sempre:
Society for Education, Music and Psychology Research

Article

Psychology of Music
2015, Vol. 43(5) 627–640

DOI: 10.1177/0305735614528833
pom.sagepub.com
SAGE

The efficacy of singing in foreign-language learning

Arla J. Good[1], Frank A. Russo[1] and Jennifer Sullivan[2]

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 2 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 6-month delay. Findings have important implications for foreign language instruction.

Keywords

children, classroom, education, foreign-language development, singing

The use of song to support encoding and retrieval of information is widely practiced by educators. 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. For example, educators in English-speaking cultures commonly promote memorization of the alphabet by setting the letters to 'Twinkle, Twinkle, Little Star.' Education researchers and theorists have suggested that songs are also powerful in supporting foreign language learning (Medina, 1993; Schoepp, 2001). However, the overwhelming majority of this research is not empirically grounded. The purpose of the current study was to assess the efficacy of song as a tool to

[1]Department of Psychology, Ryerson University, Canada
[2]Department of Psychology, University of Western Ontario, Canada

Corresponding author:
Arla Good, Department of Psychology, Ryerson University, 350 Victoria Street, Toronto, ON, M5B 2K3, Canada.
Email: agood@psych.ryerson.ca

support foreign language development using a quasi-experimental method in a classroom setting. Dependent measures included recall, pronunciation, and translation of foreign vocabulary.

Effect of song on native language recall

The advantage of song to facilitate the recall of information has been demonstrated under various experimental and naturalistic circumstances (Calvert & Tart, 1993; Kilgour, Jakobson, & Cuddy, 2000; McElhinney & Annett, 1996; Rainey & Larsen, 2002; Wallace, 1994). Wallace (1994) conducted a series of experiments that provided evidence for the song advantage. In the first experiment, adult participants were exposed to one of two renditions of a passage: a spoken rendition or a sung rendition. Following exposure, participants were asked to recall verbatim as much of the passage as possible. Those who were exposed to the sung condition recalled a greater percentage of words than those exposed to the spoken condition. It also appeared that those in the sung condition were using structural characteristics pertaining to rhythm to support recall. In particular, they tended to produce the correct number of syllables, even when the vocalized syllables constituted incorrect words. Similarly, McElhinney and Annett (1996) found that individuals who learned a passage through song were more likely to use chunking of the material as a mnemonic support than those who learned a passage through speech.

Wallace and Rubin (1991) found that individuals were better able to utilize structural characteristics of spoken text such as syllabic stress, line breaks, and phrasing when rhythmic characteristics were emphasized. The support of rhythm persists even in the absence of melody. For example, rhythmic poems such as 'Humpty Dumpty' tend to be easily memorized by children. If the mnemonic support that song provides is due to rhythm alone, then rhythmic speaking should hold the same mnemonic value as song. However, the structural characteristics of song involve more than just rhythm; song also encompasses melodic and tonal structure, which may further support memorization of text. A subsequent study conducted by Wallace (1994) demonstrated that text presented as song leads to superior recall compared to text spoken with rhythmic intonation alone.

The ability of song to support text recall has been shown to persevere following various lengths of delay. The song advantage on recall persists following short, 15- to 20-minute delays (Kilgour et al., 2000; Wallace, 1994), and extends to longer delays in the order of weeks (Calvert & Tart, 1993; Rainey & Larsen, 2002), and even years (Calvert & Tart, 1993). 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 the names after 1 week than those who had learned the names without song. Calvert and Tart (1993) presented adults with sung or spoken versions of the 'Preamble to the Constitution.' Those in the sung condition were more successful than those in the spoken condition at recalling the words verbatim following a 5-week delay. Calvert and Tart (1993) also found that adults who reported childhood viewing of a televised animated vignette of the 'Preamble to the Constitution' (created by Schoolhouse Rock) were more successful at verbatim recall of the text than were those who had not seen the animated vignette. These same individuals were also found to be more likely to use singing as a retrieval strategy when asked to recall the famous text.

Although the song advantage on text recall has been demonstrated repeatedly, it seems that the benefits of song are modulated by a song's predictability (Calvert & Tart, 1993; Kilgour et al., 2000; Purnell-Webb & Speelman, 2008; Rainey & Larsen, 2002; Wallace, 1994). In particular, the song advantage becomes stronger when listeners are already familiar with the

melody (Purnell-Webb & Speelman, 2008; Wallace, 1994), and with increases in the simplicity of the melodic structure (Wallace, 1994) and text setting (Gingold & Abravanel, 1987). When a song is novel, differences in recall between sung and spoken conditions tend to be negligible. Individuals learning a new song must accomplish the dual task of learning both a novel melody and a novel text at the same time. Under these circumstances, the melody may act as a distraction rather than a catalyst for recall. As a result, the song advantage is not always evident in the first stages of learning (Calvert & Tart, 1993; Wallace, 1994).

As the melody and rhythm of a song become more familiar, the structural information, including syllabic stress, line breaks and phrasing, becomes more available and predictable so as to provide more recall cues for the passage. Calvert and Tart (1993) found that a single exposure to a passage produced comparable patterns of recall between spoken and sung renditions, yet repeated exposure to the passage strengthened the advantage that the sung rendition had on recall. Wallace (1994) examined the benefits of repetition by exposing participants to three verses of text at varying levels of melodic repetition. Participants were assigned to one of three groups: one group heard the three verses of spoken text, one group heard each verse sung to different melodies, and one group heard all three verses sung to one repeated melody (melodic repetition). Of the three conditions, the melodic repetition condition resulted in the greatest recall accuracy.

Another important factor considered in research on recall in sung text has been the rate of presentation. Typically, text is presented at a slower rate in song than in speech, which may allow more time for encoding and rehearsal. Kilgour et al. (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 Larsen (2002) raises further questions in that they *did* manage to find a long-term song advantage, despite equating for presentation rate. One important difference between these two studies is that Kilgour et al. (2000) used a melody that was novel to participants, while Rainey and Larsen (2002) used a familiar melody ('Pop! Goes the Weasel').

Effect of song on foreign language pronunciation

Proper pronunciation is one of the more difficult skills to acquire when learning a foreign language (Techmeier, 1969). When pronouncing English vowel sounds, non-native English speakers tend to rely on the orthographical knowledge of their native language (You, Alwan, Kazemzadeh, & Narayanan, 2005). These letter-to-sound associations differ substantially between English and Spanish, particularly for vowel sounds. Singing may be an effective way to practice the correct English phonetics, by supporting better articulation of foreign sounds.

Given the strong differences in vowel pronunciation between English and Spanish, there is more opportunity for pronunciation error, and thus more opportunity for improvement in vowel sounds. A song advantage on pronunciation may be most apparent in vowel sounds. Individuals tend to exaggerate the length of vowels in song compared to speech, when singing in their native language (Scotto di Carlo, 2007a, 2007b). In addition, vowels are characterized by stable frequency information and, like melody, processing tends to be right-lateralized (Zatorre, Belin, & Penhune, 2002). Kolinsky, Lidji, Peretz, Besson, and Morais (2009) used a classification task to examine the extent to which non-word lyrics are integrated with melody. Classification responses were based on pitch contour, nonword identity, or on the combination of pitch and nonword. The reaction times for correct classifications suggest that vowels are more integrated with melody than are consonants.

Effect of song on foreign language translation

Another component of foreign language learning that may benefit from learning through song is translation of foreign vocabulary. According to Craik and Lockhart's (1972) levels of processing model, text may initially be processed at a shallow or phonic level before deepening to semantic comprehension. Some research has shown that learning foreign vocabulary through song will result in only shallow levels of processing. For example, Calvert and Billingsley (1998) found that repeated exposure to a song in a foreign language facilitated a verbatim recall of the lyrics; however, it had no effect on the semantic understanding of the central story in very young children. 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 paired-associate learning (de Groot, 2006; de Groot & Keijzer, 2000; Lotto & de Groot, 1998). In direct paired-associate learning, the paired words provide two levels of representation, lexical and conceptual, which may create a more concrete memory representation to support vocabulary learning. The current study will employ paired-associate learning to supplement the song advantage on translation.

Effect of song on engagement

In addition to the direct benefits of song for learning already discussed, it is important to note that song may also have an indirect benefit by introducing material in a manner that is pleasurable, which may lead to increased student engagement (Paquette & Rieg, 2008; Sandberg, 2009). Wolfe and Noguchi (2009) presented young students with a spoken or musical version of a story while manipulating the extent of auditory distraction in the classroom. Students were found to be more engaged during the musical version of the story as assessed by the number of correctly identified plot details. The positive effect of song persisted across levels of auditory distraction.

Current study

Although many studies have demonstrated the use of song as a tool for adults to remember text in a native language, this study fills a gap in the literature by examining how song facilitates foreign language learning in a naturalistic setting using quasi-experimental methods. Over a 2-week period, Ecuadorian children in two classes were taught a novel lyrical passage. One class was randomly assigned to learn the lyrics as a song and the other to learn the lyrics as a poem spoken rhythmically. The stimulus song was chosen because it fulfills the conditions needed for song to be most effective in supporting recall – that is, the lyrics are set in a simple manner (accommodating the melodic phrasing of the song) and the song structure is simple. The lyrics were translated using a direct paired-associate method. The children were tested on their ability to pronounce foreign vowel and consonant sounds, recall the lyrics verbatim, and translate target terms from English into Spanish. We hypothesized that children in the sung condition would outperform children in the spoken condition across all measures.

Methods

Participants

Thirty-eight Spanish-speaking children from an elementary school in Puerto López, Ecuador participated in this study. Specific problems with engagement and auditory distraction have

been noted at this particular school; levels of discipline are low and disorderly conduct is common. Children were recruited from two predetermined classes. Each class was randomly assigned to either the spoken or sung condition. 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), $t(36) = 3.1$, $p = .004$. 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 training, in the form of the school's 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 lyrics contained 29 words in total (see Appendix A). The song was entirely novel to participants prior to the study. A graduate teaching assistant from the Spanish Department at Ryerson University coded the lyrics for all segments deemed orthographically foreign for Spanish speakers. For example, the English word 'why' would be read orthographically as 'wee' in Spanish. From the 36 segments deemed as orthographically foreign, 15 vowel sounds (including diphthongs) and 15 consonant sounds were randomly selected to test pronunciation. In addition, 10 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-5200PC.

Procedure

All parents completed a demographic questionnaire and provided consent. The children were informed orally about the procedures relevant to their condition and were explained their rights as participants. All children provided verbal assent to participate. Children in both conditions participated in a total of four learning sessions and three testing sessions over a 2-week period. A follow-up testing session was run 6 months later. All recall, pronunciation, and translation attempts were audio recorded. The children were compensated with a nominal gift after each of the testing periods.

During the learning sessions, all children were provided with a handout containing each line of the lyrics along with the Spanish translation written in italics under each line (refer to Appendix A). In addition, the lyrics were written out on the whiteboard at the front of the class. Words were pointed out on the whiteboard as they were practiced. One classroom received the lyrics as a song and the other received it in spoken form with the rhythm of a poem. The same teacher taught the lyrics in both classrooms. The teacher was a native English speaker with prior experience teaching English as a foreign language as well as experience with song based instruction.

The first exposure of the lyrics was presented without interruption so the children could hear the lyrics in their entirety. Subsequent exposures involved breaking each phrase down into two sections: A and 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. The same point of separation was used in the spoken condition. Section A of each line always contained 5 syllables and was sung to the same melodic contour. Each line was taught using a 'repeat-after-me' method whereby the teacher 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 teacher translated the target terms from English into Spanish using the direct paired-associate method. In the sung condition, the song was practiced with a guitar accompaniment.

In order to minimize variability beyond the main experimental manipulation, each learning session provided exactly 20 minutes of exposure to the lyrics. In addition, speed of presentation and the number of repetitions were controlled. The teacher was aware that spoken prose is typically faster than sung prose and was careful to slow down her natural rate of speech to equate the two conditions. Children in each group received 20 exposures to the lyrics before testing began. The repetitions generated familiarity, which should support the song advantage (Calvert & Tart, 1993).

The first test evaluated pronunciation and took place immediately after the third learning session. Children were individually asked to reproduce the lyrics *with* the support of the same handout they were given during the learning sessions. Children were not given specific instruction about whether they should sing or speak the lyrics. If children in the sung condition asked about how to reproduce the lyrics, they were told to do so in whatever mode they were most comfortable.[1] Twelve of the 16 children in the sung condition chose to sing.

The second test evaluated recall of the lyrics and took place immediately after the fourth learning session. The teacher asked the children individually to recall as much of the lyrics verbatim as they could *without* the support of the handout. Again, children were not given specific instruction about whether they should sing or speak the lyrics. All of the 16 children in the sung condition chose to sing the lyrics.

The third test served as a verbal evaluation of foreign vocabulary translation and took place on the day following the second test. The teacher repeated the English word twice and the child was asked to provide the translation of the word in Spanish. The children were permitted two attempts to translate each term. Full points were awarded when a child answered correctly on the first attempt.

After a delay of 6 months without any formal instruction, 13 of the children from the original study were retested on their long-term recall of the lyrics. 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 lyrics they had learned 6 months earlier. The first attempt to recall the lyrics involved no support from the teacher. After the first attempt, the teacher provided a prime by reproducing section A of each line in the same mode as the original condition (spoken or sung). The child was then invited to make a second attempt. In the same session, children were asked to translate the same 10 target terms from English to Spanish. This served as a long-term verbal evaluation of foreign vocabulary translation. Following the same method employed in the first test (translation), the teacher repeated the English word twice and the child was asked to provide the translation of the word.

Results

All tests of significance were two-tailed with an alpha level of .05, and all post-hoc comparisons were adjusted with the Bonferroni correction. The first author and an independent, native English-speaking, rater assessed the recordings with respect to pronunciation and recall. The independent rater was aware of the purpose of the study. Inter-rater reliability for each

measure was consistently high; pronunciation (r = .85), recall (r =.86), and long term recall (r =.97), p's < .001. Because of the high level of inter-rater reliability, all analyses were conducted using data from the independent rater alone. Translation was assessed onsite by the experimenter. Results are reported in the chronological order of the procedure.

Pronunciation

Three children from the spoken condition and three children from the sung condition were absent during the pronunciation testing. Typically, incorrect responses involved pronunciations that would have been orthographically correct in Spanish (e.g., why as 'wee'). From the participants' reproduction of the lyrics, 15 vowel sounds and 15 consonant sounds were flagged for analysis. For this analysis, each pronunciation sound was considered in isolation. Participants were given 1 point for each vowel and each consonant that they pronounced correctly during their reproduction of the lyrics. Each child was awarded a score out of a maximum of 15 correctly pronounced 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. 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 = .001. Post hoc tests revealed that although there were no differences between conditions for the pronunciation of consonant sounds $t(30)$ = .18, p = .86, children in the sung condition were better at reproducing vowel sounds (M = 7.23, SD = 2.62) than children in the spoken condition (M = 3.32, SD = 1.67), $t(30)$ = 5.18, p = .001 (see Figure 1).

Recall

Three children from the spoken condition and two children from the sung condition were absent during the recall testing. Responses 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 (Kilgour et al., 2000; Wallace, 1994). Participants were awarded points for words and phrases recalled in the correct order of the original lyrics. Words considered to be inconsequential to the text, such as articles and conjunctions, were omitted from analysis. 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 2[a]). When data were reanalyzed without consideration of the correct order, the same song advantage emerged, $t(31)$ = 5.34 p < .001.

Rhythmic Structure. Given the rhythmic nature of the lyrics, it was quite easy to hear the presence or absence of a syllable. To obtain a measure of whether rhythmic structure was being encoded in sung and spoken conditions, the absolute difference was obtained between the total number of syllables in a line and the corresponding number of reproduced syllables. The absolute differences were then collapsed across lines to obtain the total syllable error. This assessment allowed for evaluation of incorrect or nonsense words that still maintained the correct rhythmic structure. An independent t test demonstrated that children in the sung condition (M = 8.07, SD = 9.44) had fewer syllable errors than children in the spoken condition (M = 23.37, SD = 7.76), $t(31)$ = 5.01, p < .001, suggesting that song facilitated encoding of the rhythmic structure that was present in the lyrics.

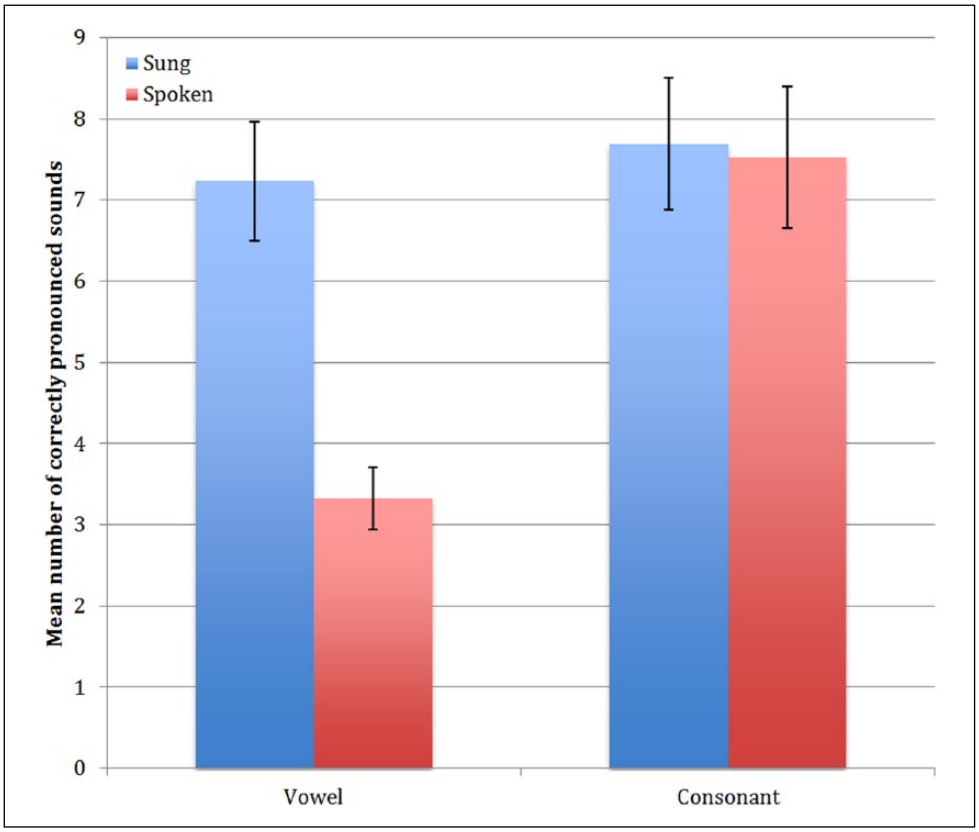

Figure 1. The number of correct vowel and consonant pronunciations compared between two conditions.

Translation

Four children from the spoken condition and one child from the sung condition were absent during the translation testing. The participants were scored on their ability to translate the target English words taken from the lyrics 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 at 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 ($M = 2.69$, $SD = 1.80$), $t(31) = 2.21$, $p = .034$.

Long-term recall

Thirteen children were retested on their long-term recall of the lyrics. 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. Long-term recall scores were analyzed in the same manner as the initial recall scores, whereby participants were awarded points for words and phrases recalled in the correct order of the original lyrics. Children from the sung condition ($M = 8.83$, $SD = 6.53$) were more successful at recalling the lyrics on the first attempt (before a

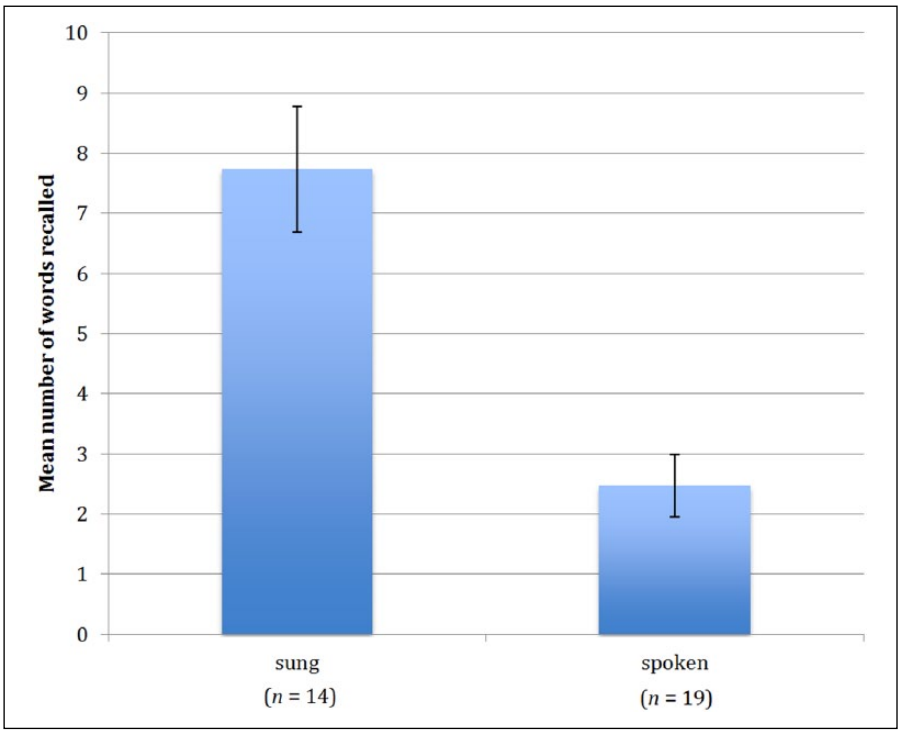

Figure 2(a). Mean number of words recalled in order for each condition.

prime was given) than were the children from the spoken condition (M = 0.29, SD = 0.76), $t(5.116) = 2.99$, $p = .03$.

A mixed-design ANOVA was conducted to determine differences between conditions at three points in time: initial recall, pre-prime, and post-prime. As three of the children in the sung condition were able to sing through the entire melody, they did not require the support of a prime and were thus excluded from this particular analysis. A significant interaction was found, $F(2, 16) = 12.57$, $p = .001$. Post hoc analyses were conducted to test for the utilization of the prime. The number of words recalled before the prime was compared to the number of words after the prime. A main effect of time revealed that fewer words were recalled before priming (M = 1.4, SD = 2.88) than after priming (M = 4; SD = 6.36), $F(1, 8) = 30.26$, $p = .001$. An interaction between support of prime and condition was also significant, $F(1, 8) = 24.19$, $p = .001$, suggesting that children in the sung condition received more benefit from the prime than did children in the spoken condition.

Post hoc analyses were conducted to determine any changes in recall over time. Children in the spoken condition had a significant decrease in recall scores between initial recall (M = 2.86, SD = 1.95) and post-priming recall (M = 0.71, SD = 0.76), $t(6) = 3.38$, $p = .015$; however, children in the sung condition maintained comparable performance across time, $t(5) = .12$, $p = .91$. See Figure 2(b) for a comparison of initial scores, pre-prime scores, and post-prime scores. Note that figure 2(b) includes all children who participated in the long-term testing session.

After a 6-month delay, no differences were found in translation success between the spoken condition (M = 1.07, SD = 1.01) and the sung condition (M = 2.26, SD = 1.47), $t(12) = 1.79$,

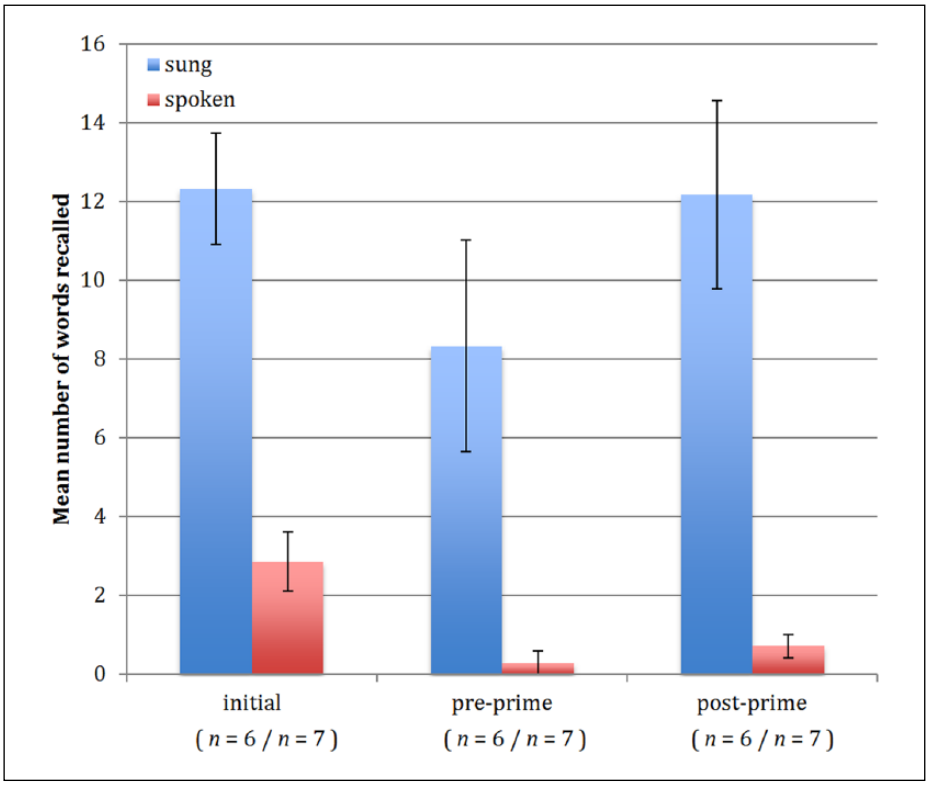

Figure 2(b). Mean number of words recalled by participants under sung and spoken conditions at initial, pre-prime, and post-prime testing. Values of *n* are reported for sung and spoken conditions respectively at each test session. Note that figure 2(b) includes all children that participated in the long-term testing session.

$p = .097$. A repeated measures ANOVA revealed a significant main effect of time $F(1, 12) = 30.33$, $p < .001$; however, the lack of interaction between the groups indicated that both conditions decreased in translation success over time $F(1, 12) = 1.38$, $p = .263$.

Discussion

The findings of the present study provide support for, and extend to foreign language learning, the popular notion of using song to facilitate learning in the classroom. As expected, the students who learned the text through song were more successful at pronouncing, recalling and translating than were children who learned text through a spoken poem. The successful recall in the sung condition persevered following a 6-month delay. The song advantage observed here is likely due to a confluence of cognitive and hedonic factors.

One factor contributing to the song advantage on recall may have been the rhythmic and melodic organization of the text. 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 seemed to have used the cues provided by the melodic and rhythmic structure as a retrieval strategy to support recall. Consistent with findings reported by Wallace (1994), the children in

the sung condition 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 lyrics, the children in the sung condition would often sing through the melody and tended to use nonsense words to fill in unremembered gaps. In contrast, children in the spoken condition seldom used the rhythmic structure to support retrieval. Although the spoken poem and song both involved rhythmic structure, the poem appears to have provided fewer structural cues to support memory.

A second factor that may have contributed to the song advantage on recall is the integration of lyrics and melody. It has been hypothesized that the dual encoding of lyrics and melody become integrated in such a way that recall of one facilitates recall of the other (Ginsborg & Sloboda, 2007). This integration hypothesis becomes particularly salient when interpreting why, in the 6-month recall test, the prime was only useful in the sung condition. The sung prime may have facilitated recall in the subsequent section by facilitating the recall of melody, which in turn facilitated recall of the integrated text (Peretz, Radeau, & Arguin, 2004).

It has been argued that vowel sounds are more integrated with melodic information than consonants (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 support for this hypothesis. Though all children heard and repeated the same number of repetitions of the correct foreign vowel sound, the children who practiced singing the lyrics with a melody were better able to remember and reproduce the accurate pronunciation of the vowel compared to children who practiced speaking the lyrics. Children in the spoken condition tended to read the English words with orthographical Spanish pronunciations (e.g., 'why' read as 'wee'). Practicing the elongated vowel sounds that occur in song seems to have provided the children with superior training for these foreign language sounds.

The current study also found a song advantage on translation of foreign vocabulary. The context of melody 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 added context of an image (Omaggio, 1979). The lyrics may become integrated with the melody, which helps to create a context and memory representation for each foreign word.

Despite the positive findings at initial testing, there were no differences found in translation abilities following a 6-month delay; the scores of both groups deteriorated over time. Consistent with the literature, the song appears to have been encoded into the long-term memory at a superficial level (Calvert & Billingsley, 1998). Students were able to recall the structural and phonemic properties of the foreign language song, including the phonological and prosodic structure of the lyrics. However, the semantic information was not encoded to long-term memory. A lack of practice of the translations over the 6 months may have limited the maintenance and deepening of the semantic knowledge for both conditions. The ability to translate foreign vocabulary is a crucial element when learning a foreign language and may require frequent practice and elaboration to support deeper levels of encoding. A better way to utilize song to support comprehension over the long-term would be to incorporate the direct paired-associate 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 lyrics will be rehearsed and encoded simultaneously with the lyrics. The direct paired-association method is known to help support deeper levels of encoding as it provides both a lexical and conceptual memory representation of the foreign vocabulary (de Groot, 2006; de Groot & Keijzer, 2000; Lotto & de Groot, 1998).

One important indirect benefit of song on foreign language learning is the hedonic value that singing adds to a language class. Singing tends to increase enjoyment in classroom activities, accompanied by increases in attention (Sandberg, 2009). Although the current study did

not incorporate any direct measures of hedonic value or attention, informal observations made by the teacher are worth noting. The teacher reported that children in the sung condition tended to smile more during learning sessions and showed excitement whenever the guitar was revealed. Children also frequently asked the teacher when the song would be practiced again.

Limitations and future research

The current study has some limitations that should be considered when interpreting the results. First, although controls were put in place to minimize bias, the teacher was not blind to the hypotheses of the study. Second, the mean age was significantly different between the two groups and this may account for some of the group differences. However, this explanation seems unlikely. Younger children are expected to perform worse than older children in all tasks; the current trends were in the opposite direction. Third, it should be acknowledged that the song condition involved a guitar accompaniment. The guitar was a novel feature in the classroom that may have contributed to gains in attention. It is not clear whether the same song advantage would be found in the absence of such accompaniment. Fourth, the study does not provide a means of deciphering the extent to which hedonic and cognitive mechanisms were responsible for the song advantage. Although these appear to be mutually exclusive mechanisms, they are likely working in combination to support the song advantage. Future research should consider taking a measure of enjoyment that would allow for an analysis of covariance to assess whether the effect of song persists even when statistically controlling for the influence of enjoyment.

The findings of this study provide a foundation that may lead to future explorations of how song can support foreign language development. Future studies should look at the ability of transferring the learned skills 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 remains when children are asked to speak the words. It would also be useful to explore whether the translation of the vocabulary learned through song would transfer to a novel context. Though the children in the sung condition were able to systematically translate the target terms using the integration of the melody, this does not allow inferences as to whether they would recognize the same term in a different context.

More broadly, the approach adopted in this study may be extended beyond educational contexts to support memory in special populations. For example, the song advantage on recall could be used to support memory in individuals suffering from dementia including Alzheimer's disease (Moussard, Bigand, Belleville, & Peretz, 2012; Prickett & Moore, 1991).

Conclusions

This study suggests that song supports foreign language learning, encompassing recall, pronunciation, and 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 using song to support learning English as a foreign language. These results contribute to a growing body of literature emphasizing the importance of singing in the classroom.

Funding

Funding for this research was provided by the Social Science and Humanities Research Council (SSHRC) of Canada in the form of: (i) a graduate fellowship awarded to the first author; and (ii) a Major Collaborative Research Initiative Grant: Advancing Interdisciplinary Research in Singing [www.airsplace.ca].

Note

1. Although we considered requiring that all responses be spoken, doing so might have resulted in a non-interpretable null finding. In particular, it would have been difficult to decipher whether a failure was due to the inefficacy of sung instruction or due to a problem with transferring information learned in one domain over to another.

References

Calvert, S. L., & Billingsley, R. L. (1998). Young children's recitation and comprehension of information presented by songs. *Journal of Applied Developmental Psychology, 19*, 97–108.

Calvert, S. L., & Tart, M. (1993). Song versus verbal forms for- very-long-term, long-term, and short-term verbatim recall. *Journal of Applied Developmental Psychology, 14*(2), 245–260.

Craik, F. I., & Lockhart, R. S. (1972). Levels of processing: A framework for memory research. *Journal of Verbal Learning and Verbal Behavior, 11*(6), 671–684.

de Groot, A. M. B. (2006). Effects of stimulus characteristics and background music on foreign language vocabulary learning and forgetting. *Language Learning, 56*(3), 463–506.

de Groot, A. M. B., & Keijzer, R. (2000). What is hard to learn is easy to forget: The roles of word concreteness, cognate status, and word frequency in foreign-language vocabulary learning and forgetting. *Language Learning, 50*, 1–56.

Gingold, H., & Abravanel, E. (1987). Music as a mnemonic: The effects of good- and bad- music settings on verbatim recall of short passages by young children. *Psychomusicology: A Journal of Research in Music Cognition, 7*(1), 25–39.

Ginsborg, J., & Sloboda, J. A. (2007). Singers' recall for the words and melody of a new, unaccompanied song. *Psychology of Music, 35*(3), 421–440.

Kilgour, A. R., Jakobson, L. S., & Cuddy, L. L. (2000). Music training and rate of presentation as mediators of text and song recall. *Memory & Cognition, 28*(5), 700–710.

Kolinsky, R., Lidji, P., Peretz, I., Besson, M., & Morais, J. (2009). Processing interactions between phonology and melody: Vowels sing but consonants speak. *Cognition, 112*(1), 1–20.

Lotto, L., & de Groot, A. M. B. (1998). Effects of learning method and word type on acquiring vocabulary in an unfamiliar language. *Language Learning, 48*, 31–69.

McElhinney, M., & Annet, J. M. (1996). Pattern of efficacy of a musical mnemonic on recall of familiar words over several presentations. *Perceptual and Motor Skills, 82*, 395–400.

Medina, S. (1993). The effect of music on second language vocabulary acquisition. *FEES News (National Network for Early Language Learning), 6*(3), 1–8.

Moussard, A., Bigand, E., Belleville, S., & Peretz, I. (2012). Music as an aid to learn new verbal information in Alzheimer's disease. *Music Perception: An Interdisciplinary Journal, 29*(5), 521–531.

Omaggio, A. (1979). Pictures and second language comprehension: Do they help? *Foreign Language Annals, 12*, 107–116

Paquette, K. R., & Rieg, S. A. (2008). Using music to support the literacy development of young English language learners. *Early Childhood Education Journal, 36*(3), 227–232.

Peretz, I., Radeau, M., & Arguin, M. (2004). Two-way interactions between music and language: Evidence from priming recognition of tune and lyrics in familiar songs. *Memory & Cognition, 32*(1), 142–152.

Prickett, C. A., & Moore, R. S. (1991). The use of music to aid memory of Alzheimer's patients. *Journal of Music Therapy, 28*(2), 101–110.

Purnell-Webb, P., & Speelman, C. P. (2008). Effects of music on memory for text. *Perceptual and Motor Skills, 106*(3), 927–957.

Rainey, D. W., & Larsen, J. D. (2002). The effects of familiar melodies on initial learning and long-term memory for unconnected text. *Music Perception*, *20*(2), 173–186.
Sandberg, H. F. (2009). Get moving! The effects of music and movement on student attention and engagement. (ProQuest Information & Learning). *Dissertation Abstracts International Section A: Humanities and Social Sciences*, *70* (4-A), 1–1161. (Electronic; Print)
Schoepp, K. (2001). Reasons for using songs in the ESL/EFL classroom. *The internet TESL journal*, *7*(2), 1–4.
Scotto di, & Carlo, N. (2007a). Effect of multifactorial constraints on opera- singing intelligibility (I). *Journal of Singing*, *63*, 1–13.
Scotto di, & Carlo, N. (2007b). Effect of multifactorial constraints on opera- singing intelligibility (II). *Journal of Singing*, *63*, 559–567.
Techmeier, M. (1969). Music in the teaching of French. *The Modern Language Journal*, *53*(2), 96.
The Short & Curlies. (2009). Functions of the Face. On *Sharing* [CD]. Toronto, Canada: Studio 8.
Wallace, W. T. (1994). Memory for music: Effect of melody on recall of text. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *20*(6), 1471–1485.
Wallace, W. T, & Rubin, D. C. (1991). Characteristics and constraints in ballads and their effect on memory. *Discourse Processes*, *14*, 181–202.
Wolfe, D. E., & Noguchi, L. K. (2009). The use of music with young children to improve sustained attention during a vigilance task in the presence of auditory distractions. *Journal of Music Therapy*, *46*(1), 69–82.
You, H., Alwan, A., Kazemzadeh, A., & Narayanan, S. (2005). Pronunciation variations of Spanish-accented English spoken by young children. In: *Interspeech*, pp. 749–752
Zatorre, R. J., Belin, P., & Penhune, V. B. (2002). Structure and function of auditory cortex: Music and speech. *Trends in Cognitive Sciences*, *6*(1), 37–46.

Appendix A

Passage given 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)