

Effect of Vocal and Instrumental Background Music on Word Memorization

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The purpose of this study was to investigate the effect of vocal and instrumental background music on a verbal memorizing task. Participants were 30 undergraduate and graduate students and were randomly divided into two groups. All participants in both groups took a pretest and a posttest to examine the improvement of the memorization. Background music was inserted during the memorization task. Subjects in Group A listened to a vocal recording whereas Group B listened to the same music except with a cello playing the melody of the vocal part. All participants were asked to take the posttest to examine the improvement of their knowledge after the memorization. The t-test was used to compare the two groups. Results indicated that Group A(8.93) exhibited higher mean scores than Group B(7.46) but there were no significant differences $t(28) = 1.38, p < .05$. This study implies that lyrics does not distract word memorization and background music does not influence cognition directly.

Keywords : Background music, Vocal music, Instrumental music, Memorization

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성악과 기악 배경음악이 단어 암기에 미치는 영향

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본 연구는 성악과 기악 배경음악이 단어 암기 과제에 미치는 영향을 알아보고자 하는데 목적이 있다. 30명의 대학생과 대학원생이 참여하여 두 그룹으로 무작위로 나뉘어 졌다. 단어 암기 과제를 하는 동안 배경음악이 삽입 되었다. 그룹 A에 있는 참가자들은 성악곡을 감상했고 그룹 B에 있는 참가자들은 동일 음악이지만 첼로로 연주되는 기악 음악을 감상 했다. 모든 참가들은 배경 음악이 있는 단어 암기 과제 후 암기력을 측정하기 위해 사후 검사가 실시되었다. T test를 통해 두 그룹의 차이를 보고자 하였다. 그룹 A의 평균(8.93)이 그룹 B(7.46) 보다 높았지만 두 그룹간의 유의미한 차이는 없었다($t(28) = 1.38, p < .05$). 이는 가사가 단어 암기 과제에 방해되지 않는다는 것을 제시하였으며 배경음악이 인지 능력에 직접적인 영향을 미치지 않는다는 것을 시사한다.

핵심어 : 배경음악, 성악곡, 기악곡, 단어 암기

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I . Introduction

Within the past several decades, numerous studies have been done concerning the effects of background music on human behavior. According to Mussulman(as cited in Boyle & Radocy, 1997), background music is any music that is “intended to be heard but not actively or purposely listened to”. In other words, ‘listeners’ are primarily engaged in some task other than listening to music. Although there are several studies related to background music, they exhibit inconsistent results indicating that background music can interfere with a variety of tasks, improve on-task behavior, enhance concentration, or have no effect at all. Wolfe(1983) did a study concerning task performance and the volume of background music. He divided the participants into four groups: task only, task and music at 60-70dB, task and music at 70-80dB, and task and music at 80-90dB. He found the volume of music to be a contributing factor for distraction. This was especially true when background music reached 80-90dB, although there were no significant differences in task performance among the four groups.

Besides the volume of background music, studies on tonality have been investigated as a distracting musical element affecting task performance and behavior. Pearsall(1989) compared three musical conditions: tonal music(Bruckner’s Symphony No.7, Movement 2 and 3), atonal music(Shoenberg’s Five pieces for Orchestra) and no music in an English class by using the Sequential Tests of Education Progress Listening Comprehension Test, Level J. According to Pearsall(1989), the results indicated that tonal music distracted listening comprehension test due to the fact that the music caught the participant’s attention.

Using different background music utilizing varied tempo and consonance has been studied on verbal learning task(Jancke & Sandmann, 2010). Unfamiliar music was used and there were no substantial and consistent influence of background music on verbal learning. However, electroencephalogram(EEG) data suggest different background music conditions evoke different cortical activations. Also, results indicated that verbal learning is kept constant when background music draws more attention.

Several studies involving background music, task behavior and performance

on people with disabilities have been completed. Celser, Groeneweg, MacBeth, Stan, & Urbancic(1988) did a study on the effect of background music on the vocational behavior of adults with developmental disabilities. Observations were done on the behaviors of these subjects working in a natural environment with both music and without music. Results indicated that the background music had a significant difference on the work behavior in a positive way. Burleson, Center & Reeves(1989) also did a study on the relationship of background music and task performance in children with psychotic behaviors. The task performance was assessed through a color sorting task. The results indicated that background music had an effect and reduced off-task responses that interfered with task performance. According to Burleson et al.(1989), the background music increased the task accuracy in children with psychotic behaviors, which clearly support music as a facilitator for task performance. Otto(1995) also did a study to investigate the effect of background music, household fan noise, and silence on the on-task behavior of children with behavior disorders. The task was a hand-writing assignment. Results indicated positive effects for background music while there were no significant effects on silence and household fan noise.

Studies of background music on task performance with the elderly have also been completed. Clair, Cochran, Johnson, & Otto(1999) investigated a study on the influence of background music on task engagement with elderly people. Eighteen subjects participated in weekly sessions for twelve weeks. Sessions included ten minutes of silence, preferred background music, and non-preferred background music. The results of this study indicated that there were no significant differences among the conditions, although it was reported that subjects were more talkative when preferred music was used as background music. Clair, Johnson, & Otto(2001) later did another study with elderly people concerning background music. The study investigated the effect of instrumental and vocal music on adherence of physical therapy rehabilitation exercise with the elderly. Subjects participated in six sessions under three conditions: two sessions with live instrumental music, two sessions with live vocal music, and two sessions with no music. The results showed that there were significant differences among the conditions in that the instrumental music achieved the best results due to the fact that participants tended to sing along to vocal music, which interfered

with exercising. Additionally, participants were unable to make movements in consistent tempo when there was no music.

Not only are different types of music an important element that affects task performance but the kind of tasks that are performed are important elements that influence the results as well. Miller & Schyb(1989) investigated a study to compare both verbal and nonverbal tasks with different types of music. Mozart symphonies, a string octet by Mendelssohn, popular vocal music, and contemporary popular instrumental music were used to test four different tasks, which included numerical ability, space relations, verbal reasoning, and a reading comprehension test. According to the authors, results indicated that nonverbal tasks were facilitated by background music although a bit of interference appeared on verbal tasks. Also, vocal music resulted in the fewest questions attempted for all groups.

Pring & Walker(1994) did a study if background music influenced verbal processing. The authors utilized nursery rhymes as background music without the verbal(lyrics) part. Results indicated that background music significantly impaired concurrent verbal processing in that the music was long-associated with words.

In order to determine if the lyrics in vocal music functions as a distraction on task performances in particularly memory, it seems logical to examine the elements in vocal music and investigate if a certain element in vocal music interferes the participants. Furthermore, previous studies imply that nonverbal tasks are facilitated by background music whereas verbal tasks appear to be disturbed, but do not include specific verbal task on memorization. The purpose of this study, therefore, was to examine the effect of vocal music and parallel instrumental music on a test designed to assess a verbal memorizing task. The background music used in this study were carefully controlled - the inclusion of the vocalization of lyrics, as the only difference.

II . Method

1. Participants

Participants in this study were 30 undergraduate and graduate students attending a local university in Midwestern region of U.S.A. Ages ranged from 20 to 30 years old. 40% were female(n=12) and 60% were male(n=18). All participants were Asian students; 90%(n=27) were Korean and 10%(n=3) were Japanese. Participants were limited to Asian students due to the fact that they were unfamiliar to Canadian provinces and territories which was the memorizing task. The participants were divided randomly into two groups of 15 subjects in each group.

2. Procedure

Both groups were given a pretest before the musical interventions. A list of Canadian provinces was provided and the subjects were asked to write down the name of the territories they know for each corresponding province. After the pretest, the subjects were given a list of the Canadian provinces and territories for them to memorize for one minute with background music. The method of the memorizing task was up to the participants; they were allowed to memorize with their eyes only, talk out loud, write as they memorize or any other method that was the best for the participant.

Group A listened to a recording of Franz Schubert's Ave Maria, a vocal recording sung by Sumi Cho with piano accompaniment. The subjects in Group B also listened to Schubert's Ave Maria, but a recording of a cellist Jiyeon Kim playing the melody with accompaniment of a piano. Schubert's Ave Maria was selected as the music in the present study due to the fact that this particular piece is inserted in the high school music class textbook. Therefore it was considered as a familiar piece to the participants. Studies have indicated that familiar music facilitated recall more than unfamiliar music in that it does not take room in short-term and working memory storage(Snyder, 2000). Participants in both groups listened to the recordings through a portable Sony CD player with

earphones while memorizing the list for one minute. After the task of memorizing the list under the different conditions, both Group A and B were asked to take the posttest. The posttest included two questions asking about the familiarity and preference of the music on a five point scale similar to the Likert scale.

The independent variables in this study were vocal and instrumental background music. Both testing conditions used the same song except for the difference of the melody being sung in vocal with lyrics or the melody being played by a cello. Also, the volume level of the music was kept constant. The dependent variable in this study was the number of correct territories that were written for each Canadian province.

III . Results

Thirty participants completed both a pretest and a posttest. The difference in the pretest and posttest exhibited improvement of each participant's knowledge of the Canadian provinces and territories after the musical interventions. A *t*-test was completed on improvement scores to determine if there were any effects that attributed to the conditions of vocal and instrumental music. There were no significant differences between Group A(vocal background music) and Group B(instrumental background music), $t(28) = 1.38, p > .05$. Results revealed that the mean score of Group A(8.93) was higher than Group B(7.46) as shown in Table 1. Specific test scores of each group are shown in Table 2 and 3. Questionnaires concerning the preference and familiarity were provided for the participants to answer at the end of the posttest. Nine subjects(30%) received a score higher than 10 out of 13 questions. Among these subjects, 6 subjects(67%) answered that they knew the music very well and 8 subjects (89%) answered that they liked the music very much.

<Table 1> Mean and Standard Deviation Scores

Group A		Group B		<i>t</i> (28)	<i>p</i>
<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
8.93	(3.12)	7.46	(2.73)	1.38	.13

$p < .05$

<Table 2> Test Scores of Group A

Subjects	Pretest	Posttest	Posttest- Pretest	x-x	(x-x) ²
1	0	6	6	-2.93	8.53
2	0	11	11	3.07	4.28
3	0	9	9	0.07	0
4	0	13	13	4.07	16.56
5	0	13	13	4.07	16.56
6	0	10	10	1.07	1.14
7	0	11	11	2.07	4.28
8	0	11	11	2.07	4.28
9	0	6	6	-2.93	8.58
10	0	8	8	0.93	0.86
11	0	3	3	-5.93	35.16
12	0	7	7	-1.93	3.72
13	0	13	13	4.07	16.56
14	2	7	5	-3.93	15.44
15	0	8	8	0.93	0.86

<Table 3> Test Scores of Group B

Subjects	Pretest	Posttest	Posttest- Pretest	x-x	(x-x) ²
1	0	8	8	0.54	0.29
2	0	4	4	-3.46	11.97
3	0	11	11	3.54	12.53
4	0	7	7	-0.46	0.21
5	0	1	1	-6.46	41.73
6	1	5	4	-3.46	11.97
7	0	9	9	1.54	2.37
8	0	9	9	1.54	2.37
9	0	11	11	3.54	12.53
10	0	7	7	-0.46	0.21
11	0	8	8	0.54	0.29
12	0	7	7	-0.46	0.21
13	0	9	9	1.54	2.37
14	2	9	7	1.54	2.37
15	0	7	7	-0.46	0.21

IV . Discussion

The purpose of this study was to determine if vocal and instrumental background music affects the task of word memorization. In other words, the study was to examine if the vocalization and the lyrics in vocal music distracted the task of word memorization compared to music that does not have vocalization and lyrics. Results indicated that the mean score of Group A was higher than Group B. However, there were no significant differences between vocal background music and instrumental background music which therefore indicates that the null hypothesis was not rejected. The results are inconsistent with the study done by Baddeley & Salame(1989). Results indicated that vocal music was more disruptive than instrumental music when performing cognitive task regarding short-term memory although there were no significant difference. However, there was a significant difference when the study was replicated with more highly trained subjects. Gilroy & Ransedell(2001) also indicated that subjects with musical training and high working memory span exhibited better fluency and effectiveness of word processing with background music whereas subjects with no music training exhibited disrupted writing fluency. The subjects who participated in the present study were non-music major college students. Further research with music trained subjects and non-music trained subjects is necessary.

There are several confounding factors that may have influenced results in this study. The present study involves only one musical element: the vocalization and lyrics. However, the questionnaires that were provided at the end of the posttest exhibits that the familiarity and preferences of music should also be considered. The familiarity of music may provide stability to the subject and therefore help the subject maintain concentration while memorizing the list of words. Also, Grosso's(1988) research supports that the preference of music affects the ability to memorize. He concluded that the individuals' needs when choosing background music affect the ability to memorize. Hallam, Katsarou, & Price(2002) also indicated that the effects of background music on task performance are mediated by arousal and mood rather than influencing cognition directly. In this study music that was perceived to be calming and relaxing exhibited better

performance in arithmetic and memory task compared to no-music condition. On the other hand, music that was perceived to be aggressive and unpleasant disrupted memory task.

The present study however, used single selected music, not considering the preferences of each participant. Therefore, recommendations for future research in the area of background music's effect on memorization include considering the participants' musical familiarity and preferences. The generalization of the research findings from this study is limited due to the small number of subjects. A systematic replication of this study would be required to establish generalization.

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- 게재신청일: 2011. 11. 07.
- 수정투고일: 2011. 11. 10.
- 게재확정일: 2011. 11. 15.