A Quantitative Research on the Influence of Music Trait on Short-term Memory of College Students

Ning Qu[1], Manyu Zhang[2]

[1]Jiangxi University of traditional Chinese Medicine, Nanchang, Jiangxi, 330000, China

[2]Taikang Chengdu Hospital, Chengdu, Sichuan, 610000, China

Keywords: Music trait, Two-factor analysis, Short-term memory.

Abstract: In the research of music psychology experiment, the influence of music trait on experiment has always been one of the directions that researchers pay attention to.In this study, music was objectively screened and classified according to independent variable two-factor analysis, and the effect of background music on human short-term memory was explored by means of recognition task. The results showed that the short-term memory effect of college students in the slow speed music was better than that in the fast speed group and the control group.

1. Introduction

The theory model of music for cognitive task mainly comes from inherent generation mechanism of background music and cognitive performance proposed by Shek&Schubert in 2009. In the existing studies about the influence of music-induced emotion on cognitive task performance, one point needs to be verified urgently, that is, when music itself serves as a meaningless material, whether it can change people's cognitive task performance. The researchers of music psychology focus on which kind of traits of music is chosen for the experiment based on the influence of music traits on the experiment in music psychology. Before differentiating music, most music traits need to receive certain music training and own basic knowledge of music under the definition of music subject. In this paper, the objective evaluation methods of music materials are screened, and two objective experimental variables (the music traits that subjects can distinguish easily) are studied through recognition task: influence of performance speed and mode of music on short-term memory in college students' cognition.

2. Music material screening

From the existing research and materials, we firstly screened out 12 songs conforming to music traits of this experiment (performance speed and form). Then, non-music majors were chosen to evaluate music familiarity and music emotion. Three-point evaluation method was applied for music familiarity: -1 never heard of such music; 0 heard but not familiar with such music; 1 heard and very familiar with such music. Music emotion was evaluated with CMACL and PANAS.

Existing research holds that music familiarity will interfere in cognitive performance. Thus, we deleted the songs with familiarity exceeding 25%, and the music with positive emotion in the remaining songs was evacuated. Finally, 4 objective music materials were screened out as the research materials, including *From The New World, A Maiden's Prayer, Guitar Sonata* and *Fantasy Impromptus*. Music speed is divided into fast and slow speed. The performance form is divided into solo and symphony according to complexity.

3. Recognition task experiment

Object of study. Inclusion criteria: college students whose native language is Chinese, without visual impairment and reading disorder. 117 subjects were chosen from a university through

  DOI: 10.25236/iwedss.2019.293

recruitment and random sampling. After some invalid data were rejected in the experiment process, experimental data of 100 subjects were finally included in the data statistics. There were 50 male subjects and 50 female subjects.

Experimental apparatuses and materials. Laptop, E-prime2.0 software, Technica earphone and Apple player were used. Music materials were 4 processed songs. Recognition questionnaire was PANAS five-point scale. The recognition materials came from 60 low-frequency two-character words chosen at random from *Modern Chinese Frequency Dictionary*.

Implementation process. Double-factor mixed design was adopted in this experiment. There were 4 experimental group (fast speed and solo, fast speed and symphony, slow speed and solo, slow speed and symphony) and 1 control group. Under the condition where experimental environment level of all subjects was consistent, the subjects were required to sit in front of the appointed computer. The distance between the displayer and the subject was 50cm. they wore the earphones uniformly. After 2min relaxation training, E-prime2.0 program testing was conducted. According to the grouping, the group of background music material was played circularly for different experimental groups, while no music material was played for the control group. After the completion of E-prime2.0 program testing, the subjects filled in the questionnaire, and then all tests ended. The experimental data were typed in the computer for statistics and data analysis by SPSS20.0.

4. Experimental results

4.1 Two-factor analysis of variance

Interaction effect test was conducted for subjects, and it was found that P values of average response time, recognition scores and PANAs scores are greater than 0.05. There is no significant difference among the groups, as shown in Table 1.

Table 1. Test results of various variables of subjects

Group	Music speed	Performance form	Speed*form
Average response time	0.256	0.471	0.928
PANAS			
Recognition score	0.607	0.341	0.496
	0.994	0.717	0.368

Based on the above data, we can know that short-term memory of college students is free from the impacts of music speed and performance form.

4.2 Main effect analysis

The data indicate that under the consistent performance form, the changes of music speed have no significant difference among the groups. But seeing from the comprehensive experiment results, slow speed music group is superior to fast speed music group in terms of subjects' short-term memory, as shown in Table 2.

Under the consistent music speed, the changes of performance form have no significant difference among the groups. But seeing from the comprehensive experiment results, recognition score of symphony group is better than that of sole group, as shown in Table 3.

Table 2. Comparison of subsets of music speed

Group	**Fast speed**	**Slow speed**	**Control**	**Sig**
Average response time	923.62	969.79	979.31	0.45
PANAS				
Recognition score				
	10.53	11.75	8.65	0.48
	91.07	91.08	89.44	0.7

Table 3. Comparison of subsets of performance form

Group	Symphony	Solo	Control	Sig
Average response time	932.09	961.32	979.31	0.57
PANAS				
Recognition score				
	10	12.28	8.65	0.60
	91.40	90.76	89.44	0.37

According to the above main effect analysis results, under the influence of background music, when the variable is performance speed, short-term memory effect of college students is better than that of fast speed group and control group under slow music. When the variable is performance form, short-term memory effect of college students is better than that of solo group and control group under symphony music.

4.3 Gender analysis

Different gender showed different results in the average response time, PANAS and recognition score. The research data show that male subjects and female subjects have no significant difference in the average response time and PANAS. Under the condition of background music, recognition score of female subjects is higher than that of male subjects regardless of performance form and music speed, as shown in Table 4.

Table 4. Comparison of average response time, PANAS and recognition score of subjects with different gender

Group	F	P
Average response	0.142	0.707
time	4.443	0.038
PANAS	3.392	0.069
Recognition score		

5. Discussion and summarization

The influence of background music with different performance form and performance speed on college students' short-term memory was studied in this experiment. In this experiment, the two factors have no significant interaction effect and main effect in terms of recognition score, response time and PANAs scores, but seeing from the data results, we can see that under slow music, college students' short-term memory effect is better than that of fast speed group and control group. When the variable is performance form, short-term memory effect of college students is better than that of solo group and control group under symphony music. Under the condition of background music, recognition score of female subjects is higher than that of male subjects regardless of performance form and music speed.

The defects of this experiment are as below: the sample size of single group is only 20, and it is difficult to form sufficient sample size for other statistical variables of subjects. Meanwhile, pre-measurement and post-measurement are not considered in the experiment design process. In other words, short-term memory test is conducted twice for the same subject with background music and without background music, respectively to discuss the influence of background music on short-term memory. Only one experiment was used for the study.

Compared with previous research on music and short-term memory, the impacts of subjective emotion are excluded in this study, and the emotion level of subjects is kept at a consistent level (emotion score of music materials and PANAs score of subjects are at the same level). Thus, the hypotheses that subjective emotion interferes in and promotes cognitive performance are excluded, and the influence of background music on subjects' cognition is verified independently.

Acknowledgement

This research was financially supported by the 13th Five-year Plan" topic of Jiangxi education program Empirical Study about Influence on College Students Cognitive Performance from Perspective of Music Psychology (Grant NO.18YB180).

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