

Music, Relaxation, or Silence: What Facilitates Optimal Spatial-Reasoning?

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ABSTRACT

A controversy exists over the “Mozart effect,” which is the influence of Mozart’s classical music on spatial-reasoning abilities. There are contradicting studies of whether listening to Mozart’s music improves performance on spatial-reasoning tasks. This study tested the effect of classical music on performance and investigated the role of arousal and relaxation. Participants were randomly assigned to Mozart music, techno music, vocal relaxation, or silence, where they then completed a matrix reasoning task. The results revealed no significant differences between the conditions and no significant correlation between the number of answers wrong for those listening to music and whether that participant was a musician or a non-musician. The lack of significant results for this study provides support for those researchers who were unable to observe a Mozart effect. However, an interaction of musician by group was found, thus, providing an interesting effect of musical training on how one performs in a particular listening condition.

INTRODUCTION

Should women play Mozart music while they are pregnant in order to have smarter babies? A visit to “Mozart Effect” websites allows parents to purchase Mozart’s music for prenatal, infants, and children in order to make them “smarter” in the future (e.g. www.mozarteffect.com). However, empirical research on the effects of listening to classical music, in particular, Mozart, yields a complex series of findings and more questions than answers.

Rauscher, Shaw, and Ky (1993) were the first to describe the effect of classical music on cognitive functioning. They called this influence, “the Mozart effect”, and it is defined as the improved performance on spatial reasoning tasks while listening to Mozart’s classical music. Rauscher, Shaw, and Ky (1993) found a significantly better performance in college students on the Stanford-Binet Scale of Intelligence paper folding and cutting task while listening to Mozart compared to listening to a relaxation tape or silence.

Replicating the Mozart Effect

The original study of the Mozart effect by Rauscher, Shaw, and Ky (1993) has been replicated many times, and there are three important studies that support their research. Wilson and Brown (1997) measured the performance on a paper and pencil maze task while listening to Mozart, silence, and a relaxation tape and found that listening to Mozart enhanced spatial-reasoning performance over each of the other conditions. Furthermore, Ivanov and Geake (2003) found the scores on a paper folding task in primary school children were higher while listening to Bach and Mozart compared to silence. Rideout and Taylor (1997) were also able to support the Mozart effect and generalize the Mozart effect to Yanni, which is similar to Mozart in tempo, structure, melody, and harmony. Both conditions demonstrated an improvement on a paper folding and cutting tasks in the presence of Mozart and Yanni (Rideout and Taylor, 1997). While these studies verify the influence of music on certain tasks, others refute the effect.

Steele, Bass, and Crook (1999) failed to replicate Rauscher, Shaw, and Ky’s (1993) experiment. There was no significant Mozart effect found. The lack of support for the Mozart effect was also found in the results of McKelvie and Low (2002). Spatial performance was once again tested in the presence of popular dance music, Mozart, and silence. There was no difference in performance on the tasks for either condition, thus, providing evidence that the Mozart effect does not influence spatial-reasoning performance (McKelvie & Low 2002).

The improved performance in the presence of Mozart music uncovered by Rauscher, Shaw, and Ky (1993) originated the popular notion that music can make one smarter. However, the studies have focused on a very specific component of cognition, spatial reasoning. The effect of classical music on spatial reasoning centers on two primary explanations. First, Rideout and Laubach (1996) suggest that Mozart music influences activity in the brain. When their participants listened to Mozart, they found a correlation between the differences in brain activity, using

an electroencephalograph (EEG) and an improved performance on a spatial-reasoning task. The differences or separations in the frequencies of the EEG increased while listening to Mozart, and they claim that this separation facilitates easier neural firing that is needed for spatial tasks (Rideout & Laubach, 1996). Mozart music “excites” the brain and primes it for neural firing responsible for higher brain functions (Rauscher et al., 1995).

Second, Thompson, Schellenberg, and Husain (2001) attribute the improved performance on tasks while listening to Mozart as an effect of arousal and an improved mood. Each participant listened to Mozart, Albinoni, another classical composer, and silence while each time performing a paper folding and cutting task. Albinoni’s music was expected to induce low arousal and a sad mood, compared to the Mozart and silence conditions. The researchers concluded that participants performed better on the spatial task after listening to Mozart compared to those who performed in silence, but there was no difference on the spatial task score for those who listened to a sad excerpt by Albinoni. However, in reference to mood and arousal, the Mozart group scored significantly higher on positive mood and arousal and lower on negative mood compared to the Albinoni group (Thompson et al. 2001). Thus, participants improved performance is claimed to be triggered by the positive mood and increased arousal level provoked by Mozart.

The explanation of arousal and mood impacting performance leads to the consideration of whether or not other upbeat types of music, such as techno music, might elicit the same arousal and positive mood as Mozart. Furthermore, it is questionable whether Mozart not only improves one’s mood and arousal, but may also help individuals to relax. Another component that may also have an impact on the Mozart effect is the amount of musical training of individuals. Brander and Rammsayer (2003) compared musicians to non-musicians on various intelligence tasks and found musicians to do better on intuitive thinking, as in spatial reasoning, over logical thinking tasks.

This study explored three aspects. First, spatial reasoning ability was examined in the presence of techno music, as well as Mozart, to investigate if other upbeat music can elicit the same arousal and positive mood as Mozart. Second, the study examined Mozart’s influence on the relaxation state of the individual by using vocal relaxation prior to the spatial task. Third, this study observed the correlation between performance on the test and the musical training background of participants, in reaction to Brander and Rammsayer’s (2003) study that found musicians do better on intuitive thinking, as in spatial reasoning. With the support of the previous research on the Mozart Effect, this study hoped to find three results. First, the performance on a spatial-reasoning task will improve while listening to Mozart. Second, participants listening to vocal relaxation will have an equivalent score to those listening to Mozart and will have an improved score over silence and techno music. Third, participants with musical training (4 years or more) will perform differently compared to non-musicians (less than 4 years).

METHODS

Participants

Participants for the study included 27 male and 96 female undergraduate students enrolled at the University of Wisconsin-La Crosse ($n = 123$). Their ages ranged from 18 to 25, with a mean age of 19.20. Of the sample, 116 were Caucasian, 2 were Hispanic, 2 were African American, and 3 were Asian/Pacific Islanders. The students participating in the study received extra credit in their psychology class.

Materials and Procedure

Participants were randomly assigned to one of four conditions: Mozart music, techno version of Mozart’s music, vocal relaxation tape, and silence. Prior to the task, the participants completed a questionnaire that investigated their musical training. After that, each condition was exposed to five minutes of their assigned music or relaxation techniques that was played on a CD player, except for the silence group who started the task immediately. They were then given eight minutes to complete the Stanford-Binet Intelligence Scale matrix reasoning task in the presence of their assigned music, except for the vocal relaxation and silence conditions, which performed in silence. The matrix task involved a series of 22 items in which the participant was given three boxes of a pattern, and he or she had to determine the last box of the pattern by choosing from multi-choice answers.

RESULTS

A One-Way ANOVA revealed no statistically significant results between Mozart ($M=2.77$, $SD=1.67$), techno ($M=3.18$, $SD=2.16$), relaxation ($M=2.96$, $SD=2.29$), and silence ($M=3.55$, $SD=2.82$) conditions, in regards to the number of wrong answers on the task [$F(3,101) = 0.55$, $p > .05$].

A correlation between the number of answers wrong for those listening to music and whether a participant was a musician, more than four years of training, or a non-musician, less than four years, was also analyzed. A Chi Square analysis revealed no statistically significant results for those in the Mozart condition [$\chi^2(6, N=31) = 7.04, p > .05$] and those in the techno condition [$\chi^2(7, N=28) = 12.25, p > .05$].

However, a Univariate Analysis of Variance with group and musical training as variables found an interaction effect of musician by group [$F(3,115) = 7.20, p = .00$], and a main effect for group [$F(3,115) = 3.24, p = .025$].

DISCUSSION

Exposure to Mozart's classical music did not result in an enhanced performance on the spatial reasoning task as compared to silence, vocal relaxation, and techno music and, thus, refutes the hypothesis that the Mozart Effect exists. The lack of significant differences between the conditions also does not support the hypothesis that techno music effects performance or that relaxation has an equivalent effect as listening to Mozart music. Thompson, Schellenberg, and Husain (2001) attributed the improved performance on tasks while listening to Mozart as an effect of arousal and an improved mood. However, the results of this study cannot support this claim. The techno music, which provided a comparison of a positive mood and increased arousal level, did not improve the score on the task and did not reflect a similar score to that of listening to Mozart. However, the Univariate Analysis of Variance does provide some insight into the role of relaxation. Musicians and non-musicians performed the same when exposed to vocal relaxation, and their scores were extremely similar to those listening to Mozart.

The hypothesis that musical training has a different effect on a participant's performance was supported. Although musicians did not have a higher score on the spatial-reasoning task over non-musicians, which would have supported Brandler and Rammsayer's (2003) study that found musicians do better on spatial reasoning over logical thinking tasks, there was an interaction effect of musician by group. Those who were musicians and in the Mozart, techno, and relaxation conditions had similar scores and, in fact, had fewer errors than non-musicians. Musicians performed the worst in the presence of silence compared to the non-musicians in the silence condition and compared to the other musicians in the other conditions. These results may provide evidence that musical training does have an effect on spatial reasoning performance in the presence of music. In future research, the type of musical training and the age at which musical training occurs can be investigated as an influence on spatial reasoning ability alone and in the presence of Mozart music.

These results, however, are still inconsistent with the original study by Rauscher, Shaw, and Ky (1993) and other such subsequent replications that found a significantly improved performance on the spatial task in the presence of Mozart music. The failure to replicate the Mozart effect may be attributed to not using the paper folding and cutting task that was used by many who witnessed the Mozart effect. Perhaps, this study's spatial task was not a proper assessment of spatial reasoning, or perhaps, the task was too easy for the participants and did not require them to use as much spatial reasoning. Furthermore, the music chosen for this study may have been too familiar to the participants and distracted them from the task.

Although this study provides support for the side that refutes the Mozart effect, more studies need to be conducted before a final decision can be proclaimed. Additional experiments would reveal what particular variables facilitate this phenomenon. Perhaps only certain spatial tasks and music facilitate this phenomenon. Moreover, the role of arousal and relaxation needs to be further investigated, because this research is currently limited. Physiological research on the brain while performing a spatial task in presence of Mozart, silence, relaxation tapes, and techno music would be most helpful in uncovering the mystery of the Mozart effect.

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