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Effects of a music programme on kindergartners' phonological awareness skills¹

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Abstract

This research examines the effect of a music training programme on the development of phonological awareness among 104 Franco-Canadian kindergarten children. The experimental group ($N = 51$) participated in an adapted version of the Standley and Hughes music training programme, while the control group ($N = 53$) took part in the Ministère de l'Éducation du Québec music programme. The analysis of our data shows that both music programmes contributed similarly to the development of tonal and rhythmic perceptible skills. However, the experimental music training programme proved to be more effective when it came to developing phonological awareness skills. In conclusion, this article argues that auditory perception, phonological memory and metacognitive abilities play an essential role in the development of musical and linguistic skills.

Key words

early childhood music education, kindergarten, literacy

Introduction

For the past 40 years, researchers in the field of education and psychology have demonstrated that music learning facilitates children's overall development. At the socio-affective level, studies reveal that music education facilitates the development of communicative skills, increases self-confidence and, with the help of music therapy, it enables the harmonization of interpersonal relationships among students who have integration difficulties (Gourgey, 1998; Hughes, Robbins, McKensie, & Roob, 1990). In addition to being a privileged medium to develop kinaesthetic skills (Gilbert, 1991; Zimmerman, 1971), music training also contributes to cognitive development (Campbell & Scott-Kassner, 2002; Radocy & Boyle, 2003).

In this respect, studies indicate that music stimulates intellectual abilities in early childhood. Some researchers maintain that listening to music and practising music have positive effects on spatio-temporal skills (Hetland, 2000) as well as on the IQ (Schellenberg, 2005). Other specialists have noted that music education promotes both academic learning and achievement. They have indicated that the teaching of music has a significant

impact on the development of mathematical skills (Vaughn, 2000), native language (Cuttieta, 1995, 1996; Douglas & Willats, 1994; Hurwitz, Wolf, Bortnick, & Kokas, 1975), and second language acquisition (de Frence, 1995; Lowe, 1995, 1998).

Research in music education and written language learning in primary school has established links between the treatment of musical and linguistic information. Studies reveal that tonal and rhythmic perceptions are correlated with word recognition skills from grades 1 to 6 (Barwick, Valentine, West & Wilding, 1989; Maze, 1967). Research with experimental programmes points in the same direction. Subjects who take part in certain music training programmes develop their metalinguistic abilities more rapidly than subjects who do not participate in such training (Friedman, 1959).

Correlational research has also shown that music can awaken children's minds to the written word in pre-school. Studies have demonstrated that children between the ages of four to eight who obtain higher scores in various musical aptitude tests, more specifically in melodic tests, also obtain superior results in phonological awareness and word recognition (Anvari, Trainor, Woodside, & Levy, 2002; Bolduc & Montesinos-Gelet, 2005; Lamb & Gregory, 1993). However, few quasi-experimental studies have managed to establish a causal effect between music learning and emergent literacy (Bolduc, 2006; Gromko, 2005; Standley & Hughes, 1997; Register, 2001).

Given the number of studies that indicate that some students have difficulty with reading skills development as early as the beginning of primary school (Statistique Canada, 1996; US Institute National Institute for Literacy, 1998–2003), we wanted to see if a specific interdisciplinary language-music programme could help pre-school aged children develop their linguistic abilities in a more effective manner. This study seeks to determine if this particular music education programme is able to improve the pre-reading skills (phonological awareness) of a group of Francophone kindergarteners who have no learning disabilities. We focused on two specific objectives. Our first objective was to examine if a music curriculum based on Standley and Hughes' programme (1997) develops tonal and rhythmic perceptions in the aforementioned group of pupils.² Second, we wanted to investigate if this same programme could improve phonological awareness performance, particularly the identification of phonemes, syllables and rhymes. A body of research already exists that establishes a link between phonological awareness and success with reading and writing (Gombert, 1991; Lecocq, 1991). If our study confirms that music education is a major facilitator in the emergence of literacy skills, the purpose of music education in kindergarten will need to be reassessed.

Methodology

Participants

This study involved 104 Francophone participants who had no learning disabilities and who were enrolled in a kindergarten programme approved by the Ministère de l'Éducation du Québec (2001). The group included 45 females and 59 males whose average age at the beginning of the experiment was five years and one month.³ These pupils came from intact classes that were taught by six generalist teachers who voluntarily agreed to participate in this research. Pupils' distribution in each class was done randomly by the school board at the beginning of the school year. They came from the same demographical region and shared the same socioeconomic background (i.e. middle class).

Design

After confirming that students shared similar characteristics, they were assigned into either the control group ($N = 53$) or the experimental group ($N = 51$). During a period of 15 weeks, each group took part in a daily music lesson lasting 60 minutes, which was offered by two specialist music teachers. A pre-test and a post-test were administered to all the participants at the beginning and at the end of the training programme.

Dependent measures

Two evaluation measures were used in this study. Musical aptitudes were evaluated with Gordon's Primary Measures of Music Audiation (PMMA) (1979). The reliability measures of this standardized test were taken into account during the evaluation phase.⁴ The PMMA consisted of one tonal and one rhythmic tasks. In both tasks, participants had to compare two sound sequences and decide if they were identical or not. On the answer sheet, each item that was heard was represented by a picture (an apple or a boat, for example). Under the picture, there were two pairs of faces. If both sequences were alike, pupils circled the pair of identical faces, but if they were different, they circled the pair of contrasting faces. Both tasks had each 40 evaluative items. One point was given for each correct answer. Results from each task were treated separately.

Armand and Montesinos-Gelet's (2001) Phonological Awareness Test was used to evaluate pre-reading skills.⁵ This test was administered using individual computer terminals. Before starting the phonological awareness tasks, participants took part in a few sound and visual control exercises that helped them explore the program and understand the procedures. Next, students had to complete two *syllable identification* tasks, one *rhyme identification* task, and three *phoneme identification* tasks. Each task contained four items and one practice item that was used to ensure that pupils understood the task. The six tasks were created on the basis of the same principle: at the top half of the computer screen, three pictures were identified by different colour (red/yellow/blue) frames while in the lower half of the screen a fourth picture appeared. In each case, pictures were named. For example, in the non-sequential *syllable identification* task, participants had to identify which word, among the three pictures from the top, had one identical syllable

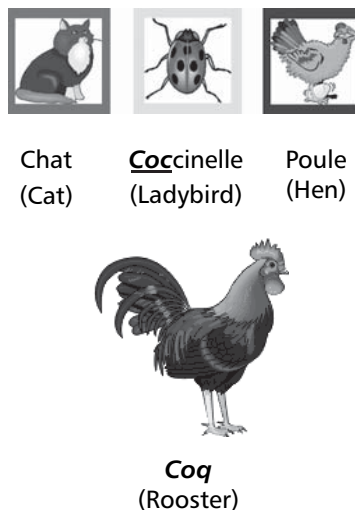


Figure 1 Example of the Phonological Awareness Test (Armand & Montesinos-Gelet, 2001).

with the word at the bottom (the answer was *coccinelle* (ladybird) and *coq* (rooster)). As soon as the answer was found, students pressed the key of the same colour as the picture chosen on the keyboard. One point was allotted per correct answer.

Music curricula

Two curricula were used in this research. The experimental group followed a version of Standley and Hughes's (1997) programme for children with special needs. The programme's objective was to increase pre-schoolers' interest in reading and writing by using musical activities. It integrates some principles from Orff Schulwerk's approach but for most part, it was inspired from other studies in the fields of music therapy (Merrion, 1989) and music education (MENC, 1995; Palmer & Sims, 1993). For the purpose of this research, the programme was specifically adapted for Francophone kindergarteners with no learning disabilities.

The first objective of the programme was to give rise to skills related to song and instrumental interpretation. Songs from varying genres and styles were taught. In addition, pupils were exposed to a range of instruments with which they could play simple melodies. The second objective aimed to incite children's musical creativity. Improvisation activities were particularly emphasized in this programme. Pupils were also introduced to graphical musical representation by encouraging them to create and use invented notations. The third goal was to develop the musical receptivity of the children. Pupils discovered different sounds and gradually refined their perception of timbre. Motor activities were given priority because they helped develop the perception of diverse musical parameters through physical movement. The fourth objective aimed to awaken their musical comprehension. Pupils built their knowledge from using an increasingly precise terminology that helped them make sense of their musical experience. In this programme, emergent literacy was achieved by analysing lyrics, composing rhythmic counting rhymes, reading children's books associated with musical concepts (i.e. making instruments, meeting great composers) as well as writing words (i.e. songs or names of instruments).

The Ministère de l'Éducation du Québec's (2001) curriculum was chosen as the control programme. At the musical level, this programme was equivalent to the experimental programme. The activities in both programmes allowed pupils to have diverse and multidisciplinary experiences that shared common aspects with writing awareness (counting rhymes/songs and vocabulary learning). The Ministère de l'Éducation du Québec's (2001) curriculum aimed at three competences. The first competence involved *inventing vocal or instrumental pieces* that engaged pupils in age-appropriate activities of improvisation, arranging and composition. The objective of the second competence *introduced pupils to interpreting musical pieces* using a variety of vocal and instrumental repertoire of different eras. The third competence looked at *appreciating musical works, personal achievements and peer achievements*. This curriculum also allowed pupils to experience various cultures through exposure to multicultural musical samples. Listening and musical creation activities (compositions, adaptations, etc.) were meant to awaken the children's critical thought and aesthetic awareness. At the same time, students were introduced to musical terminology and asked to use it when they named elements found in musical works.

Procedures

A pre-test and a post-test were administered to all the students before and after the 15-week training programme. Students underwent the tests randomly during day care and usual class hours. For the Gordon (1979) battery, pupils were organized into small

groups (three to eight participants). Work tables were set up so that students were not able to plagiarize. The audio system was placed in the centre of the classroom so that pupils could clearly hear the musical items. The tonal test was given to each pupil before the rhythm test.

For the Phonological Awareness Test (Armand & Montesinos-Gelet, 2001), the pupils were met individually. The researcher assisted with visual and sound control, as well as with practice items in each of the six tasks. During practice items, whenever pupils gave wrong answers, the researcher pointed out the correct response for them along with the reasoning behind it. Once the explanations were given and the practice examples were shown, the pupils had to answer, without assistance, the various items in each task. Keyboard keys that were not necessary for testing purposes were hidden to highlight those required to indicate the answers (red/yellow/blue keys).

Both music programmes started in January and ended in April, 2004. Some groups met during the mornings and others during the afternoons. Classes were held in the school's music room during regular class hours. The researcher, who is a music educator, adapted and implemented the curriculum for the experimental group taking into account all of Standley and Hughes's (1997) principles. The music educator who was responsible for the control programme was never informed of the training offered to students in the experimental group. Both music educators possessed good knowledge of pre-school pedagogy, having at least eight years of teaching experience. These two music specialists incorporated a variety of musical approaches in their teaching, such as Dalcroze, Gordon, Orff and Kodaly. Both educators volunteered to participate in this study.

Research limitations

Our study has some limitations. The first limitation concerns the adaptation of Standley and Hughes's (1997) programme. Sociolinguistic and institutional factors needed consideration when the activities were translated into French. In addition, we were required to adapt the curriculum to fit into the school's timetable and the music educators' time constraints. Even if activities were generally elaborated according to the original criteria (theme, concepts and level of difficulty) and that the programme was equivalent in time and length, the fact is that it is a free and personal adaptation of the original programme.

A second limitation has to do with the group of students who participated in the experimental music programme. Originally, Standley and Hughes (1997) developed their programme for American children who were four to five years old. Our French adaptation of their programme involved four to six year olds. Since the population in our study possessed different characteristics from those intended by Standley and Hughes (1997), it is quite possible that our results could be interpreted differently from outcomes obtained in American studies regarding the connection of music training and writing skills.

The third limitation takes into account the composition of the classes that participated in the study. As we mentioned previously, children were randomly assigned to their classes at the beginning of the year. Consequently, some classes had a majority of males or females and there were also some students with behavioural problems. Thus each class was unique and had its own dynamics, strengths and weaknesses. For this reason, it is impossible to ascertain to what extent the non-musical aspects of training or the pre-existing differences between groups may have influenced the results.

Finally, the specialist who was responsible for the experimental music programme was also the person who adapted Standley and Hughes's (1997) programme into French. It is possible that the researcher's teaching may have been unconsciously biased since he was well aware of the study's objectives. It is important to account for this methodological limitation even when the researcher respected the ethical principles of objectivity, rigour and honesty that govern researchers who play an active role in their own research.

Results

Results from Gordon's test (1979) indicate a similar performance between the control group and the experimental group in the pre-test. They were only slightly higher for the tonal test in comparison to the rhythm test for both groups. However, the experimental group results were higher for both tasks. The variance analysis (ANOVA) indicated that interaction between the groups was statistically non-significant at the musical level (for the tonal test: $F = 0.391$, d.f. = 1, $p = 0.53$; for the rhythm test: $F = 2.873$, d.f. = 1, $p = 0.93$).

As for the Phonological Awareness Test (Armand & Montesinos-Gelet, 2001), the difference between the results obtained by the control and the experimental groups was not statistically significant ($F = 16.127$, d.f. = 1, $p < 0.01$). During the pre-test, all the pupils obtained superior results in the *rhyme identification* task, followed by the *syllables identification* tasks, and finally the *phonemes identification* tasks.

For the post-test, the ANOVA shows that both groups had significant improvement in the tonal test ($F = 2971.336$, d.f. = 1, $p < 0.01$) and in the rhythm test ($F = 3737.475$, d.f. = 1, $p < 0.01$). However, since no statistically significant interaction was identified between the groups in the pre-test, it is not possible to say if the experimental group outperformed the control group. Nevertheless, data from the descriptive statistics enable us to say that participants from both groups showed improvement of 4.3 percent and 1.7 percent respectively in the tonal test and 5.1 percent and 14.8 percent respectively in the rhythm test.

For the Phonological Awareness Test (Armand & Montesinos-Gelet, 2001), we noticed that the children in the experimental group scored higher than those in the control group at the end of the music programme ($F = 0.063$, d.f. = 101, $p < 0.01$). Descriptive analysis of the data indicated that students in the control group improved their results by 16.7 percent in the *syllable identification* tasks, 15.1 percent in the *phoneme identification* tasks and 11.8 percent in the *rhyme identification* task. As for the experimental subjects, they improved by 32.5 percent in the *syllable identification* tasks, 30.5 percent in the *rhyme identification* task and 23.4 percent in the *phoneme identification* tasks.

Discussion

Results obtained from data analysis and interpretation seem to indicate that both music programmes used in our research allowed the development of musical perception and emergent literacy skills in Francophone kindergarten pupils. Our first research objective aimed to verify whether a music training curriculum, adapted from the Standley and Hughes programme (1997) could develop tonal and rhythmic perceptive skills. This research indicated that pupils from both the control and experimental groups obtained similar results – although slightly higher for the experimental group – in the post-test for Gordon's musical test (1979). By taking part in these programmes, pupils participated in a large number of activities that initiated them to music before starting primary school and receiving systematic teaching.

Our second research objective was to check if an adaptation of Standley and Hughes's (1997) social training programme developed phonological awareness skills. We observed that participants who were exposed to the experimental music training programme experienced an improvement in their performance, particularly in the *syllable identification* tasks and the *rhyme* and *phoneme identification* tasks, by the end of the programme compared to the control group. In fact, many researchers (Blachman, 2000; Gombert,

	Number of items	Control group (N=53)		Experimental group (N=51)	
		Pre-test	Post-test	Pre-test	Post-test
PMMA test (Gordon, 1979)	Tonal test	23.9	25.6 (+4.3%)	25.1	25.8 (+1.7%)
	Rhythm test	22.4	24.4 (+5.1%)	23.6	29.5 (+14.8%)
Phonological Awareness Test (Armand & Montesinos-Gelet, 2001)	Phonemes identification tasks	6.2	7.4 (+10%)	7.3	10.1 (+23.4%)
	Syllables identification tasks	4.7	5.7 (+12.6%)	5.1	7.7 (+32.5%)
	Rhymes identification tasks	2.7	3.15 (+11.1%)	2.7	3.92 (+30.5%)

Figure 2 Pre- and post-test results (%) of the PMMA test (Gordon, 1979) and the Phonological Awareness Test (Armand & Montesinos-Gelet, 2001).

1992; Lecocq, 1991; Morais, Alegria & Content, 1987) have revealed that children of pre-school age acquire composed units first (syllables and rhymes), and then simple units (phonemes). The gap in performance between the control group and the experimental group could be explained by the fact that the experimental programme offered numerous musical and emergent literacy activities. The latter promoted the development of word division skills, which in turn helped pupils identify the different linguistic units more easily. The didactic material we used throughout the programme, especially the children's songs, brought pupils to recognize different phonological units and to manipulate them purposefully and at their own pace.

On the theoretical front, this study's findings contribute to the advancement of knowledge in the field of musical development during childhood. Our research corroborates the results obtained by many didacticians, psychologists and linguists on the development of phonological awareness skills (Anvari et al., 2002; Bolduc & Montesinos-Gelet, 2005; Colwell & Murlless, 2002; Flohr, 2003; Steele, 2006). Moreover, this study allows us to identify more specifically the connections that already exist between the treatment of music and linguistic information (Bernstein, 1976; Fiske, 1993; Heller & Campbell, 1976, 1981; Sloboda, 1985). It also reveals the crucial role that auditory perceptions (Willems, 1977, 1987), phonological memory (Francès, 1984, 1985; Ribière-Raverlat, 1997), and metacognitive skills (Lafortune, Jacob, & Hébert, 2000) play in the development of musical and linguistic abilities in pre-school age children.

The practical implications are also important. Our research demonstrates that recreational activities are significant during the pre-school age. Like Morin (2002), we are convinced that gradual construction of knowledge in kindergarten must be given a more prominent place. Learning situations in which children are involved should remain informal, game related and based on children's authentic life experiences. We believe that musical activities offered in classes by the general or specialized educator should bring the pupil to question the different aspects of his/her environment. In fact, this particularity was promoted in the experimental music training programme, because it encouraged pupils to discover, explore and acquire knowledge through spontaneous activities.

Future research directions

The results we obtained from this research have shown the importance that should be given to the elaboration of interdisciplinary programmes that combine music education and language teaching. It would be important to determine in the near future whether the adaptation of an experimental music programme could also facilitate the development of linguistic abilities in other student samples. At the same time, it would be interesting to study the effects of a music-awakening programme on the development of early-writing skills with students enrolled in different day care facilities. It would also be very useful to investigate the effects of a music programme on the development of literacy skills in first and second grades of primary school.

Moreover it would be sound to verify if, after undergoing some modifications, the programme could also help develop linguistic abilities in students who have language developmental difficulties, such as dyslexia and dysorthography. As mentioned previously, by favouring the development of music perception abilities, we help children increase their phonological memory and acquire metacognitive abilities without relying exclusively on reading and writing activities. Thanks to music education, students focus their attention on different but equally useful elements that facilitate the emergence of linguistic abilities.

Finally, it would be relevant to study the effects of a music training programme on the development of academic abilities. Several researchers (for a literature review, refer

to Vaughn, 2000) have revealed that music contributes to the development of mathematical skills. However, to our knowledge, few quasi-experimental studies have dealt with this topic in kindergarten or primary level children in Francophone settings. Further research on this specific population is therefore justifiable. We believe that pursuing the different research directions we have suggested in this article will have multiple repercussions. It is therefore essential to support music education and interdisciplinary projects all through early childhood, because they enable young pupils to acquire skills in many fields. We must offer children the opportunity to develop their full potential in music and literacy.

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Notes

1. This article is a part of the researcher's doctoral dissertation, in which he examines the effects of a music programme on the development of word recognition and invented spelling skills.
2. You will find a description of the experimental programme based on Standley and Hughes's music training programme (1997) and the control programme (Ministère de l'Éducation du Québec, 2001) in the 'Music Curricula' section of our methodology later.
3. At a statistical level, no mortality rate appears during this study.
4. The reliability coefficients of the PMMA test (Gordon, 1979) are .85 for the tonal test and .86 for the rhythmic test.
5. The validity and reliability measures of Armand and Montesinos-Gelet's (2001) Phonological Awareness Test were never calculated. It could represent a research limitation.

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Abstract

Les effets d'un programme d'entraînement musical sur le développement de la conscience phonologique à la maternelle

Cette recherche examine les effets d'un programme d'entraînement musical sur le développement de la conscience phonologique auprès de 104 enfants franco-canadiens d'une école maternelle. Le groupe expérimental ($N = 51$) a pris part à une formation inspirée du programme de Standley et Hughes (1997), alors que le groupe de contrôle ($N = 53$) a participé au programme de musique du Ministère de l'Éducation du Québec (2001). L'analyse des données montre que les deux programmes ont contribué de façon significative à l'amélioration des capacités perceptives tonale et rythmique. En contrepartie, le programme d'entraînement expérimental s'est avéré plus efficace en ce qui a trait au développement des habiletés phonologiques. En somme, cette étude tente à démontrer que la perception auditive, la mémoire phonologique et les habiletés métacognitives jouent un rôle important dans le développement des capacités linguistiques au cours de la petite enfance.