, to being able to compose and improvise using a variety of rhythms with confidence and pleasure.

It was interesting that most students were able to cover two years of a music curriculum in a six month period but had difficulties moving forward in other curricular areas.

Discussion

Although the reading and rhythm posttests showed improvement for all students with one exception, the lack of control group, or controls for the numerous possibilities for bias or validity concerns, make it impossible to determine if the music intervention played any part in improving reading abilities. Other concerns for validity include improvement in reading as a result of student engagement rather than beat and rhythm effects, teacher effects due to personality, ability, or pre-existing attitude, normal maturity, novelty effects and Hawthorne effect.

Despite the many concerns for validity, the themes that emerged from field notes and interview data indicate that the rhythm experiences explored in this study’s intervention were important and useful. Perhaps most meaningfully for the majority of children, music experiences were enjoyable and provided a positive means of communicating and connecting with adults and children, and children with children, as well as providing means of connections to learning in other curricular areas. Music experiences seemed to make learning relevant, meaningful, and
were able to be integrated throughout subject areas. Both musical and nonmusical outcomes were observed as well as a greater sense of fluency in the children’s reading and oral expression through the media of music. The classroom teacher also noted this improved fluency during music times. A poem said to instruments and with a fun game seemed much easier to say or to read than one on the pages of a book.

The qualitative data together with the quantitative data supports efforts for further research to explore the relationship between rhythm and language experiences for children with reading disabilities. The investigation of the relationship between experiences in music and learning for children who struggle with reading is an important, exciting, and promising one, with implications for children with reading fluency deficits, auditory temporal processing deficits, behavior and cognitive disabilities and for children and teachers involved in second language learning.
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