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# The Efficacy Of Singing In Foreign-Language Learning

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# THE EFFICACY OF SINGING IN FOREIGN-LANGUAGE LEARNING

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## Abstract

This study extends the popular notion that memory for text can be supported by song to foreign-language learning. Singing can be intrinsically motivating, attention focusing, and simply enjoyable for learners of all ages. The melodic and rhythmic context of song enhances recall of native text; however, there is limited evidence that these benefits extend to foreign text. In this study, Spanish-speaking Ecuadorian children learned a novel English passage for two weeks. Children in a *sung* condition learned the passage as a song and children in the *spoken* condition learned the passage as an oral poem. Children were tested on their ability to recall the passage verbatim, pronounce English vowel sounds, and translate target terms from English to Spanish. As predicted, children in the sung condition outperformed children in the spoken condition in all three domains. The song advantage persevered after a six-month delay. Findings have important implications for foreign-language instruction.

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## Dedication

I would like to dedicate this Masters Thesis in memory of Mr. Francois Catlin. His ‘unique’ teaching methods inspired the ideas for this research. It is thanks to him that I will never forget the lyrics to “Victime de la mode” by Mc Solaar. I also dedicate my project to the children of Puerto Lopez who will hopefully never forget the lyrics to “Functions of the Face” by The Short & Curlies.

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## Introduction

*"I would teach the children music, physics and philosophy, but the most important is music, for in the patterns of the arts are the keys to all learning."*

- Plato

Many individuals can anecdotally recount an example of how song has helped them to learn and remember information. Whether it is a song about the body parts or the alphabet set to music, singing is often used in the classroom as a means to facilitate learning. Group singing in the classroom can be both hedonically and cognitively stimulating. Singing in the classroom creates a positive and motivating learning atmosphere (Paquette & Rieg, 2008). Engaging children with group singing supports pro-social behavior (Kirschner & Tomasello, 2010) and encourages confidence and participation by creating a risk-free and enjoyable environment to learn new information. Musical activities in the classroom capture attention and enhance levels of engagement (Bird, 2008; Sandberg, 2009). When auditory distractions are present, children are more likely to attend to a musical story than a spoken story (Wolfe & Noguchi, 2009). The rhythmic and melodic information of song may foster efficient encoding, rehearsal, and retrieval when learning passages of text (Calvert & Tart, 1993; Wallace, 1994). The purpose of the current study was to assess the efficacy of song to support the recall of foreign-language words, as well as other aspects of foreign-language learning such as pronunciation and comprehension in children. The current study will also explore the retention of recall and comprehension after a six-month delay.

**Effect of Song on Recall**

The use of song in facilitating recall of new information has been demonstrated repeatedly in the literature using adult participants (Calvert & Tart, 1993; Rainey & Larsen, 2002; Wallace, 1994). Wallace (1994) prepared both spoken and sung renditions of 80 to 85 connected words from a folklore ballad. Participants were each exposed to one of the two renditions and were immediately asked to recall verbatim as much of the passage as possible. Those who were exposed to the sung rendition recalled a greater percentage of the passage than those who heard the spoken rendition. It was noted that participants in the sung condition more often used structural characteristics pertaining to rhythm to support recall. For example, they tended to produce the correct number of syllables, even when the syllables constituted incorrect words.

Research has shown that recall of text is superior when the presentation is spoken rhythmically with a background beat as compared to a conventional manner of speaking (Wallace & Rubin, 1988). When rhythm is emphasized, individuals may be better able to utilize structural characteristics such as syllabic stress, line breaks, and phrasing to help trigger memory for text. For example, rhythmic poems such as “Humpty Dumpty” tend to be easily memorized by children despite not having a melody. If the mnemonic support that song provides is due to its structural characteristics, then rhythmic speaking should hold nearly the same mnemonic value as song. However, song is encompassed by more than just the rhythm; it contains a sequence of tones that generate melodic and tonal structure. The melodic aspects of a song may provide additional cues that support memorization of text. Wallace (1994) found that text presented as song led to superior recall compared to text spoken rhythmically. The addition of melodic and tonal information helps to clarify the organization of text. Individuals are able to utilize the pitch information to discriminate between syllables and segment word boundaries in continuous

foreign text (Schön, Boyer, Moreno, Besson, Peretz & Kolinsky, 2008). The beneficial effect of song on recall has also been shown with text that would otherwise be unconnected (Rainey & Larsen, 2002). For example, it is commonplace in English-speaking cultures to memorize the 26 letters of the English alphabet by embedding the letters in a song that follows the melody of the familiar tune "Twinkle twinkle little star."

***Counterargument: Rate of Presentation***

One possible explanation of the song advantage on recall concerns differences in the rate of presentation of the target information. Typically, text is presented at a slower rate in song than in speech. This slower rate may allow more time for encoding and rehearsal (see for example, Posner, 1963). Kilgour, Jakobson and Cuddy (2000) found that the song advantage disappeared entirely when the presentation rates of sung and spoken conditions were equated. However, a subsequent study by Rainey and Larson (2002) found a song advantage despite equating for presentation rate. One important difference between the two studies was that Kilgour et al. (2000) used a song that was novel to participants, while Rainey and Larson (2002) used a song previously familiar to participants.

The mnemonic benefits of song tend to become increasingly useful as a melody becomes more familiar and predictable (Wallace, 1994). When a song is novel, differences in recall between sung and spoken conditions tend to be small. Individuals learning a new song must accomplish the dual task of learning both a novel melody and novel text at the same time. As a result, the song advantage might not be available in the first stages of learning (Racette & Peretz, 2007). However, the challenges of the dual task appear to subside with each subsequent repetition of the melody. Calvert and Tart (1993) found that a single exposure to a passage produced comparable patterns of recall between spoken and sung renditions, but repeated exposure to the passage strengthened the advantage of the sung rendition on recall. Wallace

(1994) examined the benefits of melodic repetition by exposing participants to three verses of text. Participants were assigned to one of three groups: one group heard the three verses of text spoken, one group heard each verse sung to different melodies, and one group heard each verse sung to a single melody (3 melodic repetitions). Of the three conditions, the single melody condition resulted in the greatest recall accuracy. When the melody and rhythm are familiar, it is theorized that the lyrics become integrated within the context of the song and are stored as one memory representation (Serafine, Davidson, Crowder & Repp, 1986). Though some evidence suggests that melody and lyrics are processed independently in the brain (Besson, Faïta, Peretz, Bonnel & Requin, 1998; Bonnel Faita, Peretz & Besson, 2001), studies have shown that recognition of song is stronger when the original melody is paired with the original lyrics then when these components are mismatched (Serafine, Davidson, Crowder & Repp, 1986). It may be this integration of melody and lyrics that provide the facilitating effect of song on recall (Purnell-Webb & Speelman, 2008). Thus, the song advantage may rely on the integration of lyrics and melody that develops through repeated exposure.

***Long-term Recall***

Auditory images are used to store foreign sound patterns, such as second-language phonemes, until long-term memories are stored (Baddeley, Gathercole, Papagno, 1998). These images play an essential role in learning foreign-language words by continuously repeating the novel auditory information in a rehearsal loop. Songs tend to repeat automatically as an auditory image also known as an *earworm.* When a song is repeating as an auditory image, the lyrics are also being rehearsed. Calvert and Tart (1993) reported that participants who had learned a song described the rehearsal as covert (imagery) more often than overt (singing out loud). This rehearsal may support the consolidation of recall of foreign-language words over long-term delays.

The ability of song to support text recall has been demonstrated to persevere following various lengths of time delay. Recall success persists following short, 15-minute delays (Kilgour, Jakobson, Cuddy, 2000; Wallace, 1994), and extends to longer delays on the order of weeks and months (Calvert & Tart, 1993; Rainey & Larsen, 2002). Rainey and Larsen (2002) found that participants who were taught the names of baseball players embedded within a familiar melody took fewer trials to relearn all the names after one week than those who had learned the material without song. Evidence has been found that individuals in a sung condition demonstrate continual superior recall of a passage after a five-week delay than those who learned the verbal version of the passage (Calvert & Tart, 1993).

Text learned through song as a child even appears to persevere into adulthood. Calvert and Tart (1993) found that adults who had frequently seen a sung televised vignette of 'The Preamble to the Constitution' during childhood were more successful at recalling the words verbatim than those who had only learned the preamble through classes at school. The individuals who responded that they had frequently seen the vignette were likely to use singing as their retrieval strategy during the experiment, which suggests their recognition of the song advantage.

There are many studies in the literature supporting the notion that song can support the recall of native language text in adults. The current study fills a gap in the literature by examining how song facilitates recall of a foreign-language passage in children and whether the song advantage under these circumstances will persist over time.

## Other Potential Effects of Song on Foreign-Language Learning

### *Pronunciation*

Pronunciation of foreign vowel sounds may also be supported through song. Vowels are

characterized by their stable frequency information and tend to be lateralized to the right hemisphere of the brain, as is music (Kolinsky et al., 2009). Since a melodic contour is built upon points of stable frequency, vowel sounds are more evident in singing than in speaking. Research has shown that vowel sounds tend to be more integrated with melodic information than consonants, which are processed independently (Kolinsky et al., 2009). The rehearsal of the unfamiliar sounds in song, specifically the exaggerated vowel sounds that carry a melody, may contribute to a more successful reproduction of these sounds. The current study proposes that the integration of vowel sounds with the melody will support pronunciation abilities for children in the sung condition compared to those in the spoken condition.

### *Comprehension*

Another possible language component that may benefit from learning through song is comprehension. To date, there is a paucity of research demonstrating how comprehension of foreign vocabulary may be supported by song. Some research has shown that learning foreign vocabulary through song will result in only a superficial level of processing. Although repeated exposure to a song in a foreign language may facilitate a verbatim recall of the lyrics, children in one study were still unable to understand the meaning of the central story (Calvert & Billingsley, 1998). However, this study did not explicitly provide the children with a word-to-word translation from the foreign language into the native language. Previous studies have found success in employing a method of directly associating a word in a foreign language to the corresponding native language word, called direct word-associate learning (de Groot, 2006). In order to successfully translate a foreign-language word, individuals must form a connecting memory representation between the native language word and the foreign-language word. It is suggested that integrating the foreign word with a melody may provide additional support for creating this representation. The current study will investigate whether learning through song can

support comprehension of second language vocabulary, while using a direct word-association method.

**Current Study**

Though many studies have demonstrated the use of song as a tool for adults to remember text in a native language, there are currently few studies exploring how song can aid in the foreign-language development of children. The current study investigated how song can support foreign-language learning including measures of pronunciation, recall, and comprehension of a foreign language. Over a two-week period, Ecuadorian children in two classes were taught a lyrical passage. One class learned the lyrics as a song and the other learned the lyrics as a spoken poem. The passage was translated using a direct word-association method. The children were tested on their ability to pronounce foreign vowel sounds, recall the lyrics verbatim, and comprehend the foreign passage terms assessed through the translation of target terms from English into Spanish. It was hypothesized that children in the sung condition would outperform children in the spoken condition across measures of pronunciation, recall and comprehension.

A follow up study was conducted to determine the success of recall and comprehension of the lyrical passage after a six-month delay. It was hypothesized that children who had learned the passage via song would retain a higher level of recall and comprehension than the children who had learned via spoken poem.

## Methods

### Participants

Thirty-eight Spanish-speaking children from the Jaime Roldós Elementary School in Puerto López, Ecuador participated in this study. Children from two classes were recruited for participation. The spoken condition consisted of 22 students, 9 females and 13 males. The sung condition consisted of 16 students, 10 females and 6 males. Children ranged in age from 9 to 13 years. The age of children in the spoken condition ($M$=11.4, $SD$=1.1) was higher than the age of the children in the sung condition ($M$=10.4, $SD$=1.0), $t$ (36) =3.1, $p < .05$. No child was absent for more than one of the learning sessions. All of the children listed Spanish as their primary language. Although almost all children had some passive exposure to English through popular media (e.g., TV and music), none of the children had experience with formal English instruction. All of the children had been exposed to limited music instruction, in the form of the school marching band.

### Materials

A four-line lyrical passage from the song 'Functions of the Face' (The Short & Curlies, 2009) was selected as the test material. The passage contained 29 words in total (see Appendix A). A graduate student in the Spanish department at Ryerson University coded the passage for all vowel and consonant sounds deemed foreign for Spanish learners. For example, the English word 'why' would be read orthographically as 'wee' in Spanish. From these more difficult sounds, 15 vowel sounds and 15 consonant sounds were randomly selected to test the children on their ability to pronounce foreign sounds (see Appendix B). In addition, ten English terms were selected to test translation: *table, looks like, daddy, feet, smell, gross, taste, hear, playing, notes.* The selected terms were deemed important to the meaning of the sentence and likely to be novel to participants (i.e., prepositions were omitted, as were words common to both languages, such

as piano or lasagna).

Children's reproductions of the lyrics were recorded using an Olympus Digital Voice Recorder, VN- 3200PC.

**Procedure**

The school principal sent home letters to the children's parents containing the following: the information sheet about the study, a demographic questionnaire, and the parental consent form (see Appendix C). All parents completed the demographic questionnaire and provided consent. The children were informed orally about the procedures relevant to their condition and their rights as participants. All children provided verbal assent to participation.

Children in both conditions participated in a total of four learning sessions and three testing sessions over a two-week period, and then a follow up testing session six months later. During the learning sessions, all children were provided with a handout containing each line of passage along with the Spanish translation written in italics under each line (Refer to Appendix A). As well, the entire passage was written out on the white board. Words were pointed out as they were practiced at the front of the class. The first learning session lasted one-hour. The experimenter taught the children in both classes the lyrics with the assigned manipulation: sung with a melody, or spoken with the rhythm of a poem. The first exposure of the lyrics was always presented without interruption so the children could hear the passage in its entirety. Subsequent exposures involved breaking each phrase down into two sections: section A and section B. A point of melodic and metric closure between sections A and B in the sung phrases allowed for a natural separation of the sections. Section A of each line always contained 5 syllables and in the sung condition had the same melodic contour. Each line was taught in a 'repeat-after-me' method whereby the experimenter stopped at the end of each section in order for students to repeat back the lyrics. Lines were then built back to their whole and repeated again. At the end of

each line, the experimenter translated the target terms from English into Spanish using the direct word-association method. In the sung condition, the lines were practiced with the accompaniment of the experimenter's guitar.

For the following three learning sessions, the passage was repeated and practiced in the same 'repeat-after-me method' utilized in the first session. In order to minimize experimenter bias, each of these learning sessions were 20 minutes in length and controlled for the speed of presentation and the number of repetitions. The experimenter remained mindful of the level of engagement and energy when teaching to maintain the highest level of control between conditions. For the remainder of each hour-long session, children participated in their regular English lesson.

The first testing session evaluated pronunciation and took place immediately following the third learning session. Children were individually asked to reproduce the passage with the support of the same handout they were given during the learning sessions. Children were not given specific instruction of production mode (sung or spoken). If children in the sung condition asked how, they were told to reproduce the passage in whatever mode they were most comfortable. Following these instructions, 12 of the 16 children in the sung condition chose to sing the passage.

The second testing session took place immediately following the fourth learning session and was used to assess recall of the passage. The experimenter asked the children individually to recall as much of the passage verbatim as they could without the support of the handout. Again, children were not given specific instruction of production mode (sung or spoken). If the child inquired, they were told to reproduce the passage in whatever mode they were most comfortable. All 16 of the children in the sung condition chose to sing back the passage.

The third testing session took place one day after the second testing session and served as

a verbal test of word comprehension. The experimenter repeated the English word twice and the child was asked to provide the translation of the word in Spanish. Each child was permitted two attempts to translate the term.

After a delay of six-months without any formal instruction, thirteen of the children from the original study were retested on their long-term recall of the lyrical passage. Seven children (four males and three females) were from the *spoken* condition and six children (three males and three females) were from the *sung* condition. Children were individually asked to recall the lyrical passage they learned six months earlier. The first attempt to reproduce the passage involved no support from the experimenter. Three of the children in the sung condition were able to successfully reproduce the melody in its entirety without any support. With the exception of these three children from the sung condition, all other children were invited to make a second attempt, whereby the experimenter prompted recall by reproducing section A of each line in the same mode as the original condition (spoken or sung). In the same follow-up testing session, children were asked to translate the same ten target terms from English to Spanish. Following the same method employed in the initial comprehension test, the experimenter repeated the English word twice and the child was asked to provide the translation of the word.

All recall, pronunciation, and translation attempts were audio recorded. The children were compensated with a nominal gift after each of the testing periods. See Figure 1 for a flow chart of the procedure.

## Results

All tests of significance are two-tailed with an alpha level of .05. Any post-hoc comparisons were corrected with the Bonferroni adjustment. Two independent raters analyzed the data: the experimenter and a blind rater. An inter-rater reliability was assessed for each language component being analyzed with the exception of comprehension. See table 1 for means and standard deviations of pronunciation, recall, and comprehension scores.

### Pronunciation

Three children from the spoken condition and three children from the sung condition were absent during the pronunciation testing. Each child was awarded a score out of a maximum of 15 correctly pronounced foreign vowel sounds and 15 correctly pronounced consonant sounds. A mixed design ANOVA was conducted to determine any differences found in pronunciation, with method of instruction (sung vs. spoken) as the between-subject condition and speech sound (vowel vs. consonant) as the within-subject condition. As an inter-rater reliability was found to be high (r= 0.86, p<. 001), the data from only one judge was used for subsequent analysis. Overall, the consonants (*M*=7.59, SD=2.55) were better pronounced than the vowels (*M*=4.91, SD=2.84), $F(1, 30) = 21.94$, $p < .001$. The interaction between speech sound and condition was also significant, $F(1, 30) = 14.13$, $p < .01$. Post hoc tests revealed that although there were no differences between conditions for the pronunciation of consonant sounds $t(30) = .18$, *ns*, the children who practiced the passage as song were better more successful at the reproduction of the correct vowel sound (*M*=7.23, *SD*=2.62), than those who practiced the passage as a spoken poem (*M*=3.32, *SD*=1.67), $t(30) = 5.18$, $p < .001$ (see Figure 2).

**Recall**

Three children from the spoken condition and two children from the sung condition were absent during the recall testing. The recorded responses of the recall trial were scored out of a maximum of 25 points. Scoring criteria were modeled after previous experiments that have compared the efficacy of song vs. speech for text recall (Wallace, 1994; Kilgour et al., 2000). Participants were awarded points for words and phrases recalled in the correct order of the original passage. Words considered to be unimportant, such as articles and conjunctions, were omitted from analysis. The children were only awarded points for intelligible vocabulary. Because inter-rater reliability was high, $r = .85$, $p < .001$, subsequent analysis was restricted to assessments from one rater only. An independent t-test demonstrated that children in the sung condition ($M$=7.8, $SD$=3.6) recalled more of the sequenced words than those in the spoken condition ($M$=2.47, $SD$ =2.27), $t(31) = 5.26$, $p < .001$ (see figure 3). When data were reanalyzed without consideration of the correct order, the same song advantage was evident. Gender differences were explored but differences were not found in the spoken condition, $t(17) = 1.61$, *ns* nor were they found in the sung condition, $t(12) = -.15$, *ns*.

***Word position***

To test for a word position effect, recall data was subjected to a mixed design, two-tailed ANOVA with method of instruction (sung vs. spoken) as the between-subject condition and section (A vs. B) as the within-subject condition. Section A contained a total of 14 words and section B contained a total of 11 words. To facilitate comparison across sections, we determined the percentage of words recalled for each section. There were fewer words recalled in section A ($M$=1.79, $SD$=1.8) than in section B ($M$=2.97, $SD$=2.87), $F(1, 31) = 23.42$, $p < .001$. The interaction between word position and condition was significant, $F(1, 31) = 18.1$, $p < .001$. Post-hoc t-tests revealed that although the spoken condition led to a comparable number of words

recalled in both sections, $t(18) = -.71$, ns, the sung condition led to fewer words recalled in section A ($M$=17.86, $SD$=14.5) than in section B ($M$=48.7, $SD$=24.6), $t(13) = -4.42$, $p < .001$, suggesting that there was a bias of word position on recall in the sung condition (see Figure 4).

***Rhythmic Structure***

To test for utilization of rhythmic information, recall data was scored for the number of syllables that were correctly reproduced. The number of syllables reproduced was subtracted from the correct number of syllables (39 syllables) from the original passage in order to obtain a measure of syllable or rhythmic error. This assessment allows for incorrect, or nonsense words that still maintain the correct number of syllables. An independent t-test demonstrated that children in the sung condition ($M$=8.07, $SD$=9.44) had fewer syllable errors than the children in the spoken condition ($M$=23.37, $SD$ =7.76), $t(31) = -5.01$, $p < .001$. This demonstrated that children in the sung condition learned more of the rhythmic information implied by the number of syllables recalled than those in the spoken condition.

**Comprehension**

Four children from the spoken condition, and one child from the sung condition were absent during the comprehension testing. The participants were scored on their ability to translate the target English words taken from the passage with a maximum score of 10 points. Children were awarded one point for each correctly translated term. Half points were awarded to children who were able to correctly translate the term as a second attempt. Children in the sung condition ($M$=4.03, $SD$=1.67) were found to be more successful at translating English words than those in the spoken condition ($M$=2.69, $SD$=1.80), $t(31) = 2.21$, $p < .05$ (see figure 5).

**Long-term Recall**

The follow-up analyses were conducted using the same protocol as the initial recall analyses. Because of the high inter-judge reliability score (r= 0.97, p< .001), the succeeding analyses were based on one judge only. Analyses illustrated that without the support of any prompting, children from the sung condition (*M*=8.83, *SD*=6.77) were more successful at recalling the passage than the children from the spoken condition (*M*=0.43, *SD*=0.79) after a delay of 6 months, $t(5.116) = 3.03$, $p < .05$. See Figure 6 for recall success of each individual over time.

To test for the utilization of the prompt, the number of words recalled before the prompt was compared with the number of words after the prompt. This analysis was limited to responses requiring the support of the prompt from the experimenter. Analyses revealed that fewer words were recalled before prompting (*M*=1.60, *SD*=0.87) than after prompting (*M*=3.3; *SD*=1.49), $F(1, 8) = 12.69$, $p < .01$. The interaction between support of the prompt and condition was also significant, $F(1, 8) = 8.78$, $p < .05$. Post-hoc t-tests revealed that children in the spoken condition did not improve recall scores following a prompt, $t(6) = -2.12$, ns. The small sample size limited further analyses of the sung condition; however, a positive trend illustrated that children in the sung condition utilized the prompt to improve recall scores (see table 2). No differences were found in the sung condition between initial recall scores and post-prompting recall scores $t(5) = 1.5$, *ns;* however, children in the spoken condition decreased recall success significantly between initial recall (*M*=2.86, *SD*=2.54) and post-prompting recall (*M*=0.86, *SD*=0.69), $t(6) = 2.45$, $p < .05$. See Figure 7 for a comparison of initial scores, pre-prompting scores, and post and/or no prompting scores.

No differences in ability to translate target terms were found between conditions after a six month delay, $t\ (12) = -1.79$, *ns.*

## Discussion

The findings of the present study provide support, and extend to foreign-language learning, the popular notion of using song in the classroom. As expected, the students who learned a foreign-language passage via song were more successful at reproducing the foreign vowel sounds, recalling the passage verbatim, and accurately translating the target English words into Spanish than the children who learned the same passage via spoken poem. The successful recall of the sung condition persevered following a six-month delay. The song advantage may be due to a range of cognitive and hedonic factors.

### Integration of lyrics and melody

Samson and Zatorre (1991) proposed that songs are encoded in two different brain areas; the left temporal lobe is thought to be responsible for the processing of lyrics, while the right temporal lobe is responsible for the processing of melody. However, it is suggested that the lyrics and melody become integrated resulting in one rich memory representation. Previous research has demonstrated that recognition of song is stronger when the original melody is paired with the original lyrics compared to when these components are mismatched (Serafine et al., 1986).

The song advantage for recall may be due to the integration of lyrics and melody (Purnell-Webb & Speelman, 2008). The dual encoding of lyrics and melody become connected in such a way that recall of one will facilitate the recall in the other (Ginsborg & Sloboda, 2007). In addition to the advantage at initial testing, the suggested integration of lyrics and melody provides an explanation for the differences seen in utilizing a prompt to support recall following a six-month delay. Though recall scores of the children who learned a spoken poem did not improve following the prompting of section A, the children who learned the song were able to

utilize the prompt leading to an enhancement of recall success. Prompting the children with both the text *and* the melody of section A provided a richer set of cues allowing for more successful recall of the subsequent section of each line.

Research has shown that vowel sounds tend to be more integrated with melodic information than consonants, which are processed independently (Kolinsky et al., 2009). The enhanced ability of the children in the sung condition to reproduce the correct vowel sounds, but not the consonant sounds, provides further support of this hypothesis. Though all children heard the same number of repetitions of the correct pronunciation of each foreign vowel sound, the children who practiced singing the text with a melody were better able to remember and reproduce the accurate shape of the vowel compared to children who practiced speaking the text. The children in the spoken condition tended to read the English words with orthographical Spanish pronunciations. Practicing the elongated vowel sounds that occur in song seems to have provided the children with superior training for these foreign-language sounds.

The children in the sung condition may have also used the integrated lyrics and melody to support translating the target terms. Distinct from the study by Calvert and Billingsley (1998) who found that children were only able to superficially learn the foreign-language passage through song, the current study found sufficient evidence to support a link between song and foreign vocabulary comprehension. The integration of melody and vocabulary may have assisted the children in the translation of the target terms in much the same way as learning foreign vocabulary can be supported by the dual encoding of a pictorial context. Many mnemonic techniques, such as the method of loci, rely on this interaction of text and image. The melody of a song may offer a similar interaction and assistive learning method. When asked to translate a target term, many of the children would sing through the lyrical passage quietly to themselves until they located the section of each line that the term was situated. The children would then

attempt to systematically translate the target word from the Spanish translation of each line that had been provided. For example, if the target term tested was *feet*, the children would know this came from the "feet smell gross" melodic section and might guess the word to mean one of these three terms; this resulted in a greater success rate. Conversely, the children in the spoken condition did not systematically solve the translation but more often provided a random guess when asked to provide the Spanish equivalent of an English word. They often guessed the words "lasagna" or "piano," given that those words were the same in English and in Spanish. Locating the target term through integration of lyrics and melody gave the children in the sung condition the tools to more methodically translate the target terms than those in the spoken condition.

**Structural Organization**

Another factor contributing to the song advantage may be the rhythmic, melodic, and contextual organization. Consistent with findings from Calvert and Tart (1993), the majority of the children in the sung condition chose to sing the song during recall testing. They may have used the melodic and rhythmic structural cues as a retrieval strategy to support recall. They were better able to employ the structure of the rhythm by maintaining the correct number of syllables of each line. When asked to recall the passage, the children would sing through the melody and tended to use nonsense words to fill in unremembered gaps. They often remembered words chunked together, for example "feet smell gross," that were strongly connected through the structure of the song. In addition, the children who learned the song were more successful at remembering the sequence in which each line appeared from the original passage than those who learned the poem. The distinguishing melody in each line provided children in the sung condition with additional cues to remember the correct order. Although the spoken condition involved a rhythmic component, there were fewer structural cues available relative to the sung condition. Moreover, children in the spoken condition seldom used the available rhythmic structure to

support retrieval; they were more likely to repeat random words from the passage and in no particular order.

**Auditory Imagery**

The auditory component of the working memory known as the phonological loop is the mechanism involved in the fabrication of auditory images, the recollection of an auditory experience that resembles the original acoustic event (Baddeley & Hitch, 1974). These auditory images are used to temporarily store foreign sound patterns, such as foreign-language phonemes, until long-term memories are stored (Baddeley, Gathercole & Papagno, 1998). They play an essential role in learning foreign-language words by continuously repeating the novel auditory information in a rehearsal loop. This loop may also be responsible for the phenomenon of repeatedly hearing portions of a song as an auditory image, more commonly known as the *earworm effect*. The generation of this musical auditory image is hypothesized to be automatic (Kraemer et al., 2005). When a song is unintentionally repeating as an auditory image, it is also unintentionally being rehearsed. Evidence suggests that an auditory image holds a similar mnemonic value as a visual image in a task of free recall (Sharps & Price, 1992).

The generation of automatic auditory imagery may be a principal reason for achievements in foreign-language development found in the current study. It has been found that individuals will imagine the continuation of a familiar song during a silent pause (Kraemer et al., 2005). As a result, lyrics to a song are likely rehearsed as an auditory image during periods of silence. It is noted that this rehearsal of song may have supported the consolidation of memories for both the recall and the pronunciation of foreign vocabulary found in the current study.

The interaction between condition and word position (section A and section B) presents evidence to support this idea. The children in the sung condition may have been automatically

rehearsing the most recently heard words in the phonological loop during the short pause in between each line, which resulted in a higher recall in the section B of each line. On the contrary, a consistent recall success for each section in the spoken group demonstrates that there was no additional rehearsal for either section. However, there are alternative explanations that can account for this observation. For example, the melody of section A is identical in each line. This lack of distinctiveness may have made it more difficult to recall the different vocabulary for each line resulting in the poorer success rate of section A. As section B contains a distinct melody for each line, children in the sung condition may have been better able to segregate this section of each line and successfully recall the word chunks in section B. Nevertheless, the children in the sung condition produced more successful recall percentages in both sections than the children in the spoken condition who were not provided any of the addition melodic cues to present (or refuse) the distinction of each line.

The trend towards exaggerated differences in recall between spoken and sung conditions after six months was due to deterioration in recall for the spoken condition, rather than any change in the sung condition. On the basis of questionnaire data collected five weeks after a song was learned, Calvert and Tart (1993) reported that participants engaged in covert rehearsal (imagery) more often than overt rehearsal (singing out loud). Thus, the maintenance of recall in the sung condition in the current study may be the result of covert rehearsal.

Auditory imagery of the song may have also supported the comprehension of the passage. Learning foreign vocabulary can be facilitated with the contribution of a visual image to enhance the context of a foreign word (Omaggio, 1979). It is possible that a ‘melodic image’ acts in much the same way. The melodic imagery provided by song may have played a supportive role in creating a memory representation of each foreign word for the children in the sung condition. The additional rehearsal of the song through auditory imagery may also be a reason for the

superior abilities of the children in the sung condition to translate target terms than children in the spoken condition.

Despite the positive findings at initial testing, there were no differences found in comprehension abilities following a six-month delay. Consistent with the literature, the song appears to have been encoded into long-term memory at a superficial level (Calvert & Billingsley, 1998). A lack of practice of the translations over the six-months may have limited the maintenance of the comprehension success for both conditions. The ability to translate foreign vocabulary is a crucial element when learning a foreign language and may require more frequent practice to ensure deeper levels of encoding. A better way to utilize song to support comprehension in the long-term would be to incorporate the direct word-association translations within the lyrics. For example, the song "Que Sera, Que Sera" contains the translation "whatever will be, will be" in the subsequent line. In this manner, the direct translation of the passage will be rehearsed and encoded simultaneously with the lyrics. Though learning to sing a song in a foreign language seemed to have supported comprehension in the short-term, more research would need to be conducted to determine the effects of song on comprehension in the long-term.

**Hedonic value**

One further advantage of song on learning is the hedonic value that singing adds to a language class. Singing tends to increase engagement, motivation, and enjoyment in classroom activities (Sandberg, 2008). Though the current study did not incorporate an objective measure of hedonic value, several subjective observations are worth noting. Higher levels of attention and enthusiasm were observed in the sung condition than in the spoken condition. Children in the sung condition tended to smile more during learning phases and showed excitement when the guitar was revealed to sing. They demonstrated a motivation to continue learning and to practice the song in the schoolyard without the support of the experimenter. During the recall testing

sessions, the children in the sung condition were comfortable singing back the passage and did so with ease. It is noted that one child said, “This will be so easy!” Conversely, children in the spoken condition were easily distracted and quickly began to engage in their own conversations during the learning phase. The experimenter reported a difficulty holding the attention of these children and noted enthusiasm waning with each subsequent repetition. During recall testing sessions, the children in the spoken condition struggled with the task; many children asked, “How do you want me to do this?”

After the six-month delay, the experimenter noticed a continued level of enthusiasm in the children of the sung condition. Numerous children approached the experimenter asking if they were going to learn more of the song. Some of the children even began to sing the song. However, in the spoken condition, most of the children did not even remember that a poem had been taught to them. When asked if he remembered the poem taught to him six months earlier, one child said, “Yes, I remember learning about the colours, the numbers… The poem? What poem?”

**Limitations and future research**

The current study has some limitations that should be considered when interpreting the results. Firstly, as the experimenter was the teaching the lyrical passage to both conditions, an experimenter bias may have had an influence on the results. To acknowledge this limitation, the experimenter remained mindful and attempted to preserve control across the conditions. Control was maintained through the speed of delivery and the number of repetitions of the passage. In addition, a third party who was blind to the hypotheses of the experiment completed all analyses of the data. In future research of this kind, the instructor should be blind to the hypotheses in order to fully eliminate the experimenter bias.

This study also contains a minor limitation in the heterogeneity between the two groups. The mean age is significantly higher in the spoken condition. This may have resulted in superior scores for this group, but the current trends were in the opposite direction, which further strengthens the findings. Future research on this matter should consider a within subjects design to limit the differences between groups.

Though this study provides encouraging evidence that song can be supportive when learning recall and pronunciation of English vocabulary, these findings are also limited in generalizing to all components of language. This paper is not suggesting that song be used as the sole teaching technique in an ESL classroom, but that it should be used as a supportive tool to complement conventional methods of teaching. More research will need to be conducted to determine whether singing can benefit learning of semantic and pragmatic components of language.

The findings of this study provide a strong basis that can lead to many future explorations of how song can support foreign-language development. Future studies should look at the ability of transferring the positive effects to new contexts. For example, in the current study, children who were taught via song also tended to use the singing as a retrieval method in the testing phase. Though this observation supports song being a useful retrieval strategy, it limits inferences of transferring the pronunciation success from singing to speech. Though children are able to correctly pronounce foreign vowel sounds when singing, future studies should explore whether this benefit will remain if children are asked to transfer these skills to speech.

Another future study should examine whether the translation of the vocabulary learned through song would transfer to a novel context. The children in the sung condition were able to systematically translate an isolated term using the integration of the melody and the previously

translated text (as in “feet smell gross” example described above); however, this does not allow inferences to whether they would recognize the same term in a different context.

The current study provides limited insight into whether cognitive or hedonic mechanisms are responsible for the gains. These may not be mutually exclusive systems and perhaps they are working in combination to support the advantage of song. The study was not designed to tease apart these constructs in order to determine accountability of differing mechanisms. Future studies should explore this relationship more thoroughly in order to determine how much of the benefits can be explained by cognition and how much is simply due to the hedonic nature of singing. Future research should consider taking a measure of enjoyment allowing for an ANCOVA analyses to hold this variable constant while cognitive analyses are explored.

**Conclusions**

As shown by Wolfe & Noguchi (2009), when auditory distracters are present, children are more attentive to a story told through song than through speech. Considering the level of auditory distraction present in a small schoolhouse in a developing country, group singing provided the students with an attention grabbing method to overcome the difficult demands of learning a foreign language. This study suggests that song supports learning at the encoding, the rehearsal, and the retrieval stages. These exciting results contribute to a growing body of literature emphasizing the importance of singing in the classroom. The technique is simple yet powerful and benefits can extend from recall, to pronunciation, to translation of foreign vocabulary. Whether the gain in learning is due to the cognitive stimulation, the hedonic motivation, or both; the results of this study provide educators with empirical evidence about the effectiveness of song in learning English as a foreign language.

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**Appendix A**

Lyrical passage provided to all participants

**Functions of the face** *(Las funcionas de la cara)*

**Why does a table // look like a table?**

(*Porque una mesa parece como una mesa)*

**And why do my daddy´s // feet smell gross?**

(*Y porque los pies de mi papa huele mal)*

**Why does lasagna // taste so delicious?**

(*Porque la lasagna sabe deliciosa)*

**And why can I hear the // piano playing notes?**

(*Y porque yo puedo escuchar las notas de un piano)*

**Appendix B**

Foreign sounds (marked italics and underlined) selected for the pronunciation test

| **Consonants** | **Vowels** |
|---|---|
| ***Wh***y | Wh***y*** |
| Doe***s*** | D***oe***s |
| Ta***bl***e | T***a***ble |
| Loo***k*** | L***oo***k |
| ***L***ike | L***i***ke |
| ***D***o | Lik***e*** |
| ***M***y | M***y*** |
| Da***dd***y's | F***ee***t |
| ***F***eet | T***a***ste |
| ***Sm***ell | Del***i***cious |
| ***Gr***oss | Delic***iou***s |
| Ta***st***e | H***ea***r |
| ***H***ear | Pl***a***ying |
| ***Pl***aying | Play***i***ng |
| ***N***otes | N***o***tes |

## Appendix C

Information Sheet, Consent Form, and Questionnaire given to parents

Queridos Padres o tutores

Nosotros les estamos escribiendo para pedirles permiso para que su hijo/a pueda participar en un proyecto sobre el canto y desarrollo de un lenguaje extranjero. Nosotros tenemos la intención de observar como la activa participación en actividades musicales como canto grupal, percusión, y atención a las letras en ingles tendrán el impacto en el desarrollo del vocabulario en Ingles en el niño/a. Esta investigación será realizada como una clase en Ingles en la escuela de su hijo/a durante las horas de clase durante el siguiente mes.

Nosotros le estaremos pidiendo a su hijo/a que recuerden las letras de una canción y el significado de unas palabras del ingles. A su vez, nosotros estaremos audio-grabando al niño/a para determinar si el aprendizaje del nuevo idioma por medio de la canción ayudo con el pronunciamiento de palabras extranjeras.

Toda la información coleccionada será mantenida estrictamente confidencial. Aunque no existe ningún riesgo conocido con la participación de este estudio, la participación del estudio es voluntaria y si hijo/a tiene la libre elección de no continuar con su participación en cualquier momento del entrenamiento. Los datos colectados hasta esos momentos serán destruidos.

Haga el favor de indicar en la parte inferior si usted le da permiso a su hijo/a para poder ser parte en este estudio. Su cooperación será gratamente apreciada. Si usted tiene alguna pregunta, sírvase contactar a la investigadora principal, Arla Good (agood@psych.ryerson.ca)

Gracias!

---

Yo autorizo a mi hijo/a ser parte de este proyecto de investigación, entiendo que lo estoy haciendo voluntariamente, que la confidencialidad será mantenida y que ambos, mi hijo/a y yo tenemos el derecho de retirarnos del estudio en cualquier momento usando los medios resumidos en la invitación de participar.

Si, Yo autorizo que me hijo/a (nombre) _____ participe en este trabajo de investigación.

No, Yo no deseo que mi hijo/a (nombre) _____ participe en este trabajo de investigación.

Firma del Padre/Tutor : _____ Fecha: _____

*Padres / tutores Cuestionario*

Cuál es la fecha de nacimiento de su hijo/a? Día ____ Mes____ Año ____

Su hijo es niño o niña? Masculino ____ Femenino ____

Es español el idioma principal de su hijo? Si ___ No ____

Si no lo es, cual es su idioma principal? _____

Alguna vez su hijo ha recibido clases en ingles? Si____ No_____

Su hijo/a tiene alguna discapacidad de idioma o problemas de habla? Si___ No ___

Si la respuesta es Si, por favor describa brevemente cual es la discapacidad o el impedimento

_____

Su hijo/a tiene hermanos y/o hermanas? Si_____ No _____

Su hijo ha tenido alguna vez instrucciones de música? Si____ No ____

Si es así, por cuantos años? _____, y que instrumento? _____

Cuál es su relación con el niño/a _____

Cuál es su principal idioma? _____

Se hablan otros idiomas en el hogar? Si ___ No _____

Si es así, Que idiomas? _____

**Table 1**

*Means and standard deviations of recall, pronunciation, and comprehension scores*

| | | N | Mean | SD |
|---|---|---|---|---|
| Recall | Spoken | 19 | 2.47 | 2.27 |
| | Sung | 15 | 7.8 | 3.6 |
| Pronunciation | Spoken | 19 | 3.32 | 1.67 |
| | Sung | 14 | 7.23 | 2.62 |
| Comprehension | Spoken | 18 | 4.03 | 1.67 |
| | Sung | 16 | 2.69 | 1.8 |

**Table 2**

*Recall scores for each participant in the sung condition before and after prompt*

| Participant | Before Prompt | After Prompt |
|---|---|---|
| 1 | 20 | No prompt needed |
| 2 | 12 | No prompt needed |
| 3 | 8 | No prompt needed |
| 4 | 8 | 15 |
| 5 | 5 | 6 |
| 6 | 0 | 7 |

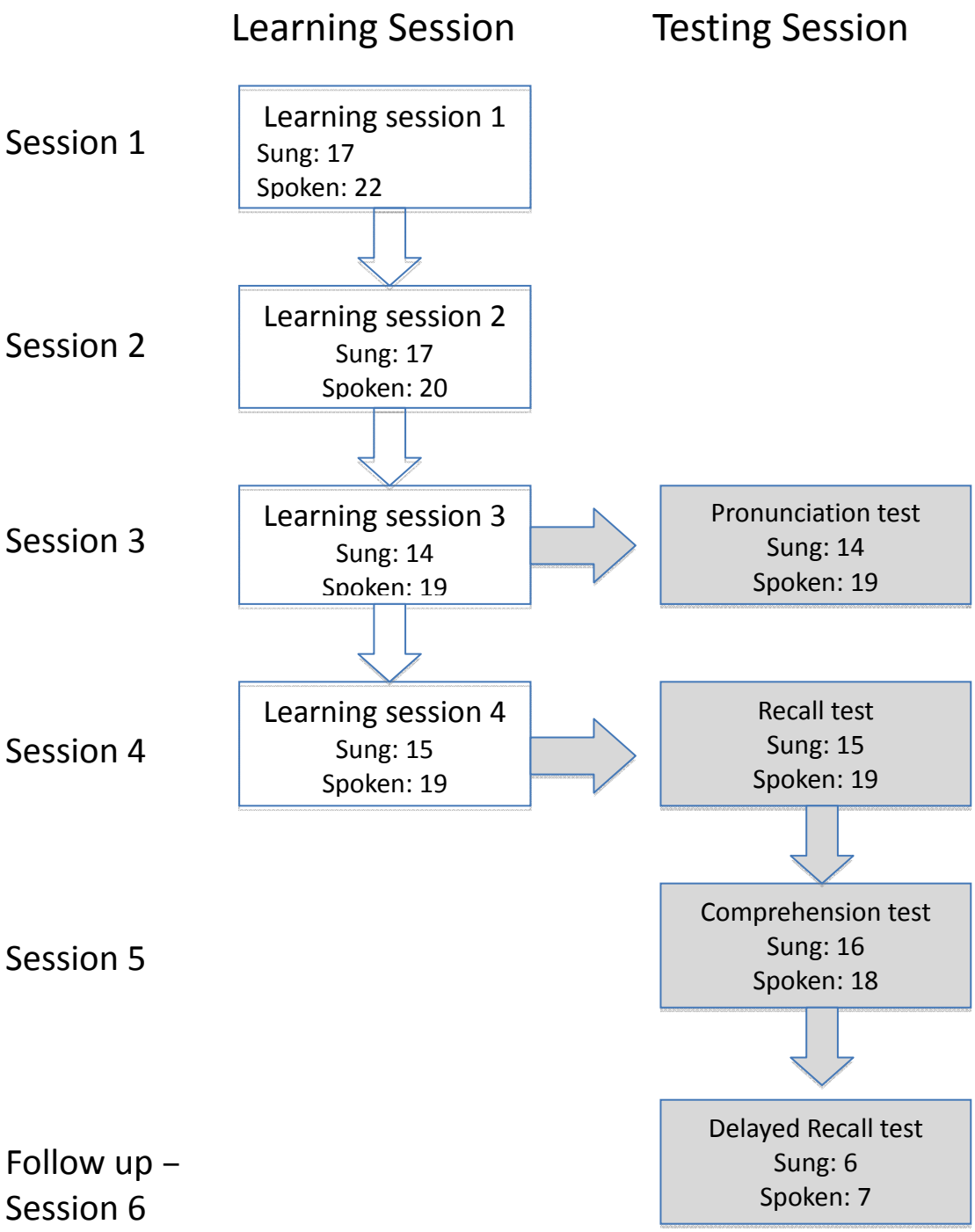


**Figure 1. Flow chart of procedure.**

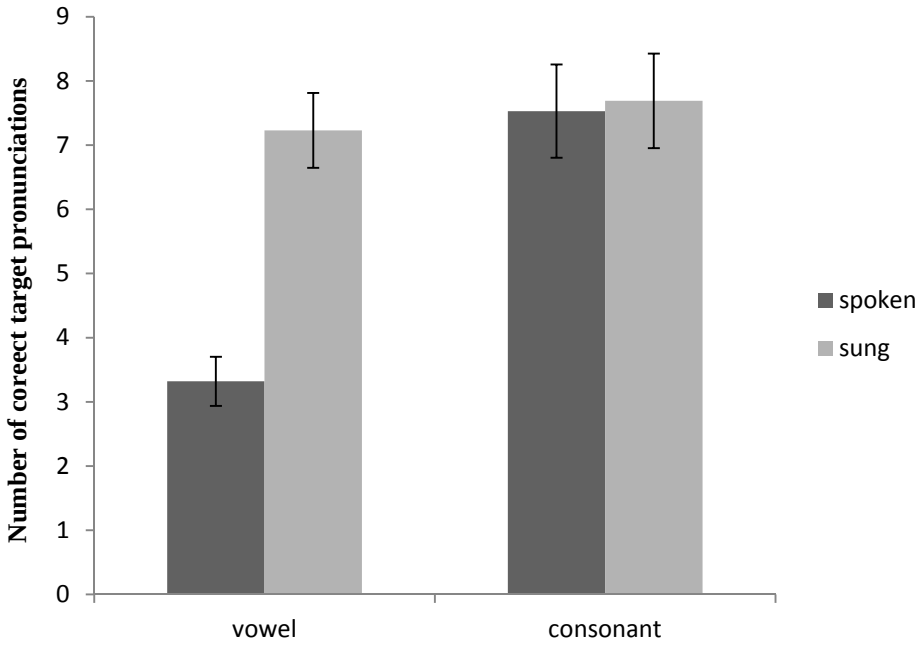


**Figure 2. The correct number of vowel and consonant pronunciations compared between two conditions.**

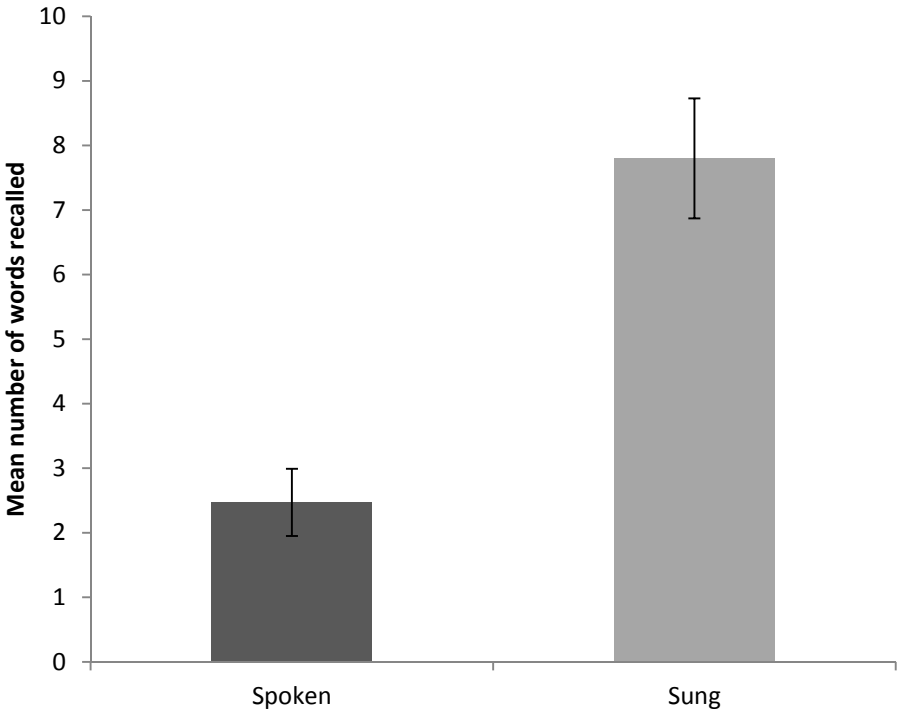


**Figure 3. Mean number of words recalled for each condition.**

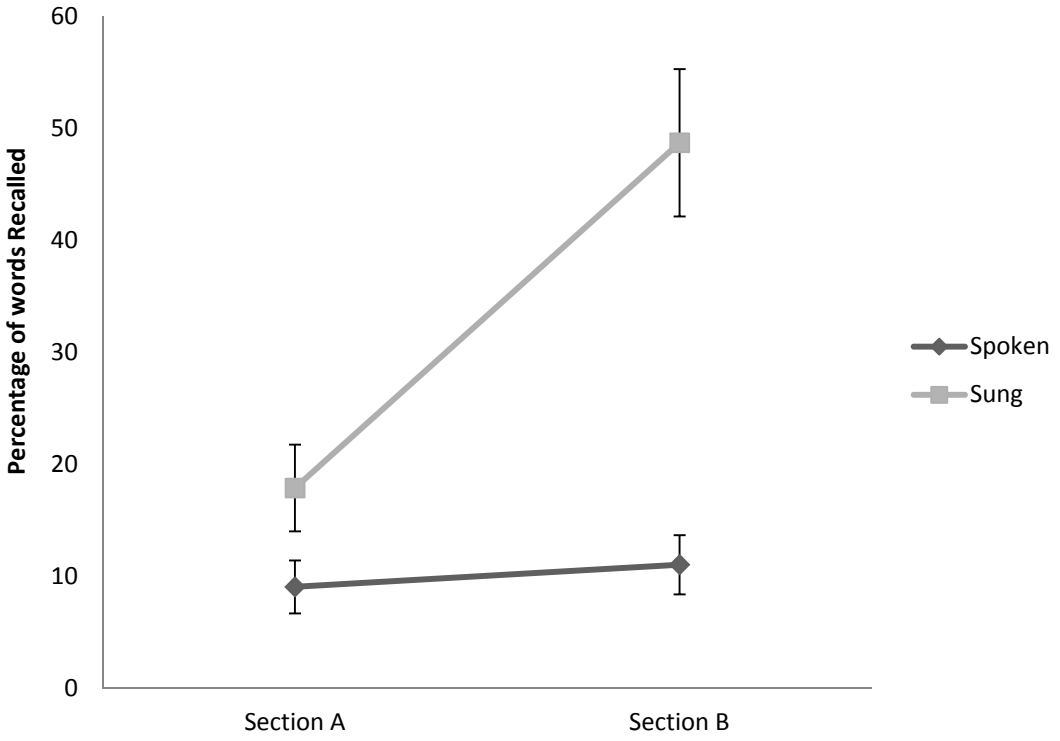


**Figure 4. Percentage of words recalled in each section compared between conditions.**

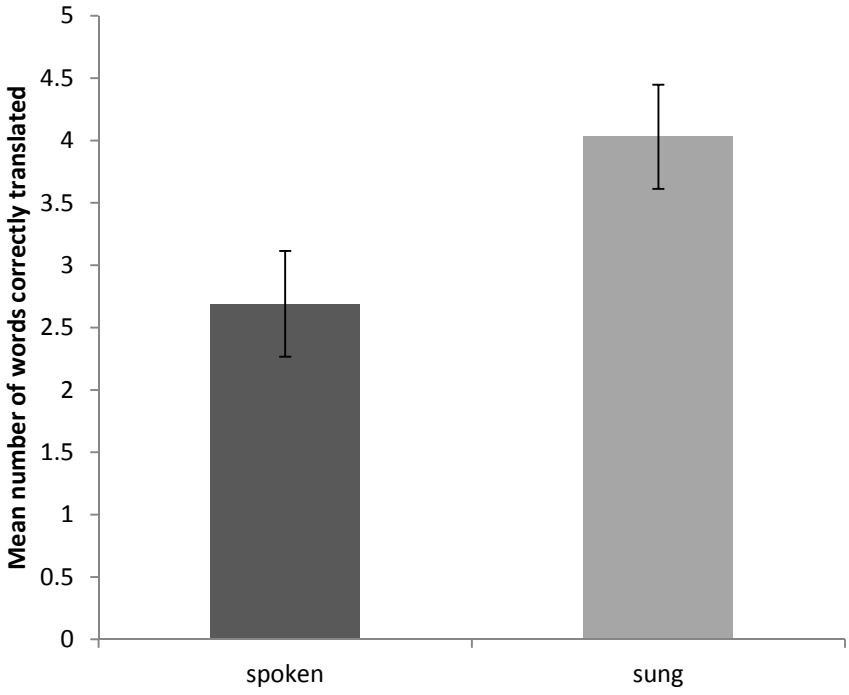


**Figure 5. Mean translation success for each condition.**

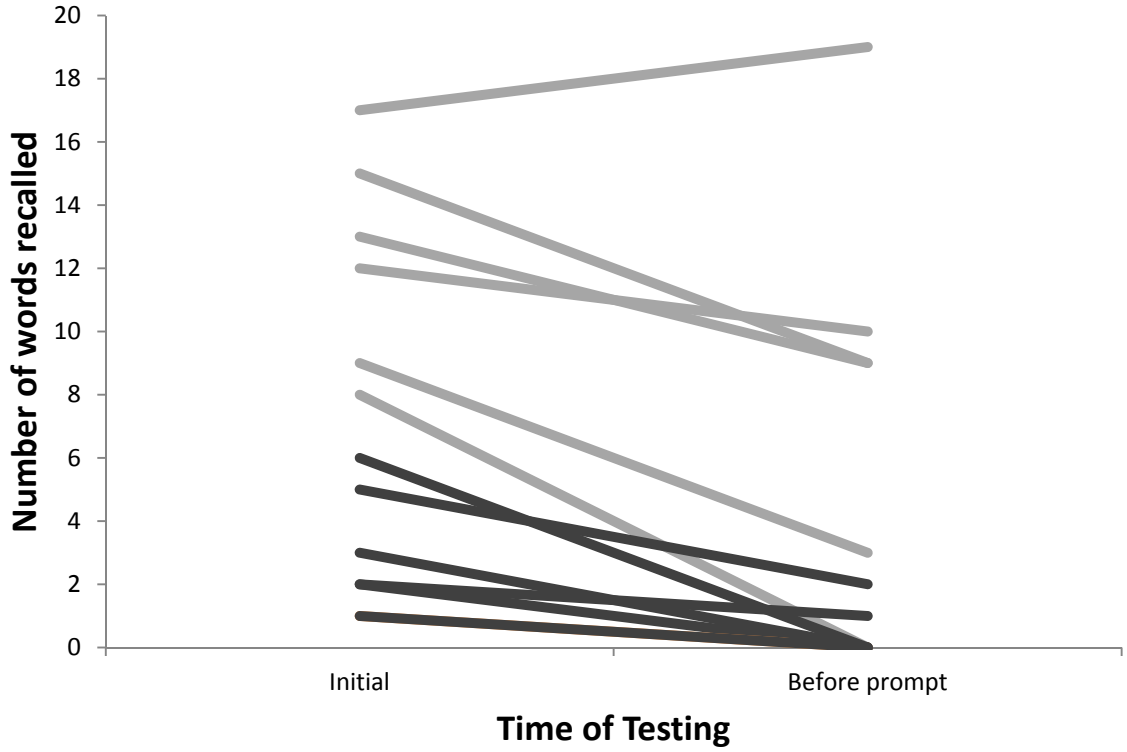


**Figure 6. Individual patterns of recall before and after a six-month delay without the support of a prompt.**

Dark lines for spoken condition, gray lines for sung condition.

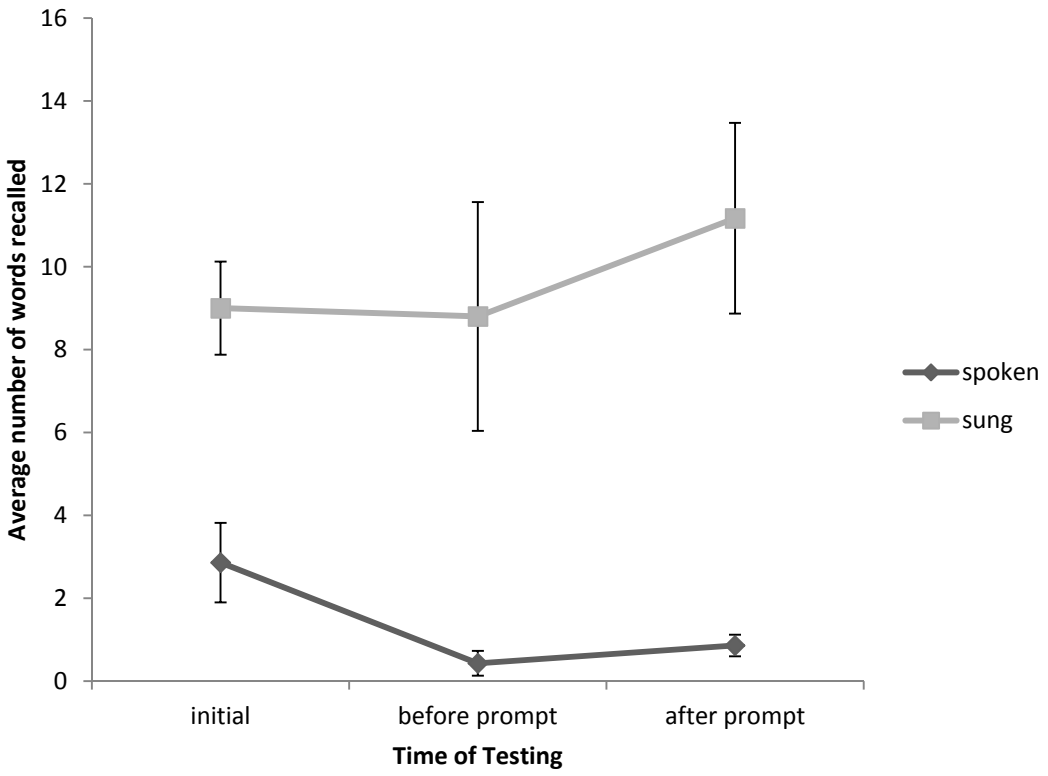


**Figure 7. Average number of words successfully recalled for both conditions at three stages of testing: Initial testing, before support of prompt, after and/or no support of prompt.**