

Implementing a Musical Program to Promote Preschool Children's Vocabulary Development

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Abstract

In light of the correlation between musical and linguistic skills, a program of musical activities was designed to promote discrimination of rhythmic and melodic elements and the association of auditory stimuli with visual stimuli and motor activities. The effects of the program on the vocabulary of preschool children were evaluated and compared with the vocabulary of children participating in the curricular subject of "Ritmos, Cantos y Juegos" [Rhythm, Songs, and Games] and that of children who were not exposed to either of the two programs. The results showed significant increases in receptive vocabulary only for the group exposed to the program with musical activities. The processes that caused the increase are discussed, as well as the possible use of the program that was implemented as a resource for preschool language stimulation.

Introduction

Music educators have offered evidence that music classes develop students' potential in many areas, especially auditory discrimination, psychomotor coordination, memory development, expressive abilities, and critical thinking (Frega, 1977). The songs of preschool children in particular are considered as providing children with fluency of oral expression and good diction, as well as helping them learn to form phrases, to use words correctly and to understand their meaning, and even to enjoy the poetic quality of children's rhymes (Aquino, 1991).

These and other considerations from the field of education denote the positive influence of musical activities on different areas of child development, especially those related to language. This has given rise to research projects that examine the relationship between music and language from several different angles.

Some positions view the similarities between musical structures and the phonological and prosodic structures of language as resulting from the nature of both music and language as a series of sounds organized over a period of time (Samson, Ehrlé, & Baulac, 2001; Lerdahl, 2001). Analyzing poems in strictly musical terms has revealed differences, and even more similarities, in the repetition of sounds that can be analyzed according to musical prolongational theory (Lerdahl, 2001). The data obtained in these and other similar studies suggest a parallelism and/or similarity in the codification and organization of musical and verbal stimuli. The studies also imply, based on this finding, that the processing of musical and linguistic stimuli may involve the same cerebral functions and/or take place in the same regions of the cerebral cortex.

The relationship between musical and linguistic stimulus processing has been examined on a neurophysiological level in various studies and using various techniques, which reveal that both words and musical tones caused similar activity in the left superior temporal sulcus, temporal medial gyrus, angular gyrus, and frontal lateral lobe (Binder, Frost, Hammeke, Rao, & Cox, 1996). It has also been shown that the primary auditory regions (BA 41 and BA 42) and the supplementary motor areas (BA 6) respond similarly to linguistic and musical stimuli. The secondary auditory regions (BA 22) are activated by hearing and understanding words as well as by hearing musical scales. The supramarginal gyrus (BA 40) seems to be involved in understanding the symbolism of language and in reading music. The processing of certain semantic aspects of language is similar to the processing of certain melodic and harmonic

aspects of music, as revealed in studies analyzing the N400 region (Besson & Regnault, 2000; Besson & Schön, 2001).

Studies of language acquisition also show a close relationship between children's musical and linguistic development. The prosodic characteristics of adult-infant communication can be analyzed musically. Research has revealed that adult speech directed at babies has an elevated pitch and an amplified range of basic frequencies, with a tendency toward high frequencies, as well as a slow rhythm, clear enunciation, and pauses that separate phrases (Rondal, 1990, p. 188). Thus, melodic contours can easily be identified in adult speech directed at babies. These contours facilitate communication with babies, enabling them to understand adults' messages, respond to them in different ways, and gradually acquire language. The rhythm of these contours plays an important role in enabling language discrimination and deciphering the message directed to the child (Ramus, Nespor, & Mehler, 2000). Melodic contours are used intuitively and spontaneously, thus establishing a musical communicative code that precedes the development of language as such; this enables the infant to become familiar with elements of sound, both melodic and rhythmic. It has therefore been proposed that adult language directed at babies may serve as a natural source of early musical stimulation (Papouseck, 1996). This view gives rise to one possible explanation of the relative ease with which young children discriminate pitch intervals and rhythms in controlled situations.

The above information is not intended as an exhaustive exploration of the close link between musical and linguistic development; rather, it represents some of the evidence that musical activities help children's linguistic development and supports the use of such activities in schools' educational programs in order to stimulate various aspects of children's language. For example, educational programs that include singing songs have resulted in increased expressive abilities (Hoskins, 1988), and programs that encourage children to write songs have been used to reduce difficulties with reading and writing (Gfeller, 1987). Other programs have achieved rapid, accurate reading (Lamb & Gregory, 1993) and have even used music in preschool classes to develop children's auditory language discrimination skills and improve their articulation and pronunciation (Gan & Chong, 1998). Dyslexic children have also experienced considerable improvement in phonological and spelling skills (Overy, 2000).

One element of children's linguistic development that has been favored by participation in musical activities is that of vocabulary. Studies of third-graders showed that those who attended music classes at school performed better on the WISC vocabulary scale than those children who did not attend such classes (Galicia, 1997; Galicia & Pavón, 2001). Children with developmental delays who participated in singing songs improved their vocabulary significantly, as measured by the Peabody Vocabulary Test (Hoskins, 1988). Also, young children who received vocabulary instruction in a second language, along with songs and rhythmic discrimination activities, incorporated more words into their receptive and active vocabularies (Gan & Chong, 1998; Schunk, 1999; Overy, 2000).

The specific relationship between musical activities and vocabulary has not yet been convincingly explained; it has been argued that musical skills are associated with a good auditory memory and especially with verbal memory (Ho, Cheung, & Chan, 2003). The same auditory mechanisms are also thought to share in the perception of certain basic elements of language and of music. These mechanisms would involve the segmentation of sounds and the recognition of sound categories and/or units based on changes in timbre, duration, volume, and pitch. Some studies have demonstrated a relationship between phonological awareness and musical perception skills, such as rhythmic, melodic, and harmonic discrimination, as well as rhythmic production skills. These skills were found to correlate, not only with vocabulary, but also with early reading skills (Anvari, Trainor, Woodside, & Levy, 2002). Similarly, the work of Don, Schellenberg, and Rourke (1999) revealed a correlation between children's musical and linguistic skills, specifically between receptive vocabulary and skill at discriminating pairs of rhythmic and melodic fragments.

The results obtained from the aforementioned research and programs seem to encourage the implementation of musical activities in order to promote children's linguistic development, especially native-language vocabulary. The research shows a correlation between (1) musical activities in general and language development, and (2) discrimination processes of both musical and linguistic elements. On the other hand, the programs do not describe the activities in detail, which hinders analysis of the processes involved in these activities. This, in turn, makes it difficult to establish precisely which variables explain the results, whether these are the musical activities in a general sense or certain specific processes in the activities. In light of the above-mentioned findings, it could be inferred that those musical activities that stimulate auditory memory and rhythmic, melodic, and harmonic discrimination would favor children's linguistic development more than musical activities that did not involve such processes. The goal of this study, therefore, was to identify whether preschool children's vocabulary development is influenced by practicing musical activities in general or musical activities that stimulate auditory memory and rhythmic, melodic, and harmonic discrimination.

Based on this goal, an educational program was designed around musical activities that would promote preschool children's vocabulary development using songs and activities such as repeating rhythmic patterns; remembering sequences of sound; discriminating timbres, rhythms, and melodic lines; and representing them graphically. All these activities incorporated visual stimuli and motor activities. To evaluate the program's influence, the participating children's receptive vocabulary was assessed and compared with the vocabulary level of children who attended another program of musical activities that placed minimal emphasis on such processes. These two evaluations were also contrasted with the vocabulary of children who did not participate in any musical activity in their school.

Method

Participants

Thirty participants were selected, with an average age of 5 years and 6 months, who attended three classes in official third-grade elementary schools (Jardines de Niños). They were from families with incomes from one to three times the minimum wage, and their parents' highest educational level was that of secondary school.

Instruments

The Peabody Vocabulary Image Test (TVIP—Spanish adaptation of the Picture Vocabulary Test by Lloyd Dunn [1986]), consisting of a series of 150 illustrations, shows the subject's range of receptive Spanish vocabulary. The subject is asked to select the picture that he considers as best representing the meaning of a word-stimulus presented orally by the examiner.

Procedure

The principals of the elementary schools where the study was conducted were interviewed and were given an explanation of the educational program of musical activities to be carried out during the time period normally devoted to the curricular subject of Rhythm, Songs, and Games. The principals as well as the children's teachers agreed to implement this program with all the students in their classes so that they would all receive the potential benefits. They also asked for the children to be given the vocabulary test, in order to gain insight about their students' vocabulary levels. The TVIP was given before the educational program began and after it ended.

The elementary school classes had an average of 25 children. In each class, the children whose families had the aforementioned characteristics were identified. Ten children from each group were then randomly selected, for a total of 30 children. This method of selection was chosen in

order to gain a homogeneous sample in which to observe the effects of the educational program, in light of the evidence that such variables as the parents' socioeconomic and educational levels affect children's linguistic development. Thus, the test and the educational program were given to all the children in each class, whether or not they had such characteristics; but only the test results of the 10 sample children in each group are reported.

One group (A2) did the activities proposed for the subject of Rhythms, Songs, and Games (RCJ are the initials in Spanish) in the official program of preschool education. For another group (A1), during the class period designated for that subject, the music education intervention program for promoting vocabulary (PIMITL in Spanish) was presented to provide musical activities in preschool classrooms. Thus the letter A designated the groups that had musical activities, and the number indicated the type of activities. The remaining group (B) did not attend Rhythm, Songs, and Games classes; rather, they continued their normal activities without music. This control group was identified as SM (*sin música*, no music). Thus the following design was achieved:

Group	First Evaluation	Condition	Second Evaluation
A1	Peabody	PIMITL	Peabody
A2	Peabody	RCJ	Peabody
B	Peabody	SM	Peabody

Conditions

A1: PIMITL Music Program. Two researchers, trained as teachers and as music educators, presented the PIMITL program twice a week for a total of 20 sessions lasting 40 minutes each (see the [Appendix](#) for a sample session). The activities were carried out during the school day with all the children in the class, including the children selected for the sample. The program was thus implemented in a natural setting. Each session had a topic that was developed through various musical activities that emphasized repeating rhythmical patterns and remembering sound sequences, as well as discriminating and making graphic representations of timbres, rhythms, and melodic lines. These activities were chosen because they were considered likely to promote language development. They were also designed to promote various kinds of associations with visual stimuli and motor actions.

A2: RCJ Music Activities. For this group, 20 sessions were held in the same manner as for the A1 group. During these sessions, the normal activities of the Rhythm, Songs, and Games subject were carried out. These activities were implemented by the teacher and music instructor assigned to that class.

B: SM No Music Activities. The children in this class carried out their daily activities in the elementary school without any musical activities, since their school did not have an instructor assigned to carry out such activities.

Results

The results are reported according to two indicators of the Peabody Test: standard score and linguistic age. The standard scores obtained in the pretest showed that the children assigned to the control group, SM, had a greater number of correct responses and higher standard scores in comparison with the RCJ and PIMITL groups, although these differences were not significant ($F = 2.984, p = .068$). This result shows the homogeneity of the groups before the intervention. All groups improved their direct scores on the posttest, but with regard to the standard scores, only the control group and the PIMITL group showed improvements. A statistically significant difference was observed in favor of the PIMITL group ($t = 7.786, p = .000$). The group with the normal activities of the Rhythm, Songs, and Games subject had slightly lower scores in

comparison with the other two groups, although this result was not statistically significant ($t = 1.960, p = .002$).

An ANOVA test reveals significant differences between the groups on the posttest ($F = 23.240, p = .000$), and the Scheffé test shows significant differences between the group that received the PIMITL intervention program and both the RCJ group ($p = .000$) and the control group ($p = .002$).

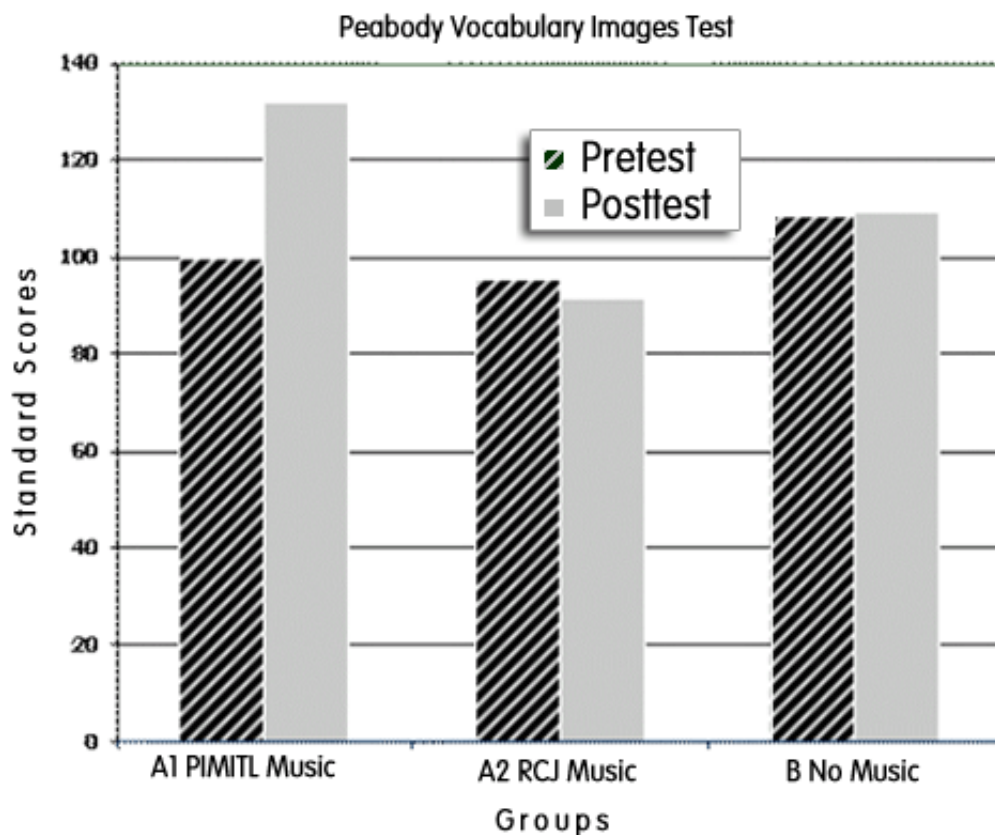


Figure 1. Standard pretest and posttest scores on the Peabody Vocabulary Images Test for each group.

The direct scores obtained from the TVIP can be converted to linguistic age, or equivalent age, which enables parents and teachers to measure the child's vocabulary in relation to his or her chronological age. The scores corresponding to the equivalent ages showed tendencies similar to the standard scores.

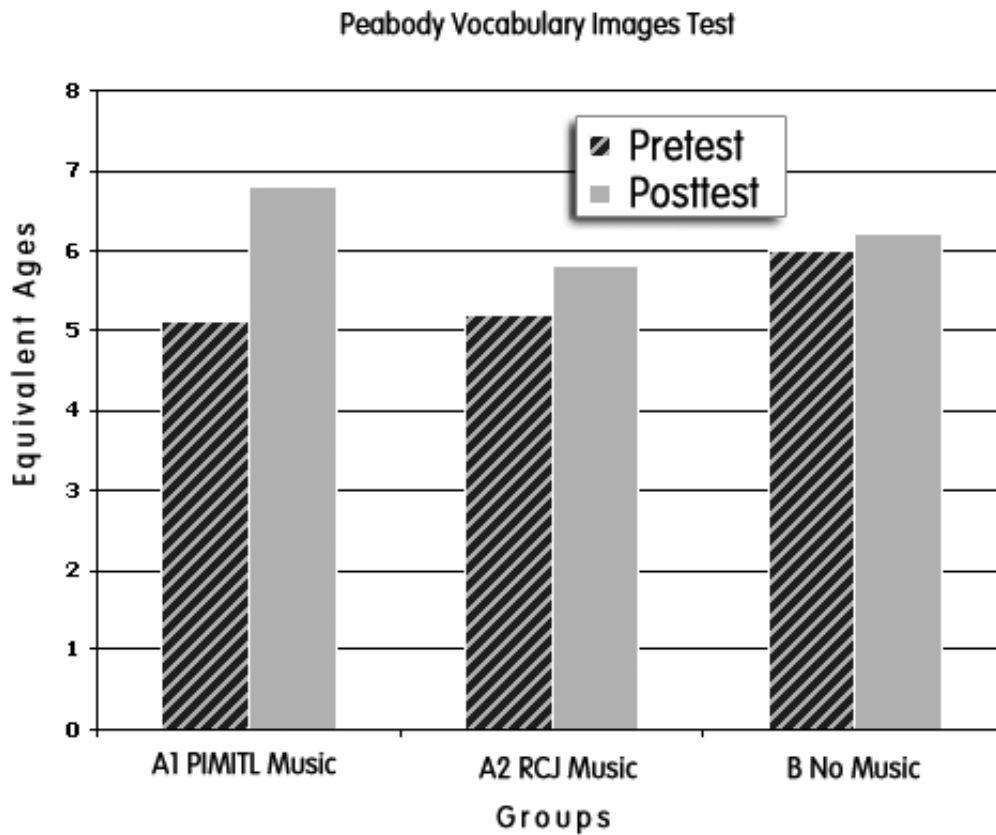


Figure 2. Equivalent ages obtained from the Peabody Vocabulary Images Test for each group.

The initial evaluation showed no significant differences between the two groups. However, Group B, which had no musical activities, had slightly higher scores than the other two groups ($F = 1.244, p = .296$). At the end of the intervention period, all the children increased their equivalent age on the posttest, although notably, the differences between the pretest and the posttest were greatest for the A1 group that received the PIMITL program ($t = -10.040, p = .000$). The children who did the proposed activities in that program attained an equivalent age of 6 years 8 months, followed by the group with no music at an average equivalent age of 6 years 2 months, and finally the RCJ group with an age of 5 years 8 months. The ANOVA reveals significant differences ($F = 55.212, p = .000$) in the posttest equivalent ages among the three groups; specifically, the Scheffé test shows important differences between the PIMITL group and the other two groups (.000), whereas between the control group and the RCJ group, no significant differences can be identified (.074).

Discussion

These data show that the activities usually held in elementary school classrooms for the curricular subject Rhythm, Songs, and Games did not affect the vocabulary development of the children in our sample. The activities must be primarily musical in nature and must have the specific objectives of discriminating sounds and forming auditory-visual associations. They must also involve sequences of auditory and visual stimuli, as was the case with the activities of the PIMITL program. According to some researchers (Chan, Ho, & Cheung, 1998; Anvari, Trainor, Woodside, & Levy, 2002), activities designed to achieve these objectives are associated with linguistic processes, and especially with vocabulary acquisition.

The children in the PIMITL group were encouraged to reproduce and/or identify sequences of sounds (rhythms, melodies, and timbres) that were considered to exercise their auditory memory. It can therefore be inferred that they appropriated the vocabulary words that they heard in their environment more easily than the children in the other groups. To account for the

significant increases in the vocabulary of the children in the PIMITL group, it is not necessary to refer to explicit vocabulary instruction, since the evidence shows that vocabulary can be acquired incidentally in contexts of daily conversation due to cognitive processes such as verbal memory (Beals, 1997). If those who received musical instruction at an early age have greater verbal memory (Chan, Ho, & Cheung, 1998; Ho, Cheung, & Chan, 2003), it could be expected that they would also have a greater vocabulary. The results of this study point toward this conclusion, which would need to be studied further in future research.

Besides sound sequences, the children in the PIMITL group also systematically discriminated rhythms and melodies. These activities may have strengthened the children's skills at identifying, recounting, omitting, and adding syllables and phonemes in oral language, skills that are considered part of phonological awareness. These skills are also known to be involved, not only in vocabulary acquisition processes (Walley, 1993; Bowey, 1996), but also in early reading skills (Bruck & Treiman, 1990; Stahl & Murray, 1994). Also, based on the evidence of the significant correlations of phonological awareness with melody and timbre discrimination and with receptive vocabulary (Anvari, Trainor, Woodside, & Levy, 2002), it can be inferred that melody and timbre discrimination activities help to stimulate receptive vocabulary development.

It is also worth noting that most of the activities in the PIMITL intervention program associated auditory stimuli with visual stimuli and motor activities. This finding leads to the interpretation that the teacher's discourse and that of the children, as well as the words to which the children were potentially exposed during songs, explanations of the songs, and other activities, were immersed in meaningful contexts and/or accompanied by contextual clues. A greater exposition to these associations and context clues may explain the significant increase in the Peabody scores for the children in this group, in contrast with the other children. Consistent with this inference is the suggestion of Penno, Wilkinson, and Moore (2002) that the variables that influence preschool children's vocabulary development and learning of new words are age, connections between unfamiliar words and their context, use of contextual clues, and type of words involved. They point out that when children learn to use contextual clues, they have a greater comprehension of language and are thus able to infer the meanings of new words. Based on this finding, it could be speculated that the children in the PIMITL group in some way had more experiences of using contextual clues and thus learned more words than the children who had only the activities of Rhythm, Songs, and Games or who did not have any musical activities.

The PIMITL program can also be considered as a resource for stimulating language at the preschool level, similar to that of reading stories. A wealth of evidence supports the relationship between story reading at home and preschool children's language skills. In particular, children's active participation in reading has been shown to increase their receptive and productive vocabulary in comparison to passive reading (Beals, 1997; Wasik & Bond, 2001; Penno, Wilkinson, & Moore, 2002). These strategies have had good results in the classroom; children have been seen to improve not only their command of words used in stories, but also of other words that they were not taught, such as those contained in the Peabody Test (Wasik & Bond, 2001). Because of these effects, shared reading in the classroom and reading done as a dialogue between reader and listener have been proposed as teaching strategies for stimulating language and vocabulary development for children who receive less language stimulation at home. The results of this study also suggest the use of musical activities similar to those of the PIMITL program to achieve the same goals, since these activities share similar characteristics. The sessions are theme-based, and the songs that are used serve to promote dialogue between the children and the teacher. The children are thus actively involved, which allows the words to be introduced in a meaningful context.

Finally, future research of a basic and applied nature is also suggested. Basic research could analyze how the inclusion of musical activities in classroom curricula affects children's verbal memory and phonological awareness. In applied research, it would be interesting to replicate the study and analyze whether productive vocabulary was increased, since this study only examined receptive vocabulary. It may also be possible to present the musical education program for

children with delayed language development and assess whether their receptive and productive vocabulary increased. Another aspect to be directly assessed is that of the differences or similarities between the musical education program and the reading of stories with regard to increasing preschool children's vocabulary.

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Note

This paper was submitted in Spanish. Berkeley Hinrichs translated the paper into English.

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Appendix

Session 7 "My Visit to the Sea"

Objective	Activity	Description	Materials	Time
<i>Discrimination</i> Presence and absence of sound <i>Motor expression</i> Acting out everyday activities	Entry	Children act out preparing bag for visit to sea and walk to rhythm played on instruments. During silent time, activities such as "gathering" seashells.	Musical instruments Rain stick	3 min.
<i>Motor expression</i> Acting out everyday activities	Greeting: "Hola, ola" (Hello, Ocean Wave)	Mimicking movements involved in changing clothes in order to "put on your bathing suit."		2 min.
<i>Grammatical integration</i> Memorizing short phrases	Rhyme: "Dos pececitos" (Two Little Fish)	Children move their hands according to the rhyme. After learning the rhyme, say two phrases out loud, continue the phrases silently, and then, when signaled, continue the rhyme out loud.	Fish made with rag wrapping paper and crayons Percussion instrument	4 min.

<p><i>Sequential auditory memory</i></p> <p>Silently repeating the rhyme</p>		<p>Then only the rhythm of the rhyme is played, and the children imitate it slapping their thighs.</p>		
<p><i>Discrimination</i></p> <p>Presence and absence of music</p> <p>Timbre discrimination</p> <p>Auditory association</p> <p><i>Motor expression</i></p> <p>Body movements</p> <p><i>Symbolic representation</i></p>	<p>Game: "El tiburón" (The Shark)</p>	<p>While music plays, children act out fish swimming. When it stops, a shark (one of the children) chases them.</p> <p>Then the children make two groups. One group is of golden fish, who go out to swim only when the melody is played on a certain instrument. The other group is of beta fish, who swim only on hearing another instrument.</p> <p>The children are then told to make a mark on a piece of paper when they hear the melody on the instrument for the golden fish; and when they hear it played on the instrument for the beta fish, to act it out with movements.</p>	<p>Background music</p> <p>Sheets of paper</p> <p>Crayons</p>	<p>8 min.</p>
<p><i>Motor expression</i></p> <p>Body movements</p>	<p>Song: "Las olas del mar" (The Waves of the Sea)</p>	<p>While singing, they make undulating arm movements that "move them to the shore."</p>	<p>Song: "Las olas del mar"</p>	<p>4 min.</p>
<p><i>Sequential auditory and visual memory</i></p> <p>Repeating sequence of activities</p> <p><i>Motor expression</i></p> <p>Acting out everyday activities</p> <p>Attention</p>	<p>Song: "San Serafín del Monte" (St. Serafín of the Mountain)</p>	<p>When the trip is over, they clean up and change clothes to go home, doing the corresponding movements in sequence: washing, drying off, getting dressed, combing hair, according to the words of the song. Then only the melody is heard, and they do the movements in order. Illustrations are used to support learning. Finally, they do the movements without the illustrations, with the melody alone.</p>	<p>Mexican children's song: "San Serafín del Monte"</p> <p>Illustrations</p>	<p>6 min.</p>
<p><i>Motor expression</i></p> <p>Acting out everyday activities</p>	<p>Exit with song: "Un cochecito compró papá" (Daddy Bought a Little Car)</p>	<p>During the song, the children hold hands in twos or threes, "get in the car," and leave the classroom. They also act out motions of driving a car.</p>	<p>Song: "Un cochecito compró papá"</p>	<p>2 min.</p>