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The Effect of Music on the Human Body and Mind

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Abstract

Music has a vast influence over the nations and peoples on this planet. It has been used in every culture, and is often connected with anxiolytic and analgesic properties. Today it is used in many hospitals to help patients relax and help relieve or ease pain, confusion and anxiety. Music is also commonly used in counseling. Music therapy techniques may include guided listening or improvisational playing and are used within the context of many theories, and for many types of mental disorders, from depression to schizophrenia. Many of the healing qualities of music in counseling are connected to its use as a nonverbal medium for communication. Music is read differently in the brain than nonmusical tones and is connected to many different areas of the brain. Learning music relegates a larger part of the brain to recognizing and interpreting music. Listening to music has also been found to have an effect on learning. A survey studying the difference in GPA between students who listen to music while studying and those who do not finds no overall significant difference, but does find that students who listen to hip-hop and rap while studying score significantly lower while students who listen to easy listening and classical are likely to have higher GPAs.

The Effect of Music on the Human Body and Mind

Throughout history, man has created and listened to music for many purposes. King Saul sent for David to play the harp when his mind and soul were troubled. Music has served to express emotions such as joy or sorrow, and has done so very effectively. Music has been a tool of communication in this way, helping one man to understand another and providing a medium of interconnection. Every known society throughout history has had some form of music. Humans were already playing such complex instruments as bone flutes, jaw harps and percussive instruments long ago in the earliest civilizations (Weinberger, 2004). Music has been perceived to have transcendental qualities, and has thus been used pervasively within forms of religious worship (Lefevre, 2004). Music is a unique gift to and from each person who creates it. It reveals vast quantities of information about the performer, from their mood swings to biochemistry, inner rhythms of organs, and even the way they are physically built (Perrett, 2004). Music is an ever-changing, ever-increasing gift from God, free and available to all who seek it and many who do not. As such, it is naturally endowed with the ability to affect those who listen in monumental ways.

Music for Healing

Music has been associated with physical and emotional healing throughout history. The ancient Greeks assigned the god Apollo to reign over both music and healing (Trehan, 2004). Ancient shamanic curative rituals used rhythmically repetitive music to facilitate trance induction (Lefevre, 2004). Aristotle and Plato both prescribed music to debilitated individuals. Plato prescribed both music and dancing for the fearful and anxious, while Aristotle spoke of the power of music to restore health and normalcy to those who suffer from uncontrollable emotions and compared it to a medical treatment (Gallant & Holosko, 1997).

Physiologically, music has a distinct effect on many biological processes. It inhibits the occurrence of fatigue, as well as changes the pulse and respiration rates, external blood pressure levels, and psychogalvanic effect (Meyer, 1956). However, music is not limited to changing the body's responses in only one direction. The nature of the music influences the change as well. Pitch, tempo, and melodic pattern all influence music's effect on mood and physical processes. For instance, high pitch, acceleration of rhythm, and ascending melodic passages are all generally felt to increase anxiety and tension and sometimes even lead to loss of control and panic (Lefevre, 2004). The makers of arcade and video games commonly exploit this effect by increasing tempo and pitch on ascending melodies during a time of high pressure and necessity of precision in performance to succeed. Inversely, music with low pitch generally produces a calming effect. Slow tempos and descending melodies often cause feelings of sadness and depression. Some explain this effect on the body by comparing the music to a mirror of the body's motor responses. When a person feels depressed he moves slowly, while when he is anxious his heart and respiration rates race (Lefevre, 2004). Furthermore, music has been found to produce a relaxed mood and stress reduction, making it a plausible way to accommodate coping with pain and anxiety (Hendricks, Robinson, Bradley & Davis, 1999).

Music and medicine. Music has been put to use in hospitals, nursing homes, and many other places where stress levels rise. In fact, a Norwegian study displayed a higher affinity for music in medical students than other university graduates (Trehan, 2004). At least 18% of the medical graduates studied played one or more instruments regularly. Medical students are well known for experiencing very high stress levels, so it is natural that they would be more accustomed to engaging in more stress-relieving activities, and sharing such activities with their patients. The modern use of music therapy in hospitals developed during the 1950s in Europe and the United States. Many physicians began to use a multidisciplinary approach to medicine and, recognizing the soothing effect of music, provided music therapy to patients who were thought to have an interest in music (Lefevre, 2004).

Studies have found that music is effective in decreasing stress preoperatively, postoperatively, and generally for the patient and the family members and friends. Patients who listened to music while waiting for surgery subjectively reported lower anxiety and also displayed lower blood pressure and pulse rates than those who did not. Generally, persons who listened to music during a hospital stay displayed lower anxiety scores than those who did not. Postoperative patients have pointed out the comforting aspect of music, and described a greater sense of control of their surroundings (McCaffrey & Locsin, 2004). Music is even effective in antenatal clinics. Hearing live performances of music significantly increased the number of accelerations in the fetal heartbeat, signaling good health (Art and Music, 2004). Infants as young as two months incline their attention toward pleasant consonant sounds and away from unpleasant dissonant sounds (Weinberger, 2004).

Music for the elderly. The elderly benefit especially from postoperative music. Many elderly patients experience severe confusion or delirium during postoperative recovery, but postoperative music has been proven to lessen such cases. Music has displayed an effect of significant decrease in physiological stress indicators, and study participants have described lessened and more manageable or even absent pain in the presence of music (McCaffrey & Locsin, 2004).

Music therapy has been incorporated into numerous different residential and adult day care centers (Hendricks, Robinson, Bradley, & Davis, 1999). The therapy has had a significant effect on reducing aggression and agitation among residents (McCaffrey & Locsin, 2004). Music has also found a venue in the palliative care setting. Patients and family members listening to music have displayed improvements in pain, anxiety, grief, and unresolved issues and concerns. These changes have been less stressful and intrusive than other forms of therapy (Therapy, 2004). Many feel that appropriate music used in the palliative care setting can have analgesic, anxiolytic, antiemetic and sleep-inducing effects (Trehan, 2004).

Music for adolescents. The power music has to change emotions and elevate or depress mood is a key sign that it would be an effective tool to use in counseling mood disorders. Adolescents, especially, are susceptible to the effects of music. The type of music adolescents listen to can be a predictor of their behavior (Hendricks, et al., 1999). Those who listen to heavy metal and rap have higher rates of delinquent activity, such as drug and alcohol use, poor school grades, arrest, sexual activity, and behavior problems than those who prefer other types. They are also more likely to be depressed, think suicidal thoughts, inflict self-harm, and to have dysfunctional families. Considering how music choice is reflective of behavioral patterns in adolescents, and also considering how music has the power to evoke mood changes in its listeners, it is logical to hypothesize that techniques incorporating music into clinical therapy would be effective and beneficial.

Music for Mental Disease

The preface to systematic music therapy for mental disease patients is thought to have emerged in the early 1900s as a consolatory activity of musicians in mental hospitals (Hayashi, et al., 2002). It has spread widely throughout the developed world after that first exploration. In 1990, the National Association for Music Therapy conducted a survey disclosing that music therapists serve in a variety of positions with many populations including mental illness, developmentally disabled, elderly persons, and those with multiple disabilities included addicted persons (Gallant & Holosko, 1997). Among children, music therapy was most effective for those who had mixed diagnoses. It also seemed extraordinarily helpful for children who had developmental or behavior problems, while those with emotional problems showed smaller gains. These findings may be due in part to a greater emphasis placed on overt behavior changes than subjective measures of experiences (Gold, Voracek & Wigram, 2004).

Music as communication. Music is a form of communication, although it does not employ linguistic symbols or signs. It is considered to be a closed system because it does not refer to objects or concepts outside of the realm of music. This sets music apart from other art forms and sciences. Mathematics is another closed system, but falls short of music in that it communicates only intellectual meanings whereas music also conveys emotional and aesthetic meanings. These meanings, however, are not universal, as comparative musicologists have discovered (Meyer, 1956). In fact, although musical meanings do not seem to be common across cultures, the elements of music such as pitch and rhythm are regarded across cultures as abstract and enigmatic symbols that are then associated with intrinsic meaning according to the knowledge base of musical style and experience a person or culture has gained (Lefevre, 2004).

Music is a true communication form. A 1990 study found that 80% of adults surveyed described experiencing physical responses to music, such as laughter, tears, and thrills. A 1995 study also revealed that 70% of young adults claimed to enjoy benefits for the emotions evoked by it (Panksepp & Bernatzky, 2002). A further study performed at Cornell University in 1997 measured physiological responses of subjects listening to several different pieces of music that were generally thought to convey certain emotions (Krumhansl, 1997). Each subject consistently matched his or her physiological response with the expected emotion of the music. When a person experiences thrills while listening to music, the same pleasure centers of the brain are activated as if they were eating chocolate, having sex or taking cocaine (Blood & Zatorre, 2001).

Music therapy. The use of musical interaction as a form of communication suggests it would be a useful technique in therapy for patients who are not accessible through verbal language (Gold, et al., 2004). Individuals who have difficulty finding words to express emotions are often said to have alexithymia. Music therapy is an effective tool in reaching these individuals by helping them to feel understood and validated by means other than verbal expression (Bright, 1999). Music therapy is also especially helpful for those who have more general speech and communication difficulties (Lefevre, 2004).

Psychodynamic music therapy can be divided into two major models. Each model contains a focus on active or receptive music therapy techniques and improvisational or structured techniques (Gold, et al., 2004). The Psychodynamic models focus on stirring up primitive emotions hidden in the subconscious id, sublimating certain emotions for the superego, and helping the ego find a sense of purpose. Music is often used to evoke catharsis by bringing up repressed emotions. Naturally, individuals have a tendency to place learned emphasis on what they hear, mirroring their own emotions in the music that they hear. In child therapy, transference can be expressed through the songs a child may recall during a session. These songs often reflect issues the child has dealt with as well as unnamable feelings toward the worker. Creating and performing music allows children to capture forbidden and repressed feelings in a symbolic form that is acceptable to be expressed and released. This is especially effective for young children who often do not have an extensive vocabulary to find well-fitting words for their feelings and thoughts (Lefevre, 2004).

Psychodynamic music therapy can be divided into two major models. The first is Analytical Music Therapy (AMT). AMT uses free improvisation to express inner moods and emotions. The other major therapy is Guided Imagery and Music (GIM). GIM involves listening to carefully chosen recorded music and reflecting on it. Both models focus on verbal reflections after the music therapy has been performed (Gold, et al., 2004).

The humanistic approach to music therapy models would tend to refrain from guiding the client in interpretation of their emotions, but simply support and affirm the client in his or her improvisation, believing that the client's psyche knows best how to help itself (Lefevre, 2004). Humanistic models are influenced by Carl Rogers' client-centered therapy and Perls' Gestalt therapy. The main tenets of the therapy are to emphasize the present and encourage awareness of present emotions. Two major humanistic models of music therapy include Creative Music Therapy and Orff Music Therapy. Both are active models and use improvisation but are more structured than psychodynamic models (Gold, et al., 2004).

The biomedical approach often incorporates guided musical listening into its therapy (Lefevre, 2004). The behavioral model uses music in various forms as a contingent reinforcement or stimulus. This model is based on B. F. Skinner's therapy. The reinforcement may consist of playing, singing, or listening to music and the change effected is overt behavior (Gold, et al., 2004). Singing works well as a reinforcement because it is a self-affirming, self-expressive pursuit (Lefevre, 2004). Clinicians found that the contingent use of music strongly reinforced appropriate social behavior (Hooper, 2002). Finally, the eclectic model incorporates ideas and techniques from many different theories to use when appropriate (Gold, et al., 2004).

Music therapy is given to children and adolescents with psychopathologies in many countries. Studies have shown that music therapy has a moderate positive effect for these patients and is more effective for some pathologies and in some models than others. The eclectic, psychodynamic and humanistic models were more beneficial to patients than the behavioral models. Children and adolescents suffering from behavioral and developmental disorders received a more positive effect than those suffering from emotional disorders. There are many possible reasons for the previous finding. Children who have behavioral or developmental disorders often have trouble focusing and sustaining attention and music therapy provides them with active music making to help their kinetic learning styles. Music therapy also provides an environment that is nonjudgmental and noninvasive, helping them to be comfortable enough to show capacities they may repress in other circumstances. Music making is also often a highly intrinsically motivational factor for many children (Gold, et al., 2004). Music therapy can also help children with learning disabilities develop social skills, which facilitates mainstreaming them (Hooper, 2002). Adding music to traditional models of psychotherapy proved to decrease depression symptoms significantly more effectively than the therapy alone. Adolescents participating in ten weeks of therapy using music had significantly lower posttest symptoms than pretest (Hendricks, et al., 1999).

Gallant and Holosko (1997), psychologists working with addictive patients, see music as a catalyst for transcending many dimensions of a person's life such as the cognitive, affective, behavioral, social and spiritual. These practitioners also point out the ability of music to reach beyond usual methods to help patients become "unstuck" at issues they have difficulty confronting.

Schizophrenic patients tend to view music as attractive and often are relaxed in its presence. A study performed on older female schizophrenic patients participating in a 15-session music therapy program revealed a significant improvement of their negative symptoms. The patients displayed some signs of improved personal relations, and an improved subjective sense of participation in a chorus activity. However, the study suggested the improvements were only temporary, as the patients exhibited a decline in a follow up segment (Hayashi, et al., 2002).

Music and the Brain

It seems very unlikely that the actual sound waves created by the music played have a physical impact on any physical system in the body, such as the nervous system feeling pain, the respiratory system, blood pressure, pulse rate, as well as the emotions and thoughts. How, then, can music have any effect at all on such things? The effect must be mental, leading one's focus to the center of mental activity, the brain.

Neuromusicology is a term used to describe the study of the relation between the human nervous system and the ways people interact with music (Roehmann, 1991). Normal sounds, such as the tones heard in music proceed into your body through a marked path. They begin as sound waves enter the cochlea (inner ear). The function of the cochlea is to sort complex sounds into their elementary frequencies, and then transmit them to the auditory cortex as trains of neural discharges via separately tuned fibers of the auditory nerve. The auditory cortex is in the temporal lobe. Here specialized cells respond to certain frequencies. Neighboring cells have overlapping tuning curves to prevent gaps in the system. However, the brain's response to music is more complex. Instead of interpreting each tone individually, the brain groups the sequences of tones together and identifies the relationships between the sounds. This involves many more areas of the brain than those aforementioned (Weinberger, 2004). As Gestalt psychologists have shown, understanding complexities is a more difficult matter than identifying multitudes of single stimuli, or musical tones in isolation, but must group the stimuli together into patterns and interpret how the patterns relate to one another (Meyer, 1956).

Music centers in the brain. Studies comparing patients with brain injuries and healthy individuals have discovered a lack of one centralized area for music perception in the brain. Instead, music activates many areas throughout the brain. Several of these areas are also involved in other types of cognition. Music activates slightly different areas in each individual's brain, contingent on experience and musical training or lack thereof (Weinberger, 2004). In recent times, neuroscience has discovered activations in at least 18 areas of the brain during performance of specific tasks in making or hearing music (Perrett, 2004).

Aniruddh D. Patel (1998) of the Neurosciences Institute in San Diego recorded findings that a specific region in the frontal lobe of the brain is employed in both constructing language and music, while other parts of the brain handle related facets of language and music processing. Having already established music's propensity as a form of communication, neurologists and musicologists may well assume the brain handles language and music together. However, other studies have shown music and language are easily distinguishable in the brain.

Case studies. The Russian composer Vissarion Shebalin constitutes an excellent case study to highlight this discovery. Shebalin suffered a stroke in 1953 resulting in the loss of his language capacities, more specifically the abilities to speak and understand speech. However, his music writing skills were unaffected and Shebalin continued to compose music until his death in 1963 (Weinberger, 2004). An additional useful study reveals that Alzheimer's patients recall words to familiar songs much better than spoken words or information. In fact, they tend to recall words from songs about 62% of the time, while they only remember spoken material about 37% of the time (McCaffrey & Locsin, 2004).

A second useful case study involves a woman known as I.R. who suffered bilateral damage to her temporal lobes including the auditory cortical regions. Her intelligence quotient and language abilities were unaffected, but she could not recognize any previously known music, nor could she learn to recognize new music. She could not distinguish between any two melodies regardless of how different or varied they are. However, her body still reacted physiologically to match emotions from hearing different types of music. This study confirms that many parts of the brain are used in the perception and comprehension of music (Weinberger, 2004).

Focus areas for aspects of music. Different aspects of music have different focus areas of the brain as well. Imaging studies of the cerebral cortex revealed a focus of activation in the auditory regions of the right temporal lobe while subjects focused on the harmony of the music. The high activation area for timbre is also located on the right temporal lobe (Weinberger, 2004).

Consonant and dissonant chords activate different brain regions as well. Consonant chords focus the activation on the orbitofrontal area of the right hemisphere and part of an area below the corpus callosum. The orbitofrontal region is part of the reward system of the brain. Dissonant chords activate the right parahippocampal gyrus (Blood & Zatorre, 2004). Combining consonant and dissonant chords in sequences creates patterns that help music reflect emotional experiences and contribute to music's effect on mood. The common names of two usual patterns are tension-resolution and tension-inhibition-resolution. These patterns are neurologically observable through brainwave patterns. Dissonant chords cause erratic and random neuron firing patterns while consonant chords cause even patterns (Lefevre, 2004).

Contour consists of the patterns of rising and falling pitches in music and is the cornerstone of all melodies. Changes in contour affect the intensity of the response of neuron firings in the auditory cortex. The neurons reacted differently when one tone was preceded by others or was played alone and also when the tone was part of an ascending or descending melody.

The auditory cortex cells in guinea pigs also respond differently when the guinea pigs have been conditioned to respond to a tone by a mild shock than if they are unconditioned stimuli. This may help explain how a familiar melody such as a phone ringtone or a family member's whistle may catch a person's attention in a crowded, noisy room (Weinberger, 2004).

Replaying music in one's mind is quite as engaging as listening to the music the first time. Brain scans of two groups of nonmusicians who either listened to music or imagined hearing it showed activation in the same area of the brain (Zatorre & Halpern, 2005).

Musician brains. The brains of musicians differ in their neurological responses to music than those of nonmusicians. More of their brains are devoted to the perception and interpretation of music. Christo Pantev's 1998 study (as cited in Weinberger, 2004) found that musicians use 25% more of the auditory regions of the left hemisphere than nonmusicians while listening to a piano playing. This is only true for musical tones, and not for similar but nonmusical sounds. The age at which a student began lessons has been proven to be a stronger factor on the percentage of auditory cortex responding than the number of years he has been learning. In comparison, Peter Schneider's 2002 study at the University of Heidelberg in Germany (as cited in Weinberger, 2004) found that the actual volume of the auditory cortex in musicians was 130% larger than that of nonmusicians. In this study, size was correlated to levels of musical training, implying that learning music increases the amount of brain tissue devoted to it.

Music learning in the brain. Studies have shown that there is a critical development period for music development in the brain. Musicians that began to play before the age of ten activate different areas of the brain while playing than those who began playing after the age of ten (Ormrod, 2004). Shahin, Roberts, and Trainor's 2004 study performed at the University of Ontario (as cited in Weinberger, 2004) recorded brain responses in four- and five-year-old children as they listened to piano, violin, and pure tones. Those children who had received more exposure to music at home showed greater brain activity than children three years older who had no such exposure.

Musicians also commonly exhibit hyper- development in the areas of the brain relating to the finely tuned muscles used in playing their instrument (Weinberger, 2004). In fact, skilled musicians can be compared to skilled athletes, only on a small-muscle scale. They must be able to decipher the complex symbolic codes representing movement that comprise notation, move predominantly small muscles exactly and precisely, time their movements precisely, and add their own personal touch to the tone, timbre, volume increases and decreases, and every aspect that makes up musicality in musical performance (Roehmann, 1991).

Inasmuch as musicians can be compared to athletes in their skills, they can also be compared to them in their afflictions. Professional musicians suffer from many ailments relating to the profession. Some of these include tendonitis, carpal tunnel syndrome, back pain, anxiety, vocal fatigue, overuse syndrome, and focal dystonia. Focal dystonia is a localized disturbance of skilled movement. It is usually task-specific and common to people in certain professions that involve moving hands and fingers in quick, nimble, precise ways for long time spans while focusing on a flow on information (Roehmann, 1991).

Music and Intelligence

Now that music's effects on the human body in terms of physical health, emotions, and mental health have been considered, focus is shifted to the mental and intelligence aspects. One way music involvement may be beneficial to intelligence is by the changes it makes in your brain. One of the major music centers in the brain is part of the middle mammalian layer of the brain, which is also important in emotions. Developing the middle brain leads to better attention maintenance skills, memory, motivation, and critical thinking skills (Snyder, 1997). Music is also similar to math in that it has obvious rhythm and organization. The brain functions similarly to organize the two subjects (Whitaker, 1994).

One of the earlier studies involving music and intelligence was performed by Irving Hurwitz at Harvard in 1975. First-grade children were taught to read solfege, the sight-singing technique using "do, re, mi…", and then given reading tests. The children who had studied solfege score significantly higher than the control group who had not (Wilson, 2000). Gordon Shaw completed a famous study in 1993 on a group of college students. He gave them three different IQ tests following three different activities. One activity involved listening to Mozart's, "Sonata for Two Pianos in D Major." Another activity was guided relaxation techniques and the third was no activity. Those who listened to Mozart scored an average of nine points higher on the IQ test. The effect on intelligence lasted only for ten or fifteen minutes. Shaw saw the music as a warm-up exercise for the areas of the brain that perform analysis and critical thinking. This discovery became known as the Mozart Effect (Rauscher & Shaw, 1998). Later, Shaw found in another study that preschoolers studying the keyboard achieve higher scores on math and science aptitude tests than the control group, equaling a 34% increase in their puzzle-solving skills (as cited in Wilson, 2000). A study was done dividing six-year-olds into four groups that took piano, singing, or drama lessons, or no lessons at all. Those that participated in piano or singing lessons showed an average increase in IQ of 7.0 points at the end of the school year compared to an increase of 4.3 IQ points for those involved in drama or no lessons (Bower, 2004). A 1991 study by Takashi Taniguchi at Kyoto University found that listening to sad background music aids in the memorization of negative facts, such as war and crime, while listing to cheerful music is facilitative in learning positive facts, such as discoveries and victories (as cited in Wilson, 2000).

Students with learning disabilities who listened to Baroque music while studying for and taking tests earned higher test scores than a control group who didn't (McCaffrey, Locsin, 2004). Gordon Shaw did not believe that classical and baroque music were the only kinds of music that would increase intelligence, but he did place requirements on the type of music. To increase intelligence, the music needed to be complex, including many variations in rhythm, theme and tone. Music lacking in these qualities, especially highly repetitive music, may even detract from intelligence by distracting the brain from critical thinking (Whitaker, 1994).

Although many studies have been done on the effects of classical music, many adolescents and young adults today are deeply infatuated with many other types of music. Adolescents often use music to facilitate coping with loneliness and stress (Hendricks, et al., 1999). This necessitates a study to find if music other than classical and baroque is also effective on raising grades. The present study was designed to determine if there is a correlation between listening to music while studying and a better grade point average (GPA) for college students at Liberty University. The author's hypothesis is that listening to music while studying will show a positive correlation with higher GPAs.

Method

This research project consisted of a 100-count survey given to students at Liberty University. The 10-question surveys included some demographic data, and questions about average time spent studying in high school and in college, average high school and college GPAs, and whether or not students listened to music while studying, and if so, what types of music. The data was then compiled and analyzed. All surveys were completed voluntarily and all participants had the understanding that their anonymous information would be used for research. Two extra surveys were taken to allow for the exclusion of two surveys that were missing answers or failed to follow directions.

Subjects

The survey was distributed on the campus of Liberty University. All surveys were taken voluntarily and without recompense. Surveys were distributed within several classes, including the concert band, a large chemistry class containing mostly biology and health sciences majors, and a statistics in psychology class. This contributed to a higher concentration of music, biology, health, and psychology majors. Other surveys were distributed in common areas such as the computer lab and dining hall and dormitories, where a variety of students could be found. Students of every academic standing (i.e. freshman, sophomore, etc.) and a wide variety of ages were represented, although most were concentrated in the average age range of college students at Liberty University.

Gender ratios were similar. There were 43 males and 57 females completing the survey. Ninety percent of the study participants were between the ages of 17 and 22, while 7% were between 23 and 25 years of age, and 3% were 26 years or older. Ratios between classes were fairly similar. Participants included 26 freshmen, 21 sophomores, 23 juniors and 30 seniors.

Fifteen different majors were represented, although the survey contained greater concentrations in the aforementioned areas. Also affecting this factor is the size of each major department at Liberty University. For instance, after the top three majors, communications was next, which is the largest major at Liberty University. The ratios of majors were as follows: music: 15; biology: 12; psychology: 11; communications: 10; business: 8; education: 8; health: 7; computer science: 6; religion: 6; nursing: 5; government: 4; undecided: 3; math: 2; family and consumer science: 2; and history: 1.

Apparatus

The survey used was formatted simply and designed by the author. It contained nine multiple-choice questions, and one fill-in-the-blank. The latter asked what major the participant was studying. The survey was created in a Word document, using a 2-column format and open box bullets for the multiple-choice boxes (Appendix A).

Procedure

The survey was distributed over the course of approximately one week on the campus of Liberty University to voluntary participants, both in classes and outside of classes. Some participants knew the author of the study and others did not. After accumulating all of the research, the data was compiled into the author's SPSS Student Version 12.0 for Windows software program and analyzed.

Results

The ratio of those who listen to music while studying to those who do not was greater than hypothesized. Over half of students surveyed listened to music, with a ratio of 55% to 45%. Most students reported listening to many types of music while they study while some listed only one or two. The most frequent type of music to listen to while studying was, somewhat surprisingly, classical with 23% of participants. Following classical was rock with 20% of participants. Alternative took 19%; jazz had 15%; hip-hop/R&B and country music tied with 14% each; gospel had 10%; easy listening took 8%; rap finished last with 7%.

The initial independent sample t-test run on the hypothesis that listening to music while studying would positively affect GPA showed no significance ($t(98) = -1.182$; $p =$ 240). However, the mean GPA of those who did not listen to music while studying was slightly lower than those who did. Closer examination of the mean GPAs of each type of music revealed that listeners of each individual type of music had lower, but not significantly lower GPAs than those who did not, except in the case of two types of music. Those that listened to easy listening music had a much higher, though not significantly higher, GPA mean than any other group. Those who listened to rock music had a slightly higher GPA mean than those who did not listen to music. Also, two types of music showed notably lower GPA means than the no-music group. Hip-hop/R&B had the lowest GPA mean while rap followed closely behind. Jazz and country also had moderately lower GPA means. Alternative, classical, and gospel music stayed very close to the no-music control group.

The independent sample t-test was run again after reorganizing the data into two groups. One group included those that listened to any type or types of music other than easy listening while studying. The other group included those that listened to no music or easy listening music while studying. This time, the findings were significant ($t(98) = 2.095$; $p = .039$). The easy-listening/no-music group had a significantly higher GPA mean than those that listened to other types of music. However, this finding does not necessarily show a difference between the effect of listening to music while studying and not listening to music while studying on college GPA. Instead, the no-music group is changed by the addition of the students listening to easy listening music, which raised the mean.

To correct this problem, the data was reorganized again into three groups. One group consisted of those listening to music other than easy listening while studying. The second group contained those who listened to any combination of music that included easy listening while studying. The third group included those who did not listen to music while studying. A one-way ANOVA test was run on this set of information. No significance effect on GPA was found between these three groups ($F(2, 97) = 2.202$; $p = .116$).

Next, the data was divided into a different three-group comparison. This time, the focus turned to the negative end of the spectrum. The first group included all students who listened to any type of music while studying excluding country, rap, hip-hop/R&B, and jazz. These four types of music showed considerably lower GPA means than the no-music group. The second group included all students who listened to any type of music while studying that included at least one of country, rap, hip-hop/R&B, and jazz. The third group remained those students that listen to no music while studying. An ANOVA test was run. The comparison between the three groups was not significant ($F(2, 97) = 3.003$; $p = .054$). However, the Post Hoc LSD Comparison revealed a significant difference between groups. There was no significant difference between the group excluding the four types of music and the group including the types ($p = .075$), nor was there a significant difference between the group excluding the four types and the no-music group ($p = .819$). Interestingly, the difference between the group including country, jazz, rap, and hip-hop/R&B and the no-music group was highly significant ($p = .021$). This highlights a negative association between these four types of music and students' GPA.

The data was then further divided into three more groups isolating rap and R&B, considering that rap and hip-hop/R&B had the lowest overall GPA means. The groups were defined as: students who listened to any type of music while studying excluding rap and hip-hop/R&B; students who listened to any type of music while studying that including at least one of rap or hip-hop/R&B; and students who listen to no music while studying. An ANOVA test actually showed a high significant difference in the general comparison between groups ($F(2, 97) = 4.814$; $p = .010$). Further, the Post Hoc LSD Comparison revealed more significant differences. The group including rap and hip-hop/R&B had a significantly different GPA from the group of music listeners excluding rap and hip-hop/R&B ($p = .011$). The group including rap and hip-hop/R&B was also significantly different from the no-music group ($p = .003$). The group excluding rap and hip-hop/R&B was not significantly different from the no-music group ($p = .593$).

The possibility of a connection between the effects of hours studied and music listened to on GPA was also considered. The same three groups music listening levels mentioned just previously were compared with the variable containing study hours spent at Liberty University per week in their effect on the mean LU GPA. The effect of study time on GPA mean was not significant ($F(4, 100) = 1.555$, $p = .194$), as had already been established through an independent sample t-test. The effect of type of music listened to was significant, as had already been seen in the previous test ($F(2, 100) = 6.038$; $p = .004$). The interaction between the two groups was not significant ($F(8, 100) = 1.633$; $p = .127$).

One final test grouped the data in a different way. Instead of continuing to isolate the most negative music types, the most positive were isolated. The groups consisted of: students who listened to only classical or easy listening or both while studying; students who listened to music including any other type while studying; and students who listen to no music while studying. An ANOVA test was run on the data. No general significant difference was found between the groups ($F(2, 97) = 3.059$; $p = .052$). No significant difference was found between the group that listened only to classical or easy listening and the group that listened to no music ($p = .666$). A significant difference was found between the group that listened to no music while studying and the group that listened to music other than classical and easy listening ($p = .031$). There was no significant difference between the group that listened to only classical and easy listening and the group that listened to all other kinds of music ($p = .074$).

Discussion

These results point to several generalizations. Listening to most kinds of music while studying does not seem to have a large effect on performance in classes. However, listening to rap and hip-hop/R&B did show a negative effect on grades. If any music types were to have a positive effect, they might include classical, easy listening, and rock.

This study is not conclusive because it has many faults. First, the sample size is very small. A larger study is recommended in the future. Second, the sample was not very diverse, as it was taken all from one college, which does not accurately reflect college students across the nation or world. Third, the students surveyed were mostly Christian, which also does not accurately reflect the population, and also might have an effect on they type of music the students tend to listen to and their study habits, as well as any number of other factors. Next, the survey questions did not allow for completely accurate calculation of GPA means, as it asked for a range of GPA instead of a specific GPA. Specific numerical values would provide much more accurate information and be much easier to process and interpret as well.

Another factor not considered in this short survey is socioeconomic class and racial diversity. Music choices often correlate with these factors, so there may be many other hidden causal factors for the results. Finally, the survey relies on honest people telling the truth to get accurate results. In the future, a larger, broader, more accurate study is recommended to confirm or refute the findings in this one.

There are other factors to consider for other studies in relation to this topic. One such subject might include studying the specific effects on listening to music while studying different subjects. For instance, some students may improve their subject retention while listening to music and doing math homework than reading history. Other factors to consider are whether lyrics in music effect study effectiveness. Many more studies are necessary to more thoroughly understand the subject of the effect of music on the brain.

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Appendix A

Survey

Dawn Kent

1. Are you:
   - ❑ Male
   - ❑ Female

2. How old are you?
   - ❑ 17-19
   - ❑ 20-22
   - ❑ 23-25
   - ❑ 26+

3. What is your class status?
   - ❑ Freshman
   - ❑ Sophomore
   - ❑ Junior
   - ❑ Senior

4. What is your Major?

____

5. What was your High School GPA?
   - ❑ 3.5-4.0
   - ❑ 3.0-3.5
   - ❑ 2.5-3.0
   - ❑ 2.0-2.5
   - ❑ <2.0

6. Approximately how many hours did you study per week in High School?
   - ❑ >12
   - ❑ 9-12
   - ❑ 5-8
   - ❑ 1-4
   - ❑ <1

7. What is your current College GPA?
   - ❑ 3.5-4.0
   - ❑ 3.0-3.5
   - ❑ 2.5-3.0
   - ❑ 2.0-2.5
   - ❑ <2.0

8. Approximately how many hours do you study per week?
   - ❑ >12
   - ❑ 9-12
   - ❑ 5-8
   - ❑ 1-4
   - ❑ <1

9. Do you listen to music while you study?
   - ❑ Yes
   - ❑ No

If you answered Yes to #9, continue to #10. If you answered No, you are finished. Thank you for your time.

10. What genre of music do you most often listen to while studying?
    - ❑ Alternative
    - ❑ Classical
    - ❑ Country
    - ❑ Easy Listening
    - ❑ Ethnic
    - ❑ Gospel
    - ❑ Jazz
    - ❑ R&B/Hip Hop
    - ❑ Rap
    - ❑ Rock