Does Background Music Affect Memorization of Chinese Character Meaning?

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Abstract

To help beginners memorize vocabulary effectively is one of the Chinese language teacher's important but difficult responsibilities. This small-sample pedagogical study is intended to investigate elementary level Chinese language learners' (English-only group and the Korean/English group) short-term memory of novel Chinese characters' meaning with or without accompanying music. Used for memorization in the study are 50 novel Chinese characters with their meaning in English. First, these characters were presented in random order to the participants under four different background music conditions: instrumental, music with English lyrics, music with Korean lyrics, and no music. And after the exposure of the characters and the music, a test was given to the participants to examine how well the participants remember the meaning of the characters. The result shows that across the four different music conditions, the English-only group and the Korean/English group did not show significantly different performance either in accuracy or reaction time. This suggests that music with or without lyrics is not distractive when students do short-term memorization of new Chinese characters' meaning, no matter what language students speak.

Keywords: background music, lyrics, short-term memory, Chinese character learning

Introduction

Music has never been so popular on campus as it is today. According to Schäfer, Sedlmeier, Städtler, and Huron (2013), a total of 129 functions of listening to music have been identified, and, one of the most important claims is that music serves as a valued companion and provider of a comfortable level of activation and a positive mood. Some researchers and educators (such as Davidson & Powell, 1986, Brewer, 2006 Schellenberg et al., 2007) have claimed that use of appropriate background music was effective in enhancing teaching and learning activities. However, it remains a question whether music in language classrooms is helpful for language learning or distractive.

Chinese character learning is always difficult for Chinese as a second language (L2) students. Since knowing the meaning of the new words is the fundamental step in language learning, both teachers and students have been trying hard to find ways of effectively memorizing novel Chinese characters' meaning.

Literature Review

Music had been thought to be helpful for language learning in the literature. In a study of music and first language (L1) learning, McCarthy and William (1985) claimed that music and the elements of language (rhythm, harmony, melody, form, dynamics and mood) are valuable aids to language development found the positive power of music by claiming that music and the elements of language (rhythm, harmony, melody, form, dynamics, and mood) are valuable aids

to language development such as word recognition, comprehension, reading study skills, and literary comprehension. On second language learning and even a broader domain of learning, music was also proved to be positively effective in a large number of empirical studies. A study carried out by De Groot (2006), for example, indicated that music conditions (both instrumental and music with lyrics) resulted in more foreign language vocabulary learning than the silent condition. In another example, Mammarella et al. (2007) found that classical music significantly increased working memory performance compared with the condition of no music. In a report made by Brewer (2006) Lozano and Gateva, the authors designed ways to increase memory abilities including the use of music in the classroom, and found that the use of background music during lectures, vocabulary decoding, or group readings created a highly effective learning environment and resulted in high memory retention.

A number of scientists claimed to support this positive connection between music and cognitive performance. Some researchers suggested (Hallam, Price, & Katsarou, 2002) music produces beneficial effects on task performance through the arousal and mood that music causes instead of affecting cognition directly. Rickard et al. (2005) confirmed that musical stimuli modify autonomic and neurochemical arousal indices and may also modify synaptic plasticity. As a result, some researchers and educators (e.g., Davidson & Powell, 1986; Brewer, 2006) have advocated applying background music in classroom or other learning settings.

 However, this previous affirmative claim was not supported by all in the literature. An empirical research study conducted by Jäncke et al. (2014) showed that exposure to instrumental or vocal music does not have any influence on verbal learning in the coding stage of a whole learning procedure. In a study conducted by Harmon et al. (2008), participants exposed to music (either classical or rock music) did not score significantly higher on listening or reading comprehension tests than those exposed to silence. In some other studies, music was even claimed to serve as nothing but a distraction impairing cognitive performance. According to Furnham and Strbac (2002), background music was found to produce distracting effects which were not significantly different from noise in prose recall and arithmetic performance. Other examples indicated that background music significantly impaired concurrent verbal processing (Pring & Walker, 1994), writing fluency (Ransdell & Gilroy, 2001), and immediate recall, free recall, numerical and delayed recall (Cassidy & MacDonald, 2007).

More researchers came to believe that, however, the above arguments either oversimplified or overgeneralized the cognitive effect of background music. These researchers found that music conditionally helps with cognitive activities. Hallam, Price, and Katsarou (2002) explored the effects of music, perceived to be calming and relaxing or not, on a memory task. The calming music led to better performance when compared with no music, whereas music perceived as arousing, aggressive, and unpleasant disrupted performance on the memory task. Lyrics were also considered as a factor that significantly influences learning. Furnham (2003) compared the impact on cognitive process of three conditions: no music, instrumental music and vocal music. He concluded that silence yielded the best cognitive performance and vocal music yielded the worst. More research needs to be conducted to discover the relationship between music (of all types) and cognition at more detailed levels.

There remains significant uncertainty regarding whether music helps second or foreign language learning. A recent literature review by Zeromskaite (2014) analyzed relevant papers published in peer-reviewed journals between 2007 and 2014. The study shows it is difficult to generalize the results to overall L2 learning due to the little research done in this area. The difficulty in generalizing a positive effect of music on language learning was also reported in

another study where researchers identified different effects of background music on learning different foreign languages (Kang & Williamson, 2014). In addition, on the effect of music on L2 Chinese learning, little research has been conducted.

Method

This small sample, contextualized study attempts to confirm the nature of the cognitive effect of different music conditions on the short-term memory of novel Chinese characters' meaning. Specifically, three research questions need to be addressed:

(1) Does music help L2 Chinese beginners with the short-term memorization of novel Chinese character meanings?
(2) Do different musical conditions affect the memory differently?
(3) How does memorization differ when the same musical conditions apply to students who speak different first languages?

The answer to these questions is expected to help Chinese language instructors decide whether to use music and what kind of music to use in daily classroom teaching, especially when teachers plan to facilitate vocabulary memorization. If possible, this pilot effort may spark further relevant studies.

With these goals in mind, multiple musical conditions were developed: silence, instrumental music, and vocal music (in English and Korean). The vocal piece and the instrumental piece used were held equivalent, so that confounding factors that may arise from music were ruled out. To pinpoint the possible effect of music, a silent (no music) condition was employed to compare with the musical conditions. Furthermore, music with lyrics in the students' native language is expected to be more distractive than the lyrics of music in a different language. Instrumental music will be worse than silence, and better than vocal music, in terms of memorization accuracy and reaction time.

Participants

Due to the normal low enrollment of the Chinese language classes in the present study, a small sample was recruited from ABC University (pseudonym). Fifteen participants (7 males and 8 females) were from two Elementary Chinese Language II classes using the convenience sampling method. Of the participants, seven are English-only speakers (Mean of age = 19, SD = 1.77) with five Caucasian-Americans, one African-American, and one Chinese-American. And the other eight are bilingual (Mean of age = 19.43, SD = 1.4) who can understand both English and Korean as well as, or similar to, native speakers (Table 1).

All the participants had similar Chinese language learning backgrounds and are leveled as elementary by the departmental evaluation, which means they have developed basic learning skills learned from the elementary Chinese course and no great learning skill difference should exist among them. For participation in this study, each participant will receive course credit in the class.

Table 1
Participants in This Research

	Male	Female	Total
English-only Speakers	5	3	8
Korean/English Speakers	2	5	7
Total	7	8	15

Stimuli

Forty pre-selected Chinese characters (see Appendix A) were randomly selected from Concise Chinese-English Dictionary (3rd Edition) published by the Commercial Press of China (2004). These characters were examined by two professors of Chinese and both confirmed these characters are advanced level vocabulary. None of the characters was identified as learned by four students (not participants in this study) randomly selected from an elementary Chinese class at ABC University.

In the experiment, these characters were displayed together with their English meaning for the participants to memorize. Pinyin was only provided on the screen but not pronounced out for the purpose to avoid distractions that may interfere with the memorization of meaning. To control for the impact of a different number of meanings or of different lengths of meanings on memorization, only one meaning with fewer than six English words was chosen for each character. The selected characters were divided into four sets (see Appendix B), each of which was displayed with one of the four types of background music.

The selected music was Hand in Hand, the theme music in Seoul Olympic Games 1988, composed by Giorgio Moroder. Three versions (instrumental, music with English lyrics, and music with Korean lyrics) were edited so as to be equivalent in terms of length, tempo, and genre, and would be played at the same volume.

Design

The mixed design was employed to test differences in memory accuracy and reaction time between the two language groups under each of the music conditions. The language group is a between-subjects factor including English-only group and Korean/English group. The background music is a within-subjects factor which consists of four conditions: Condition A – Silence, Condition B – Instrumental music, Condition C – Music with English lyrics, and Condition D – Music with Korean lyrics.

Two songs with the equivalent music will be included in the music conditions: one with English lyrics, and the other with Korean lyrics. The English version is native to English-only group but non-native to Korean/English group whose L1 is Korean and L2 is English. The Korean version is native to Korean/English group, but non-native to English group. These two language groups are assumed to be representative for the two major subpopulations in universities: native English speakers, and international students.

As the dependent variable, this study will test the participants' immediate recall (short-term memory), which is the same as some of the above studies (e.g., Cassidy & MacDonald, 2007; Pring & Walker, 1994). Also, delayed recall as used by Pring and Walker (1994) will be the post-test to check the long-term memory one week after the presentation of stimuli.

In order to avoid the possible order effect, the four musical conditions were randomized and assigned to four equal-sized sets of Chinese characters (10 in each set) using Latin Square method (Table 2). Each participant was randomly exposed to one unique order of the

combination of musical conditions and set of Chinese characters while the participants were memorizing the sets of characters. The whole experiment including the combination of music and the character set was conducted using E-Prime 2.0.

Table 2
Order of Background Music Conditions

Chinese character	Stimuli			
I	A	B	C	D
II	B	C	D	A
III	D	A	B	C
IV	C	D	A	B

Note: A – Silence
　　　B – Instrumental music
　　　C – Music with English lyrics
　　　D – Music with Korean lyrics

Procedure

Before the experiment, the experiment administrator (EA) explained the nature of the research to each participant, and when they had totally understood the nature of the study and their rights and agreed to participate they were asked to sign the consent form. Then the EA took the participants to the computer, seated them, and helped them put on the earphones to run the experiment.

Across the presentation of the Chinese characters, the participants were asked to listen to a certain one of the four types of background music: silence, instrumental music, vocal music with Korean lyrics, and vocal music with English lyrics. The music selected was presented over headphones at a safe, comfortable listening level (< 60 dB).

The participants were required to complete four equivalent sessions. Each session consisted of two sub-sessions:

1) In the first sub-session, a set of ten characters was presented on the screen with the Pinyin and English meanings. The participants were required to memorize all the meanings within two minutes.

2) In the second sub-session, there was a thirty-item test to check how well each participant could remember these meanings. The participants hit "1" on the keyboard if the meaning matched the character, and "2" if not. After the test was finished, the participants would be allowed to have a one-minute break. Both accuracy and reaction time (time between stimulus presentation and participant's response) were recorded.

The whole experiment took approximately 30 minutes. After the participant finished the experiment, they were given a survey. In the survey (Appendix C), they were asked a few questions, for example, *Are you familiar with the music/lyrics? How do you like the music? Does the music interfere with your character memorization?* To answer the close ended questions, participants only need to make a choice given in the interview protocol, while brief verbal responses were made for the open-ended question. Then, each participant was given a debriefing and dismissed.

Analysis

Two 2×4 analyses of variance were conducted to test if the two groups (English-only Group vs. Korean/English Group) performed differently in accuracy and reaction time in the four background music conditions (silence, instrumental music, music with English lyrics, and music with Korean lyrics). Table 3 shows the descriptive statistics.

Table 3
Mean Score of Accuracy of Memory and Reaction Time

Group	Music condition	Accuracy of memory (%)		Reaction Time (ms)	
		M	*SD*	*M*	*SD*
English-only	Silence	93.8	.052	1597	264.0
	Instrumental	85.4	.090	2067	825.1
	Music with English Lyrics	91.3	.064	1731	486.4
	Music with English Lyrics	91.3	.085	1719	401.5
	Mean Score	90.5	.038	1839	491.0
Korean/English	Silence	88.6	.180	1792	435.0
	Instrumental music	92.9	.044	1708	332.9
	Music with English Lyrics	88.6	.096	1897	482.6
	Music with English Lyrics	87.6	.037	1847	400.2
	Mean Score	89.4	.069	1834	274.3

Statistics yield no main group effect either in accuracy or reaction time, $F_{accuracy}$ (1, 13) = .147, p = .708, partial η^2 = .011; $F_{reaction\ time}$ (1, 13) = .091, p = .768, partial η^2 = .007, indicating that across the four different music conditions, the English-only group and the Korean/English group had no significantly different performance either in accuracy or reaction time on novel Chinese character meaning memory. The result also showed no main music condition effect, $F_{accuracy}$ (1, 13) = .150, p = .929, partial η^2 = .011; $F_{reaction\ time}$ (1, 13) = .674, p = .573, partial η^2 = .049, which means that neither the memory accuracy nor the reaction time across the two groups was not significantly different between the four different music conditions. There was also no significant interaction detected between group and music condition either in accuracy or in reaction time, $F_{accuracy}$ (1, 13) = 1.534, p = .221, partial η^2 = .106; $F_{reaction\ time}$ (1, 13) = 1.973, p = .134, partial η^2 = .132.
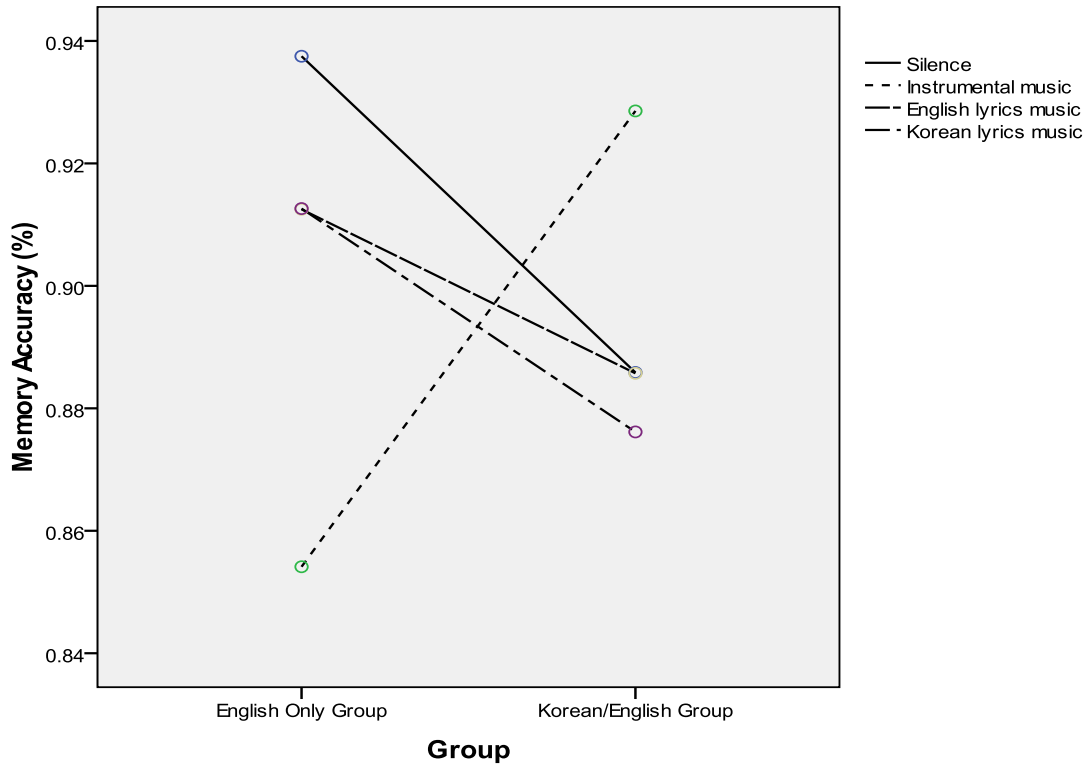
Figure 1. Memory Accuracy of the Two Groups

  Follow-up pairwise comparisons were conducted to test if there was any significant difference in accuracy or reaction time between any pair of music conditions. First, there still existed some accuracy differences between each pair of music conditions, although the result was not statistically significant, p's > .5 (Figure 1). Under the instrumental music condition, Korean/English group (M = .929, SD = .044) produced higher accuracy than English-only group (M = .854, SD = .091), while under the other three music conditions, English-only group (M = .938, SD = .052; M = .913, SD = .064; and M = .913, SD = .085) was all better than Korean/English group (M = .886, SD = .180; M = .886, SD = .096; and M = .876, SD = .069). In addition, both the groups performed more accurately under the condition of silence ($M_{English\ group}$ = .938, SD = .052; $M_{Korean/English\ group}$ = .886, SD = .180) than Korean lyrics music condition ($M_{English\ group}$ = .912, SD = .085; $M_{Korean/English\ group}$ = .876, SD = .069).
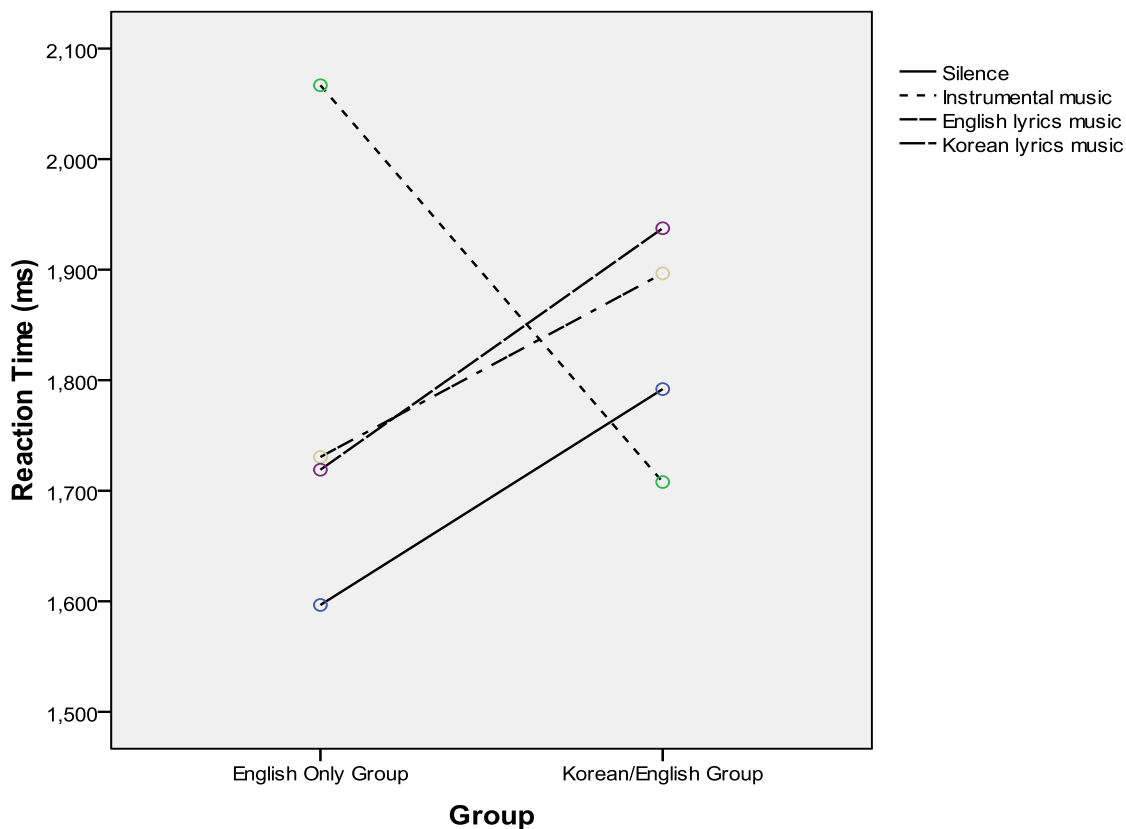
Figure 2. Reaction Time of the Two Groups

Like the accuracy, pairwise contrasts yielded no significant (*p*'s > .05) but still some obvious difference of reaction time (Figure 2). English-only group performed more slowly (*M* = 2066.8, *SD* = 825.1) than Korean/English group (*M* = 1707.8, *SD* = 332.9) after listening to the instrumental music. However, in all three of the other music conditions, English group reacted more quickly (*M* = 1596.6, *SD* = 264.0; *M* = 1730.5, *SD* = 486.4; and *M* = 1718.9, *SD* = 401.5) than Korean/English group (*M* = 1791.9, *SD* = 435.0; *M* = 1896.5, *SD* = 482.6; and *M* = 1937.4, *SD* = 400.2). Across the two groups, the reaction time after the music with English lyrics (*M* = 1808.0, *SD* = 474.8) was almost the same as with Korean lyrics (*M* = 1820.9, *SD* = 402.4), but they used more time to make responses after the silence (*M* = 1687.7, *SD* = 355.1).

A bivariate correlation was conducted to check the relationship between the accuracy and the reaction time. The result shows a significant negative correlation between these two factors, *r* (59) = -.505, *p* < .05. This means that the participants are likely to react more slowly as they perform less accurately, and vice versa.

Conclusion and Discussion

First of all, this is a small sample experimental study situated in the author's real teaching context. The conditions that existed in the procedure may only work locally. And the findings from this research may not be generalizable, considering the small size of the sample.

As one of the major findings from this study, there was no significant difference in either the memorization accuracy or the reaction time across the music conditions between the two language groups, in general. This result is similar to both Chou's (2008) and Zimmer's (1978). This implies first that novel Chinese character meaning memory cannot be affected significantly whether the college learners can speak one language or two languages.

Second, it can be interpreted that the music conditions do not make a difference when being used in classroom activities. It is suggested that instructors can choose to use or not to use music in classroom activities. If using music, instructors should not worry too much about music types, but should try their best to make the music not distractive or depressive, and adjust the volume based on learners' comfort with the music. Also, as the analyses above indicate, the Korean group performed better, though not with statistical significance, than the English group under the instrumental music condition. This implies that instructors should encourage Korean students to try instrumental music in their Chinese character learning. However, since the difference is not statistically significant, teachers should convey this encouragement according to students' real situation. Further confirmatory studies may be launched for alternative results.

Additionally, the sample used in this study may not be representative enough. First, students were sampled only at one university. The research result should not be applied to other settings until samples are randomly selected from the target population and randomly assigned to experimental or control groups. Second, the number of participants is relatively small. This gives a small effect size, which may weaken the validity of the findings. It is then suggested that future research increase the number of participants and carefully look at the differences that may be explained by the intended design.

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Appendix A

Whole Set of Characters – Experiment Stimuli

恙[yàng]: ailment

吝[lìn]: stingy

弩[nǔ]: crossbow

沁[qìn]: to ooze

甄[zhēn]: to distinguish

霭[ǎi]: haze

媲[pì]: to be equal to

阄[jiū]: lot

佼[jiǎo]: handsome

剐[guǎ]: cut to pieces

冗[rǒng]: redundant

虔[qián]: pious

沓[tà]: crowded and repeated

襄[xiāng]: to assist

谀[yú]: to flatter

俸[fèng]: salary

馁[něi]: dispirited

沛[pèi]: copious

衅[xìn]: to quarrel

肄[yì]: to study

叟[sǒu]: old man

赦[shè]: to remit a punishment

刎[wěn]: to cut one's throat

炙[zhì]: to toast

莅[lì]: to arrive

冉[rǎn]: slowly

茸[róng]: fine and soft

恸[tòng]: sorrowfully

熹[xī]: dawn

轩[xuān]: lofty

揠[yà]: to pull up

馐[xiū]: dainty

殇[shāng]: to die young

黜[chù]: to dismiss

敦[dūn]: honest

殆[dài]: almost

孱[chán]: frail

殚[dān]: to exhaust

屐[jī]: clogs

臼[jiù]: mortar

Appendix B
Four Sets of the Chinese Characters

Set One	Set Two	Set Three	Set Four
恙[yàng]: ailment	冗[rǒng]: redundant	叟[sǒu]: old man	揠[yà]: to pull up
吝[lìn]: stingy	虔[qián]: pious	赦[shè]: to remit a punishment	馐[xiū]: dainty
弩[nǔ]: crossbow	沓[tà]: crowded and repeated	刎[wěn]: to cut one's throat	殇[shāng]: to die young
沁[qìn]: to ooze	襄[xiāng]: to assist	炙[zhì]: to toast	黜[chù]: to dismiss
甄[zhēn]: to distinguish	谀[yú]: to flatter	莅[lì]: to arrive	敦[dūn]: honest
霭[ǎi]: haze	俸[fèng]: salary	冉[rǎn]: slowly	殆[dài]: almost
媲[pì]: to be equal to	馁[něi]: dispirited	茸[róng]: fine and soft	孱[chán]: frail
阄[jiū]: lot	沛[pèi]: copious	恸[tòng]: sorrowfully	殚[dān]: to exhaust
佼[jiǎo]: handsome	衅[xìn]: to quarrel	熹[xī]: dawn	屐[jī]: clogs
剐[guǎ]: cut to pieces	肄[yì]: to study	轩[xuān]: lofty	霭[ǎi]: thunder

Appendix C

Survey

Here is a short survey related to the music you heard today and your daily status of listening to music. Please take around five minutes to complete it.

Thanks!

1. Did you know this music before this study?
(1) Yes.　　　　(2) No.
2. Did you know the lyrics in your native language?
(1) Yes.　　　　(2) No.
3. Did you know the lyrics in the non-native language?
(1) Yes.　　　　(2) No.
4. In this experiment, did you try to identify the words of the lyrics?
(1) Yes.　　　　(2) No.
5. How much can you recall the lyrics in your native language?
(1) Much.　　　　(2) Nothing or little.
6. Do you like the music?
(1) Yes.　　　　(2) No.　　　　(3) I don't know.
7. Do you think music is distractive when you memorize regular course contents?
(1) Yes.　　　　(2) No.　　　　(3) Moderate.
8. What do you think of the music sound volume?
(1) OK.　　　　(2) Loud.　　　　(3) Low.
9. What is/are the major memorizing method(s) you used in this study?
Answer:
10. How did you like this study? Why? (optional)
Answer:
11. How did you like the experiment design (interface, instructions, and other components)? Why? (optional)
Answer:

Experiment ID:_____ Age:_____ Gender: ( ) Male; ( ) Female (Check with 'X'.)
Native language/ major language being used: ( ) English; ( ) Korean (Check with 'X'.)

听音乐影响记忆汉字字义吗？

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摘要

帮助初学汉语这有效记忆生字是汉语老师很重要但也是不容易的一件事。通过小样本课堂教学实验，本研究调查了两组初级中文学生（英语母语组和韩语母语/英语二语组）在有无背景音乐的条件下对汉字字义的短时记忆效果。实验中使用的50个汉字及英文含义随机与同一首乐曲的不同版本结合出现、供实验者记忆：纯器乐曲、英语歌词歌曲、韩语歌词歌曲、无背景音乐。紧接着对实验者进行记忆测验。结果显示，在所有四种音乐背景条件下、不管歌词使用何种语言，两个语言组被试的记忆准确性和反应时无显著性差异。在一定程度上说明，歌词语言和有无音乐对汉字字义的短时记忆没有影响。

关键词： 背景音乐，歌词，短时记忆，汉字学习

About the Author:

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