

# Is there a place for music in Nuclear Medicine?

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## Abstract

Music, since the time of ancient Greek Asclepieia is well-known for its influence on men's behavior. Nuclear Medicine can study the effect of music in humans' brain. Positron emission tomography (PET) studies have shown brain areas to be activated after colored hearing vs after hearing to words. Furthermore, PET studies gave evidence that visual imagery of a musical stave is used by some musically untrained subjects in a pitch discrimination task. Listening to music combines intellect and emotion by intimate anatomical and functional connexions between temporal lobe, hippocampus and limbic system. Mozart's music is considered the best for bringing favorable music effects to men. This is called "the Mozart's effect" and by some is attributed to the fact that this kind of music's sequences tend to repeat regularly every 20-30sec, which is about the same length of time as brain-wave patterns. It may be useful to suggest that a certain kind of music played in the waiting room and/or in the examining room of a Nuclear Medicine Department may support patients' cooperation with their physicians, especially in cardiac nuclear medicine. Furthermore, patients should be calm and not afraid of radioactivity. A long DVD program to be played during working hours can be decided between a music therapist and the Nuclear Medicine physician.

Music, since the time of ancient Greek Asclepieia is well-known for its influence on men's behavior [1]. Plato in his book "Timaeus" claims that harmony in music has been given by Gods, not for pleasure only, but to establish piece to our troubled soul and make our soul imitate Gods serenity. Listening to various kinds of music (eg. classical) is considered to palliate pain or chronic headache [2], to lower blood pressure [3], tachycardia and to minimize arrhythmias [4, 5]. Of course, not all studies claim the same magical influence of passive music listening on different aspects of human health and especially on cognition [6-14]. Other researchers claim that music can ease patients' stress and make them better attend and follow physicians instructions referring to their behavior during the examination they are about to undertake [2, 3].

Nuclear Medicine can study the effect of music in humans' brain. Positron emission tomography (PET) studies have shown brain areas to be activated after colored hearing vs after hearing to words [15]. Furthermore, PET studies gave evidence that visual imagery of a musical stave is used by

some musically untrained subjects in a pitch discrimination task [16]. Listening to music combines intellect and emotion by intimate anatomical and functional connexions between temporal lobe, hippocampus and limbic system [16]. Hippocampus is related to memory and emotion [16]. Mozart's music is considered the best for bringing favorable music effects to men. This is called "the Mozart's effect" and by some is attributed to the fact that this kind of music's sequences tend to repeat regularly every 20-30sec, which is about the same length of time as brain-wave patterns [17]. Unpleasant opposite effects were detected after listening to Albinoni's music or to Philip Glass's music [17].

Although some scientists are still in doubt about the favorable effects of certain kinds of music to men's behavior, there is accumulating evidence for the contrary. It has been reported that music has a direct effect on the brain, that music "links" both hemispheres, that makes people perform better, that music helps patients to better "listen" to themselves and to others [17]. In 1998 the USA state of Georgia offered a psychological support program to parents through classical music and in 2006 Poland also introduced "Tomatis music methods" for children with learning difficulties [17].

Specifically, Mozart's first movement of Sonata in D major for two pianos has been often used for the production of "Mozart effect" [17].

Nuclear medicine procedures much depend on patients' understanding and cooperation. So, it may be useful to suggest that a certain kind of music played in the waiting room and/or in the examining room of a Nuclear Medicine Department may support patients' cooperation with their physicians.

Three hundred healthy Greek students, non musicians (188 women, 112 men; mean age 21.91 years,  $SD \pm 4.95$ ), who were interviewed (by VG and NS-unpublished data-), stated that according to their opinion and/or experience classical music can help overcome depression (54%), improve their cognitive performance (69%), their spatial reasoning (42%) and their attention to follow a suggested plan (28%). Students also replied that they would like to listen to classical music while being in a medical waiting room (67%).

In Cardiac Nuclear Medicine especially during the exercise test or the myocardial perfusion test or during nuclear angiography, the calmness and cooperation of the subjects studied are crucial for the efficacy of the examination.

All Nuclear Medicine procedures need to have the cooperation of the patients studied as to follow instructions needed. These instructions may be: the period of time to fast or to have some drinks or the period of time to avoid taking certain drugs before the test or to follow instructions when to urinate before a bone scan or to have a steady position under the camera, etc. Furthermore, patients should be calm and not afraid of radioactivity. To achieve the best of cooperation with the patients and follow the actual test procedure, some Nuclear Medicine departments already have television screens or some music for their patients. On the other hand, one should not forget that both current television programs and the kind of music they offer to the public may be irritating instead of calming the patients. It has been suggested that a usual music-sound energy exposure should not exceed 90dBA, while the "pop" music is on average 84-130dBA [18]. It is actually difficult to prepare for our patients a long DVD program to be played during working hours. Perhaps the kind of music and the kind of videoclips this DVD may include are to be decided between a music therapist and the Nuclear Medicine physician. It has been reported that certain classical music pieces, from baroque and classical era composers can be in the kind of music to induce calmness and physical-psychological euphoria [2, 3]. Perhaps, such an example could be "Bolero" composed by M. Ravel during his hospitalization for some mental disease [19]. This kind of music could be considered to bring pleasure to its composer.

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