

Abstract

Many researchers have decided to devote their time to studying the effects of music on human behavior and physiological mechanisms. Music is a whole world and there are many musical genres (such as jazz, pop, classical music) that are influenced by different cultures and even global music that crosses cultures and geographical boundaries that affects people in a unique way. Out of the abundance that music has to give to human existence, many researchers focus on the effects of classical music on human behavior, and more specifically, on the effect of sonatas by famous composers, such as Mozart, on the mood and cognitive abilities of the listeners. Accordingly, the focus of the present study addressed specific effects of Mozart's sonata K448 on emotional, cognitive, and brain aspects in people listening to musical stimulation compared to those who did not listen to musical stimulation. The purpose of this study was to examine the effects of listening to classical music (Mozart's Sonata K448) on verbal working memory performance (reaction time and task accuracy), brain-electrophysiological measures (brain oscillations under specific electrodes) and mood. The study subjects were 45 healthy, cognitively normal people with a high school education or higher, in the age range of 20-40. The effect of a short 9:26 minute intervention of listening to a certain part - the Andante (72-76 BPM in Mozart's Sonata K448) was tested in the experimental group compared to a control group that was not exposed to musical stimulation. Immediately after the intervention, the mood of the subjects was measured using the POMS questionnaire and memory performance was measured Working with the N-back task was sensitive to prefrontal executive attention mechanisms during a computerized task that tests working memory. At the same time as the working memory task, brain waves (brain oscillations) were recorded under relevant target electrodes at different frequencies and in different positions during the task so that the brain activity was measured in specific working memory function stages - Encoding, retention and rest stages.

Participants in the experimental group who listened to an excerpt from Mozart's sonata K448 showed more accurate and faster performance than the control group. From self-reports regarding their mood, significant differences were found between the experimental group and the control, in that the experimental group experienced lower levels of stress ($M = 0.48$, $M = 1.18$ respectively) and depression ($M = 0.3$, $M = 2.09$ respectively). Significant differences were also found in the brain-functional activity between the two research groups. It was found that the average power of high beta waves at rest and during retention under electrode F7 (left prefrontal) were significantly lower in amplitude in the experimental group compared to the control group. The amplitude of alpha waves during encoding in the working memory task under the F7 electrode was lower in the experimental group compared to the control group. Correspondingly, the amplitude of high beta waves during coding under electrode F7 were lower in the experimental group compared to the control group. These results may illustrate that the experimental group apparently mobilized cognitive resources more efficiently and that the

working memory task required an increased cognitive effort from the control group, compared to the experimental group. At the same time, in the control group it was found that the average strength of theta wave amplitude during retention intervals under electrode P8 (parietal-right-lateral) is significantly related to their accuracy in the working memory task. The relationship indicated a negative correlation between theta power and task accuracy. This finding was not found in the experimental group.

In conclusion, it can be concluded that a single and short intervention of listening to the slow part of Mozart's sonata K448 leads to better verbal working memory performance, under the present research conditions. At the same time, it is evident that a single listening also leads to a significant effect on brain-functional activity that is manifested in the experimental group in a different way from the control group and also leads to an improvement in visual-verbal working memory functions and mood in the experimental group only. The findings may contribute significantly to various applications in the educational field and it is recommended to integrate them as a short intervention tool in classrooms and with students individually. Incorporating music in the educational field and in the clinical field may significantly improve working memory performance and even directly affect brain-functional activity, and on the other hand the development of these brain systems, which include prefrontal-parietal brain networks, which affect "warm" prefrontal mechanisms and control mechanisms. Crimea" working in harmony to navigate human behavior related to response inhibition and a flexible flow of thought.