



## Music, Cognition and Sustained Attention (Vigilance)



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### Abstract

*Music holds a very special place in human culture. Orientation and inclination toward music has been universal. Apart from the entertainment value, studies have reported a close relationship of music with emotion. The link between music and emotional responses has been well established. Growing number of researches are now focusing on effect of music on cognitive abilities. Studies have reported that music enhances the cognitive abilities as well inhibits cognitive functions. Research evidence suggests that music influences a person's attentiveness, logical abilities, implicates positive well-being, positive emotional tone, and feeling of happiness in the person. Researches also indicated negative impacts of music on mental abilities, attention, sustained attention and other higher cognitive processes. This paper is an endeavour to understand the role of music on cognitive functions in general and vigilance in particular.*

**Keywords:** Music, Attention, Vigilance, Cognition

### Research Paper

#### Introduction

Music is the divine creation of humans, according to Plato “*Music gives a soul to the universe, wings to the mind, flight to imagination and life to everything*”. Music is an art form that possesses sonic qualities. It is something that can evoke a strong feeling without much effort. It is a language that speaks emotions and is possibly not bounded by the words for its expression. That is why sometimes music is defined as the voice of the heart or mind. Basically, music is a unique sound combination of different types of phonemes that are made of harmonic frequencies. A lot of research confirmed the fact that the most common human responses to music are to move to it (Besson & Schon 232, Thompson). Furthermore, philosophers, psychologists, anthropologists, musicologists, and neuroscientists have proposed a number of theories concerning the origin and purpose of music and some have pursued scientific approaches

to investigate them (e.g., Peretz, Levitin, Schäfer & Sedlmeier).

Music is a popular source of relaxation as well as an influential obsession in today’s techno world. Music is present in the sound of laughter, rhythmic occurrences, and melodies of a raindrop. Music is defined by its diversity, solitude, representation, and qualities. Psychophysical qualities of music and musical performances are often tightly linked to cognitive processes. Music is one of the fastest-growing fields within cognitive psychology, and cognitive processes like perception, comprehension, memory, and attention support musical behaviors. Research findings suggest that there are cognitive theories of how people understand music encompass neuroscience, cognitive science, music theory, music therapy, computer science, psychology, philosophy, and linguistics (Deutsch & Diana). Research suggested that music affects individuals psychologically (Knight and Rickard), physiologically (Bernardi, Staum and

Brotons) and socially (Arnett). Cognitive skills also influence the musician's visuospatial cognition (Sluming et.al.), mathematical abilities (Vaughn), language (Piro and Ortiz, Corrigan and Trainor), and memory (Franklin et. al., Hansen, Wallentin and Vuust).

### Objective

The objective of the present paper is to scientifically review the studies done to explore the effect of music on cognitive task performance. It tries to understand the how music mediates the vigilance performance and explore the conditions and types of music that enhances performance on cognitive tasks.

### Relevance

Listening to music not only have a relaxation effect but it also reduces stress and anxiety. Background music at workplace, preferred genre of music, personality type and nature of cognitive task, simple or complex affects the performance. Since, vigilance tasks are not only increases the mental workload, it's monotonous nature leads to decrement in performance. Review of the relevant scientific literature will help us understand the type of music and the mechanism through which music will help in enhancing the performance during cognitive task. The conclusion of the relevant scientific literature will be relevant to those whose primary work involves performing on cognitive tasks.

### Methodology

This article aims to review the association between music, cognitive capabilities like attention, memory, vigilance or sustained attention etc. The current review paper attempts to synthesize findings from empirical investigations conducted across multiple disciplines, including psychology, neurology, and musicology. Additionally, the current review aims to carefully assess and synthesize existing research literature in order to provide a thorough knowledge of how music promotes vigilance-related cognitive processes. This includes investigating how different components of music, such as pace, melody, and genre, influence attentional processes, sustained focus, and cognitive function in activities that require vigilance. However, to achieve this, an extensive search of scientific databases was conducted using electronic databases such as PubMed, PsycINFO, Web of Science, and Google Scholar. The search terms included combinations of "attention," "vigilance," "music," "cognition," and related terms. Moreover, the methodology involved conducting a comprehensive literature search to identify relevant

studies and articles that examined the music impact on several mental capabilities. The selected articles were then analysed to summarize the findings and provide insights into the effectiveness of music in enhancing or sinking human cognitive performance. A wide range of studies published in peer-reviewed journals including research papers, systematic reviews, proceeding, books, book chapters, web articles and meta-analyses that investigated the effects of music, cognitive capabilities like attention, memory, vigilance were reviewed.

The current review paper's key aims may include the some essential component like summarizing the empirical evidence, analyse mechanisms, identifying elements that influence the effects of music, evaluate theoretical frameworks and discussing the practical implications in synthesis of finding related to cognition and music. Lastly, the paper targets to present a complete summary of the current state of research on attentional processes, sustained focus, and cognitive function on music.

### Music and Cognition

People commonly do some sort of task (e.g., reading, homework, driving) while they listen to music. Such activities require the cognitive abilities like language comprehension, attention, memory, vigilance and so on. This leads many to enquire whether listening to music enhances cognitive performance. To answer this question, a simple procedure that requires people to listen to music and then complete a test of cognitive abilities. Then the performance is compared with performance on another version of the same or a similar test in a control condition that substitutes listening to music with sitting in silence or listening to another auditory stimulus.

Music's basic building blocks affect human cognition in different domains like perception, attention, working memory. Studies have shown that music enhances cognitive abilities (Hall), and it has also been reported that music interferes with complex cognitive processes (Fogelson). Jackson and Tluaka reported that specific types of music such as classical music affect learning; the phenomenon of the 'Mozart effect' also displays the relationship between learning and music.

Role of music in cognition has emerged as an interesting area. Researchers (Thompson, Schellenberg and Gabriela, 2001) suggested that music can affect cognitive abilities by modulating arousal and mood. Music influences human performance in all psychological domains i.e. emotionally, motivationally,

and cognitively, it can induce feelings like enthusiasm, sadness, happiness, or relaxation (Sloboda & O'Neill). Facilitative effects of music have been studied on spatial cognition. Raucher, Ky and Shaw reported that in the spatial reasoning category of Stanford Binet IQ test participants performed better after listening to music (Mozart sonata). Because performance was significantly higher in the Mozart condition than in the other conditions, this finding became known as the "Mozart effect."

Different types of music, background music, etc may influence the cognitive abilities differently. Different music types affect cognitive abilities of human differently (Ballard, Elias). (Tze and Chou) reported that several studies have investigated the role of different type of background music on cognitive abilities such as reading, memorization. (Wilson), reported that listening to classical or instrumental soundtracks affects cognitive performances.

Preference of music also affects cognitive performance. (Soto et al) suggested enhanced visual awareness when completing the task with preferred music as compared to non-preferred music and silence. Later, (Johansson, Holmqvist, Mossberg, and Lindgren) reported that reading comprehension performance of participants was significantly better when they listened to preferred music as compared to non-preferred music. However, no significant difference was observed between silence and preferred music.

Attention is a cognitive process on which effect of music have been studied extensively. (Beh and Hirst) reported how music facilitates attention process whereas, Alikonis et.al., focuses on the inhibitory role music plays when it comes to attention processes.

### **Background music and Cognitive Performance**

Studies support that background music can improve attention and concentration. (Shih, Huang and Chiang) found that the background music at workplace affects performance. The study consisted of two groups. Control group listened to background music with lyrics and experimental group without lyrics of the same song while completing attention test. The findings indicated that music without lyrics can enhance attention performance both directly and indirectly by increasing worker's satisfaction of the environment.

The effects of background music on cognition are dependent on many factors (Hallam & MacDonald). Even for the same task, background music can facilitate, impair, or have no effect on performance. Variables that

undoubtedly play a role include individual differences (e.g., personality, music training, music preferences, and study habits), the type of cognitive task, the context, and the choice of background music in terms of its mood or pleasantness.

Thus, based on the researches it can be concluded that music enhances memory, improves attention and focus especially tasks requiring sustained concentration by increasing alertness and arousal, stimulate creativity and enhance problem solving skills by regulating mood and creating a favourable environment for cognitive tasks.

### **Music and Sustained Attention (Vigilance)**

Music influences human cognitive processes, and the most extensively studied is the facilitatory and inhibitory effect of music on attention and sustained attention (vigilance). Maintaining attention for longer duration is referred as sustained attention or vigilance. One the problem with vigilance is the decrement in performance (Macworth) as the time progresses on task. Different causes for the vigilance decrement have been proposed which includes decrease in arousal level, decline in perceptual sensitivity and change in response criteria (Davies & Parasuraman).

Researches establish the fact that music affects vigilance performance both in a positive (facilitatory) and negative (inhibitory) manner (LaBerge, Madsen, Hartley and Williams, Standley, Button, Behm, Holmes, and MacKinnon, Banbury and Berry, Schellenberg, Matthews, Quinn and Mitchell) reported that single and multiple sources or complexity of music facilitates and inhibits vigilance performance respectively. Several researches reported that background music facilitates activities involving concentration and attention. (Dalton and Behm; Corhan and Gounard; Davies, Lang and Shackleton; Ferguson, Carbonneau, and Chambliss).

Examining the effect of music on vigilance performance is not a new phenomenon but it is fascinating to observe that the same music that facilitates human performance at various levels also plays an inhibitory role as far as human performance is concerned. Research done in this context has already demonstrated the adverse effects of acute and continuous music as well as noise on human performance as well as the performance at a vigilance task.

Music has a relaxing effect on body and mind thereby reducing stress, enhances arousal and alertness. The monotonous nature of sustained attention task leads to decline in the level of arousal thereby causing decrement

in performance across time on task. Music can help in maintaining arousal level and avoiding boredom. Thus, listening to music can improve performance in tasks that require vigilance, such as driving or monitoring screens for extended periods.

## Conclusion

Music has very special role in human culture across globe. Music plays a multidimensional role in enhancing cognitive abilities. Music affects a person's cognitive abilities like decision making, perception and attention and other higher mental processes. Music enhances and reduces a person's performance and other cognitive abilities such as attention and sustained attention (vigilance). Thus it can be concluded that music exposure affects individuals at different levels, and the most intriguing to the researchers is the interaction between music and human cognition. Incorporating music into daily routines and tasks can be a simple yet effective way to enhance cognitive function and maintain vigilance.

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