The effects of sound environments on performance of the memorizing numerical string task and cerebral blood flow changes

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IN this study, we investigated effects of sound environments to the task performance and cerebral blood flow (CBF) changes. We selected the memorizing numerical string task as a task that requires short-term memory. The task consists of memorizing eight digits and enters the eight digits correctly. We used near-infrared spectroscopy (NIRS) to monitor the CBF changes. As the result, the difference of sound environment makes significantly difference to the task performance. And In the area of left frontal CBF changes were difference to the sound environments. These results suggest that the relevance is existed to influence of sound environments on task performance and CBF changes.

I. Introduction

Previous study has reported that the short term memory system is affected by sound environments. (E.g. background noise, music) [1]. However, there are few studies that focused on the relevance to cerebral blood flow (CBF) changes on affecting task performance in sound environment. Therefore we focused on the effects of sound environments to the task performance and CBF changes. The first goal of this study is to explore the relation between the effects of sound environments on performance of the task and CBF changes.

II. METHOD and RESULTS

In this study, we collected 8 healthy right-handed adult male. Left frontal lobe CBF changes were measured with near-infrared spectroscopy (NIRS) [2]. This experiment used three sound environments; silence condition, condition where Mozart “ The Sonata for Two Pianos in D major, K. 448 ” (mozart) was offered, and the condition where whitenoise was sounded. We selected the memorizing numerical string task and the number of correct answers were considers as the index of task achievement [3]. Fig.1 shows that the task performance. Two-way ANOVA revealed statistically significant difference in the sound environment ($F(2,14)=5.42, p<.05$). The difference of sound environment makes significantly affect to the task performance. Fig. 2 shows the arithmetic mean of blood flow changes of eight subjects. In the condition of the silence, the blood flow changes were kept just after it was raised. However, in the condition of whitenoise and Mozart, the changes were decreasing after it was raised. In the Fig.3, time blood flow changes' averaging is shown. Post-hoc Tukey's test was performed.There was significant different in the blood flow changes at the silence condition between Mozart condition.

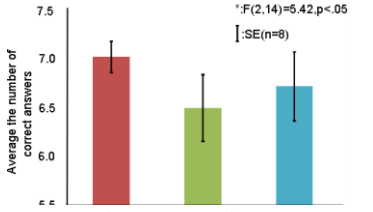

Fig1. Average of the number of correct answers

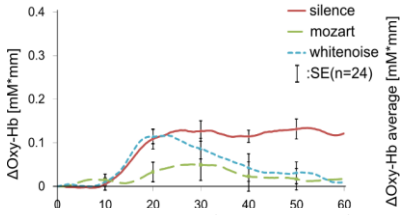

Fig2. Arithmetic mean of Oxy-Hb waveform

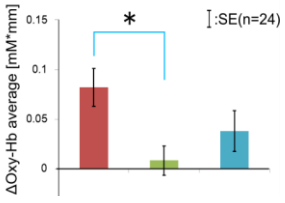

Fig3. Tme average at frontal lobe

III. CONCLUSION

In this study, the effect of the sound environments to task performance and CBF changes were discussed. It was found that the relevance to influence of sound environments on task performance and CBF changes. In the conclusion, the present study has demonstrated that the influences of sound environments are existed and at the same time, the relationship between the task performance and CBF flow changes is existed.

References

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