International Journal of Research
Available at https://edupediapublications.org/journals
e-ISSN: 2348-6848
p-ISSN: 2348-795X
Volume 04 Issue 14
November 2017

The Effects of Classic Music on Calculating Ability

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Abstract

This study examined the effects of classic music listening on the accuracy of doing mathematic operation. Primary school students under age 10-13 (N-134) are tested on two math tasks with the same difficult level under two separate conditions: in silence, or with classic music.We predicted that the classic music will impair their ability on mathematic calculation, and imposes significant negative impact on the test results. According to our pre-research (volunteering sample of 283 participants), over 54% of the participants responded that listening music will not ruin their calculating . ***Mayfield and Moss (1989) revealed that background music with a quick tempo improved the subjects' cognitive performance in a task involving the calculation of stock market price changes. (Mayfield, C. and Moss, S. 1989. Effect of music tempo on task performance. Psychological Reports, 65: 1283-1290.)***However, the hypothesis test that we constructed reveals that the difference of accuracy under two conditions is significant, suggesting that listening music significantly impair the calculating ability.The Effects of Classic Music on Calculating Ability

Music is a ubiquitous component of contemporary society. Empowered by the advanced technology, people can listen to music anywhere simply by clicking up the iTunes on their iPhones. According to our survey among 283 volunteers(most of them are students), 73.14% of the respondents confessed that they have the habits of listening to music (mostly classic music) while study. However, could classic music be associated with academic performance? Could people perform better on study with classic background music? Or, will it impair people's academic performance?

Perhaps one of the most prestigious research examining the effect of background music on learning is the research of Georgi Lozanov (July 22, 1926 in Sofia, Bulgaria – May 6, 2012 in Sliven, Bulgaria, a Bulgarian scientist, neurologist, psychiatrist, psychologist and educator, creator of suggestology, suggestopedia and integrated psychotherapy).He is known as the father of accelerated learning, which suggests to utilize background music to foster memorization and boost learning ability. He proposed to make students focus by alleviating stress and stimulating their brains with background music. In one of his research, he tested the participants by slow classical music with 60 per minute beat rhythm. It terms out that their speed of memorization increased by 50%, and their learning efficiency is greatly improved as well .This approach also possesses a variety of specific methods, including a method called "music scene". It requests the student to listen to the classical music,

such as, Hector, Beethoven, Mozart, and reading the textbook aloud with their teachers. According to the experiment report, students are enabled to learn a foreign language using this method in 6 weeks. In another experiment conducted by D. Stephen Lindsay,(a cognitive psychologist in the field of memory, and a professor of psychology at the University of Victoria, British Columbia), he examined the effect of music on reading comprehension ability: He selected 80 middle school students, randomly divided them into four groups, and asked them to finish reading comprehension tasks under four different conditions: with mountain spring sound, old Canon music, rock and roll, or without the background music .Results showed that students' reading performances were significantly better under the background of classical music and mountain spring sound than those without the background music; whereas, their reading comprehension scores under rock music are significantly lower than those without the background music.

The relatively sparse researches on the effect of music have left room for further research. Much of the research has focused on the effect of classic music on either linguistic learning ability or reading comprehensive ability; however, calculating is also a major component of learning ability. Will it be a bit of myopic to conclude that classic music is beneficial for students' study, without examining its effect on their calculating ability?

Therefore, the current study will help us understand how students' study ability is affected by classic music in a more comprehensive scope—added with the effects on calculating ability. Specifically, participants' test scores are expected to be lower under classic music than without music.The Effects of Classic Music on Calculating Ability Method

Participants

Participants include 133 students volunteer (67 females,66 males) under age 10-16 from 4 different grades—grade 4, 5, 6. We randomly selected one class in each grade from Chongqing ShanHu Experimental Primary School .They all possess different academic performance; yet, potential participants are excluded if they are extremely good at math. Those who are not used to listen to music while study were also excluded, as were potential participants who could not withstand such disturbance.

Materials

Calculating ability of Grade 4, 5, 6 is measured using test papers designing by ourselves, which are base on their teaching schedules. One test paper is composed of two sections with the same number of questions and the same difficult level. Participants were required to finish each section within 10 minutes in different conditions. Scores are recorded as the wrong answers of each section.

Procedure

At the initial meeting, all randomly selected students were informed to participate in a math test; we intentionally conceal the real purpose of our study in order to ensure the single-

blinded request and avoid Hawthorne Effect.

Two days after, we went to their school and began the test at 3:10 P.M. Participants from grade 4, 5, 6 were each given the math test papers designed based on their teaching schedules.None of the participants were permit to use calculator or smart phone; what's more, the windows were closed to isolate the noise and avoid the destruction outside the classrooms.

Participants were requested to finish the first section—within 10 minutes—in silence. Immediately after 10 minutes, participants were allowed to have a 10-minute rest to recover. Next, they would have to start working on the next section, with a piece of classic music—***For Alice, Ludwig van Beethoven***—played on stereos in a moderate volume. After another 10 minutes, the test papers were collected by the researchers, and all the participants were informed the real purpose of this experiment. In addition, they were told that (1) they were not to tell any other participants whether they had completed the test paper or simply given up. This procedure was followed to prevent the group influence of some participants seeing others give up. (2) They were not allowed to review the test questions if they had finished the test paper. This procedure was followed to expose their original state while they were doing the test. (3) They were not

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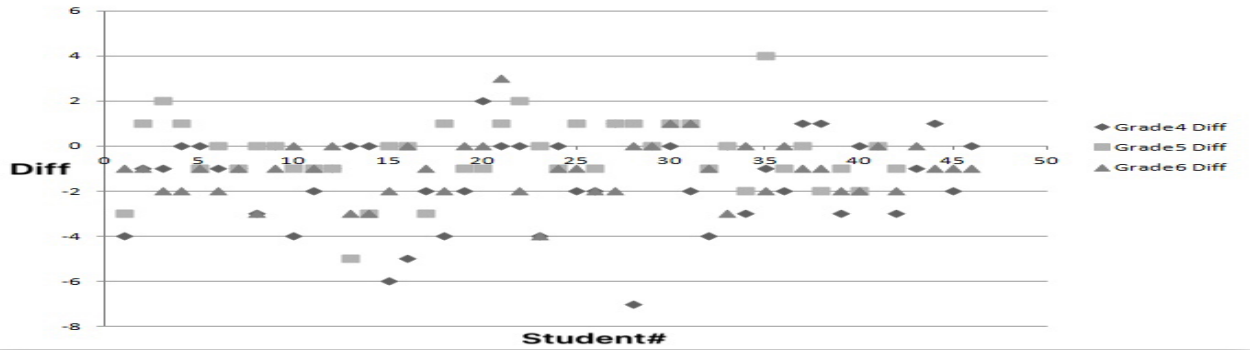
permitted to have any communication with others to ensure the fairness of the experiment. (4) They were not allowed to turn back to the first section while doing second section, or preview the second section while doing the first section. We than dismissed the class after the test.

Results

The differences of the number of wrong answers under two separate conditions are generated as a dotplot (see figure 1.), from which we can tell that the majority of the students, regardless of their grade, get more questions wrong under classic music, which indicate that the classic music might impose negative impact on their calculating ability.

Figure 1.



We predicted that the students' number of wrong answers will be more under the condition of classic music rather than in silence. Four matched pair t-test for mean difference and four 95% confidence intervals (all separated by grade 4,5,6 and the general scores respectively) are conducted.

For grade 4(see figure 2.), the average difference is -1.08696(SD=1.26185), which indicates that students generally did a better job on calculating without music. The matched pair t-test for mean difference indicate that the number of wrong answers are significantly fewer without listening to classic music, t=-5.842, p=2.675E-7 << 0.05.

PAIRED SAMPLE T TEST

		PAIRED DIFFERENCE							
					95% confidence interval for difference				
		MEAN	STDEV	S.E.Mean	LOWER LIMIT	UPPER LIMIT	t	df	P-VALUE
PAIR 1	WITHMUSIC4 - WITHOUTMUSIC4	-1.45652	1.97435	.29110	-2.04283	-.87021	-5.003	45	0.000005

Figure 2.

Another matched pair t-test for mean difference of grade 5(see figure 3)(M=-0.76190,SD=1.51109) also shows that students get more questions corrected without classic music(t=-3.268,p=0.02<0.05).

Figure 3.

PAIRED SAMPLE T TEST

		PAIRED DIFFERENCE							
					95% confidence interval for difference				
		MEAN	STDEV	S.E.Mean	LOWER LIMIT	UPPER LIMIT	t	df	P-VALUE
PAIR 1	WITHMUSIC5 - WITHOUTMUSIC5	-.76190	1.51109	.23317	-1.23279	-.29102	-3.268	41	0.02

Significant difference is also found in grade 6(see figure 3.)(M=-1.45652, SD=1.97435,t=-5.003,p=0.000005<<0.005),indicating that students in grade 6 have a better performance in calculating without listening to classic music simultaneously.

PAIRED SAMPLE T TEST

		PAIRED DIFFERENCE							
					95% confidence interval for difference				
		MEAN	STDEV	S.E.Mean	LOWER LIMIT	UPPER LIMIT	t	df	P-VALUE
PAIR 1	WITHMUSIC6 - WITHOUTMUSIC6	-1.08696	1.26185	.18605	-1.46168	-.71223	-5.842	45	2.675E-7

Figure 4.

Overall, we found support for our alternative hypothesis that students did a better job of calculating without music than under the condition of classic music.(M=-0.99254,SD=1.68361, t=-6.824,p=1.4186E-10<<0.05)(see figure 4) Unexpectedly, classic music has a significantly negative impact on students' calculating capability.

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PAIRED SAMPLE T TEST

		PAIRED DIFFERENCE					t	df	P-VALUE
		MEAN	STDEV	S.E.Mean	95% confidence interval for difference LOWER LIMIT	UPPER LIMIT			
PAIR 1	WITHMUSICTOTAL – WITHOUTMUSICTOTAL	-.99254	1.68361	.14544	-1.28021	-.70486	-6.824	133	1.4186E-10

Figure 5.

Discussion

The purpose of this study was to test whether classic music will impose negative impact on students calculating capability. We predicted that students will perform better in calculation without music than with classic music. In this study, the test result does unveil that the correct rate is higher while students doing calculation in silence. Thus, the hypothesis was supported by this experiment.

The findings made effective addition to the previous study, verifying that classic music might not improve study ability in specific aspect other than reading comprehension. Taken together, these findings suggest that classic music might be beneficial to verbal-related task; however, it might be a disturbance when operating calculate-based task. The reasons behind, however, are still elusive. According to our interview after the experiment, the majority of students gave us feedbacks reflecting that they couldn't focus well while listening to classic music and doing calculation simultaneously; the elegant melody became a seemingly disturbant factor that divert their attention. Thus, we surmise that the students multiple-task operating ability might relate to the experiment results, but it seems hard to explain why the outcomes of reading comprehensive test are different from calculating ability test.

Research on the effects of classical music on students's study ability could continued in several directions. First, other confounding factors might affected the outcome of the experiment: our participants might be too young to do multiple tasks at the same time, so the following study could further the current experiment by conducting tests within students of larger age gap to see whether their correct rate will be corre-

lated to their age. In addition, the time of the day when the participants took the test might as well influence the results: students were tested in the afternoon, so they might be too sleepy or hungry to focus under the condition of classic music. Second, longer-term of students' performance under classic music could be explored. It is possible that their calculating ability will fluctuate over the duration of the music condition. Studies could ask how long a person could remain focused under the condition with classic music. Third, and perhaps the most fascinating, studies could explore the profound reasons behind this phenomenon: for example, could the brain function differently while students are calculating rather than doing reading comprehensive task? However, this will require professional equipment and knowledge in neurology.

In conclusion, the results of this study provide some fascinating insights into the effect of classic music on students study ability. As we predicted, students may indeed be disturbed by the background music while they are doing calculation; in another word, they couldn't concentrate on their calculating tests with classic music. On the other hands, if students are doing reading comprehension tasks, classic music might foster their memorization ability, but for calculation test, one might be hindered by the classic music. Many students—regardless of their age and grade—have the habits of listening to music while study. This study, together with the previous and following studies, will contribute to knowledge of the disadvantages—and perhaps advantages—of listening to music while study. The mixed results of this study suggest students should listening to specific genre of music while doing corresponding tasks, and avoid indiscrimination music listening while doing tasks. It is not beneficial for students to listen music all the time while they are studying, so the wiser one listen to music, the more efficient one will be.

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Georgi Lozanov(1926-2012) ***SUGGESTOPEDIA***