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**MUSIC THERAPY: STRUCTURAL MUSIC MODULATION ON REDUCING  
SYMPTOMS OF GENERALIZED ANXIETY DISORDER**

by

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**SUBMITTED TO SCRIPPS COLLEGE IN PARTIAL FULFILLMENT OF THE  
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## Abstract

The present study examines whether modulating musical structural elements in therapeutic treatment reduces the severity of symptoms among individuals diagnosed with generalized anxiety disorder. Music therapy has recently become a more utilized non-traditional treatment modality for anxiety. However, the specific elements of music that trigger relaxation responses alongside prevent rumination spirals has not received significant attention in literature thus far. This study aims to assess what type of music allows for the most effective treatment in reducing anxiety. Using a 2 (tempo: adagio, allegro) x 2 (timbre: string instrumental, vocal) x 2 (key: C major, D minor) between participants experimental design, participants diagnosed with generalized anxiety disorder will be assigned to one of eight conditions manipulating structural elements of music. Over a 10 week study period, participants will attend a CBT talk therapy session and music therapy session once a week. At the end of the study, participants will reassess the severity of GAD symptoms. It is hypothesized that music therapy involving adagio tempo, string instrumental timbre, and the key of C major music will demonstrate larger symptom reduction levels than that of allegro tempo, vocal timbre, the key of D minor music. Additionally, a supersize effect would demonstrate larger significant reductions in symptoms using a combination of adagio, string instrumental and C major key music. This study may allow the increased use of music therapy alongside traditional treatment modalities to provide greater accessibility, immediate relief, and more efficacy within the modality by understanding what elements are most impactful to reduce symptoms.

## MUSIC THERAPY: STRUCTURAL MUSIC MODULATION ON REDUCING SYMPTOMS OF GENERALIZED ANXIETY DISORDER

### **Background Information**

When a popular song comes on the radio, people may react differently to hearing it; some may sing along, some may cry, some may turn it off in frustration. This is what music is, a powerful tool to access various emotions, which many people utilize to cope with particularly difficult ones. The ways in which individuals may react to music may be dependent on their broader emotional well-being, such as people who experience anxiety. Anxiety is a common emotional state everyone experiences from time to time. However, when the anxiety becomes debilitating or chronic, it may be categorized as an anxiety disorder. There are many types of anxiety disorders such as obsessive compulsive disorder, social anxiety disorder, panic disorder, post-traumatic stress disorder, and the main focus of this study, generalized anxiety disorder. While they all share common characteristics, it is important to note the variances between such disorders to properly diagnose individuals and subsequently provide the most effective treatment. For example, obsessive compulsive disorder describes individuals with rumination patterns often tied to irrational beliefs and thinking, and are typically paired with compulsions. Furthermore, social anxiety disorder describes individuals who experience heightened levels of worry and fear when subjected to interacting with other people. Generalized anxiety disorder may be diagnosed in individuals who experience some or all of the following symptoms: increased difficulty in managing responsibilities, chronic or persistent worry that is multi-focused, and often experience coexisting conditions such as major depressive disorder (Stein & Sareen, 2015).

Generalized anxiety disorder, also known as GAD, is one of the most common anxiety disorders, such that in the United States alone, 3.1% of the population were on average reported to have been diagnosed in the last year, and 5.7% of the population will be diagnosed with GAD

over their lifetime (Kessler & Wang, 2008). The prevalence of GAD is about two times as high among female identifying individuals than in male identifying individuals (Kessler & Wang, 2008). While the onset of the disorder varies among age groups, it is most commonly diagnosed in early adulthood and in individuals in palliative care (Mackenzie et al., 2011). GAD may also develop in individuals exposed to childhood adversity and physical punishment in early life stages, and genetics; specifically among twins who typically present GAD 15-20% of the time (Hettema et al., 2005). It is reported that self medication among individuals with GAD using alcohol and drugs is quite common at around 35% (Stein & Sareen, 2015).

Many professionals search for the following clinical presentations in individuals for generalized anxiety disorder. Persistent or uncontrollable worry lasting for 6 months or more; chronic and extreme sense of helplessness; alongside comorbidities such as depression, addiction, or other physical ailments such as insomnia, headaches, and abdominal pain may present in people with GAD. Another common symptom is termed anhedonia, which explains the lack of experiencing pleasure, and “intolerance of uncertainty” (Stein & Sareen, 2015).

Neurocognitively, GAD demonstrates an increased activation of structures within the limbic system, specifically the amygdala, alongside reduced activation of structures within the prefrontal cortex (Hilbert et al., 2014). It has been recorded that there is lessened connection and communication between the limbic region and prefrontal cortex among people with this disorder (Ball et al., 2012; as cited in Stein & Sareen, 2015). When treating generalized anxiety disorder, remediation of the cognitive abnormalities may occur, ultimately improving the functionality of the brain among patients (Stein & Sareen, 2015).

### **Treatment Modalities**

There are many treatment options offered to individuals with GAD, and it is very common for patients to explore the various methods to determine what method or combination proves more efficacious in reducing symptoms. A first line of treatment offered to patients is psychotherapy. More specifically, cognitive behavioral therapy has been an effective treatment within traditional psychotherapy (Cuijpers et al., 2014). CBT aims to restructure the irrational thoughts and worry many patients may experience. While many patients have difficulty coping with their worry and uncertainty, CBT provides exposure, talk therapy, and relaxation training to reduce avoidance of worry and triggers to adjust malleable behavioral patterns. Additionally, an emphasis on creating skills to manage anxiety longer-term and post-treatment is salient in CBT (Stein & Sareen, 2015). Sessions for CBT typically occur once a week for about a 15 week period, or 8 to 12 group therapy sessions, lasting for around 60 minutes. For larger accessibility, many CBT practices have expanded to telehealth methods of communication (Brenes et al., 2015; as cited in Stein & Sareen, 2015). Another form of psychotherapy commonly used to treat GAD is psychodynamic therapy, which focuses on looking at the underlying conflicts that are seen as the anxiety triggers. Additionally, mindfulness-based therapy focuses on putting thought into the “present” and core values that may transcend the symptoms of the disorder (Hofmann, 2015). Lastly, applied relaxation therapy emphasizes the ways in which one can induce a relaxed state to reduce immediate symptoms of heightened anxiety among GAD patients (Stein & Sareen, 2015).

Another very common route individuals with GAD take to mediate the severity of symptoms is pharmacotherapy. This treatment method utilizes medication to reduce symptoms of the disorder (Wilson et al., 2015). Specifically, GAD patients are typically prescribed selective

serotonin-reuptake inhibitors (SSRIs), serotonin-norepinephrine reuptake inhibitors (SNRIs), or antidepressants such as benzodiazepines, buspirone, and pregabalin. SSRIs and SNRIs are the most reputable and preferred medications for treating GAD, producing a significant response rate between 30-50% (Reinhold & Rickels, 2015; as cited in Stein & Sareen, 2015). They produce responses within 4-6 weeks and are typically dosed in the same levels as antidepressants (Taylor, 2015; as cited in Stein & Sareen, 2015). Benzodiazepine, or clonazepam, is a long acting medication that is very efficacious for treating GAD but provokes concerns of addiction, and should only be used for 3 to 6 months which is much shorter than the typical presentation of GAD (Ravindran & Stein, 2010; Krystal et al., 2015; as both cited in Stein & Sareen, 2015). A second-line treatment for pharmacotherapy are tricyclic antidepressants such as imipramine which have a profile similar to SSRIs but are less utilized due to the uncertainty in their efficacy. (Kapczinski et al., 2003; as cited in Stein & Sareen, 2015).

Despite the success of many psychotherapy and pharmacotherapy treatments, there are still about 50% of patients suffering from GAD who do not experience relief of their symptoms using such traditional methods (Reinhold & Rickels; as cited in Stein & Sareen, 2015). Additionally, the uncertainty surrounding the more efficacious length of time to take medication, alongside effects of combination therapy do not provide a wide range of options for those who may need additional or more practical long term forms of care (Wetherell et al., 2013). It is crucial to expand the breadth of potential treatment options, including non-traditional forms of therapy to assess its ability to mitigate symptoms of disorders such as GAD.

A study conducted by Fujio McPherson evaluated the efficacy of complementary and alternative medicine, CAM treatments, in reducing GAD symptoms and severity. Examples of CAM treatments include and are not limited to yoga, ayurvedic medicine, massage, acupuncture,

and herbal medicine. Using a quasi-experimental, pretest-posttest design, McPherson looked at the benefits of CAM treatments among GAD patients. Participants received acupuncture once a week for a total of 6 weeks, and practiced breathing exercises rooted in yoga science, massage therapy accompanied with aromatherapy, journaling, and nutrition and health counseling. It was found that symptoms of depression, anxiety, and stress were significantly reduced among the participants over the course of the study (McPherson, 2013). Overall, the study provided a foundation to legitimize non-traditional therapy methods that should be integrated alongside traditional psycho and pharmacotherapy treatments.

Perhaps the lack of literature surrounding the validity of non-traditional therapy methods can be explained by the sociocultural power dynamics between Western and Eastern cultures, specifically the dominance of Western ideologies and practices through thousands of years of colonization. Within the medical field, this unequal dynamic is highlighted, with racism and bias causing Eastern medicine to take a backseat to Western medicine, and subsequently preventing the discovery and implementation of many efficacious treatment modalities rooted in Eastern practices. A study conducted by Tai Pong Lam and Kai Sing Sun (2013) explored the personal experiences of traditional Chinese medicinal practitioners working in Hong Kong, where Western medicine is highly prevalent due to the British regime lasting 150 years in the 19th century. Despite 65% of the world using CAM treatments, only around 9% tend to use such treatment methods in Western environments. Herbal treatments and other naturalistic therapies have been shown to produce fewer side effects from patients, and more increasingly induce acceptance among patients. The practitioners who participated in the interview study described their roles in the medical field as subordinate to Western doctors who often scrutinized their more open-minded diagnostic approaches. While it is evident that alternative treatment



modalities are legitimate, the use of only Western medicine as first line treatment may provide an explanation for the lack of research in understanding how non-traditional forms of therapy and treatment can help improve the well being of patients with various disorders, including generalized anxiety disorder.

In addition to improving mental, physical and emotional well-being of patients, non-traditional therapies provide added benefits that many traditional treatment methods are not able to give. Many CAM therapies are more personalized to the patient, which can increase connection between therapist and patient (McPherson, 2013). Furthermore, they often include a more holistic and whole body practice that engages many senses and aspects of well being, subsequently providing longer term healing rather than a “quick fix” (McPherson, 2013). Most importantly however is the increased accessibility that alternative treatments provide to patients. Therapies such as music therapy have the capability to be brought to a person more directly, or even into one’s home, ultimately encouraging healthy coping skills. As Lois Zoppi (2020) demonstrates in a study, music therapy allows for individuals who struggle with verbal communication, dementia, traumatic brain injuries, or general conditions surrounding mental health to receive care without having to particularly converse.

### **Music Therapy**

Music therapy may appear to be a relatively new field in psychotherapy, however the use of music in a clinical setting has been reported to date back to the age of Aristotle and Plato who mentioned it in their writings, in addition to many Eastern cultures who reported its efficacious nature in treating psychological ailments (Stamou et al., 2002). The therapy practice more formally began following the first World War when musicians would play for wounded veterans in hospitals (Sullivan, 2007). When doctors noticed significant emotional improvement among

the veterans following the performances, musicians were more frequently requested to attend the hospital to provide comfort and relaxation to the veterans. Furthermore a *Columbian Magazine* featuring an article titled “Music Physically Considered” in 1789 was published describing the practice of music therapy. In the following decades, writings about music therapy appeared in more writings such as the medical dissertations of Edwin Atlee in 1804 and Samuel Mathews in 1806. The first study that was recorded to use music therapy specifically experimented with altering dream states using music at Blackwell’s Island in New York (History of Music Therapy, n.d.).

Music therapy specifically looks at the use of music as a tool to treat a variety of illnesses. It incorporates a person’s responses to music to foster positive modulations in mood and general well being (Zoppi, 2020). Music therapy additionally allows for individuals to improve their memory skills when learning or listening to the music, increase coordination and reading comprehension, and assign personal sense of responsibility. It also gives patients an opportunity to explore difficult emotions with increased comfort due to the creative and relaxed environment the therapy provides (Zoppi, 2020).

Music therapy may include creating music, singing, dancing to music, or listening to it, as people may find different forms of music therapy to be more helpful than others. The processing of music involves a multitude of brain structures, each activated by different aspects of music such as pitch, tempo and melody (Zoppi, 2020). Rhythm is processed in the cerebellum and frontal lobes which decode the emotional stimuli from the music. Pitch can be processed in the right temporal lobe, and the nucleus accumbens can aid in activating physical pleasure signs like goosebumps when hearing music. These physiological reactions to music can aid individuals with mental health conditions such as anxiety and depression. Individuals with anxiety may

experience reduced symptoms with music as shown by decreased blood pressure and heartbeat which lowers stress due to the diminished arousal levels. Furthermore, it has been recorded that anxiety can be reduced immediately after a music therapy session in addition to having long term benefits, and quickly lowers adrenaline and cortisol levels which pose as a natural anxiolytic “medication”. For depression, listening to music can also release dopamine and endorphins which increases the levels of “happy” feelings and reduces pain levels in individuals (Zoppi, 2020) As an alternative or complementary therapy method to CBT psychotherapy treatments, it can help improve communication skills, awareness, attention skills, confidence, decreased anxiety, increased motivation, and safe emotional release among patients.

While the specifics on what aspects of music allow for significant improvements in patients are uncertain, exploration in the field has recently increased. Music is known to be associated with many facets of human life including psychologically, biologically and socioculturally. Music itself is inherently interdisciplinary due to its use of math, physics in its properties such as sound waves and acoustic pressure, and ethnology and sociology (Hillecke et al., 2006). A heuristic working factor model was developed to explain why music can serve as a form of legitimate and effective therapy. The model contains 5 factors, each addressing an aspect of music and human processes.

The first factor addresses music’s ability to modulate attention. More specifically, music has auditive properties that allow for people to be more significantly attracted to the stimuli than other sounds or stimuli (Hillecke et al., 2006). Thus music can distract individuals from stimuli that may trigger anxiety or provoke negative emotions, which can partly account for the anxiety reducing effects of music (Koelsch, 2009). The second factor describes emotion modulation between music and the human brain. Music is known to be processed in brain structures that

involve emotional processing such as the limbic system, gyrus cinguli and paralimbic cortical regions (Hillecke et al., 2006). Koelsch (2009) discusses how fMRIS have reported the modulation of limbic and paralimbic brain structures when listening to music that alter emotional states of being. Furthermore, studies have demonstrated that amygdala dysfunction, alongside paralimbic structures such as the orbitofrontal cortex are associated with disorders such as depression and PTSD. The human body's autonomic nervous system, hormonal endocrine and immune system are all also deeply affected by emotion, which can be regulated with the integration of music therapy. The third factor addresses the modulation of cognition with the presence of music. It has been shown that music can help facilitate the recall of episodic memories, and involves neuronal processing similar in complexity to that of human verbal speech (Hillecke et al., 2006). Music involves memory processing stages such as encoding, storage and recall relating to the meaning of music and experiences associated with music. This may provide aid to individuals with memory deficits such as Alzheimer's in adapting and remaining comfortable in unknown environments (Koelsch, 2009).

The fourth factor in the model targets behavior modulation. Music as Hillecke et al. (2006) discuss, has the ability to condition and evoke behavioral and movement patterns subconsciously. Neuroscientists have reported that timing processes located in the frontal brain are substantially influenced by rhythmic stimulation. Such information has aided stroke patients, and other individuals with movement deficits such as Parkinson's disease to remediate their movement patterns. The association of relaxation in music therapy can condition a patient's behavior to mimic relaxation when listening to music or thinking about it over time. More specifically, much of cognition and action overlap using a shared neural code. Such sensorimotor codes that encode and store information correlate with working memory in the premotor cortex.

Various cognitive processes can be altered with the learning of new behavioral patterns, which suggests a correlation between new actions and emotional conditioning (Koelsch, 2009).

Lastly, Hillecke et al.'s, (2006) model discusses communication modulation which addresses music's emphasis on nonverbal communication. Music therapy can improve skills of nonverbal communication, which is especially relevant in active music therapy that engages the patient and therapist in improvising or creating music (Koelsch, 2009). Music provides a sense of community and connection between the patient and the music, patient and therapist, or patient and other patients in a group music therapy setting (Hillecke et al., 2006). Social cognitive thinking can also be improved using music therapy among individuals with conduct disorders to understand the intentions behind music created by other people. Koelsch (2009) also explains an additional facet to the model known as perception modulation. This facet focuses on the training music provides to decode features in music such as frequency changes and pitch which correlate to brain structures such as the brainstem and auditory cortex.

Further studies have been conducted using neuroimaging to understand the cognitive relationships between music, alongside musical variation, and the brain. In a study presented by Blood et al. (1999; as cited in Koelsch, 2009) it was discovered that dissonant music, often associated with minor musical scales, is perceived as more unpleasant. The variations between pleasantness modulated activation in the posterior subcallosal cingulate cortex and right parahippocampal gyrus. Moreover, when dissonance was decreased, increased activation was highlighted in the orbitofrontal and frontopolar cortices.

Another study by Blood & Zatorre (2001) utilized preferred music among participants to examine pleasure states such as "goosebumps". Increased pleasure activated cerebral blood flow in the insula, ventral medial prefrontal cortex, ventral striatum and orbitofrontal cortex.

However, cerebral blood flow decreased in the amygdala and hippocampus which indicated that music has the capacity to provoke emotions. Additionally, in patients with depression or PTSD who show reduced volume in the hippocampus, music may prevent hippocampal neuronal death and restart activity in the hippocampus, ultimately allowing for the generation of positive emotions produced by music. Additional research has been conducted in which modulations in the limbic and paralimbic regions have occurred due to music manipulation.

Koelsch et al. (2006) observed the effect of joyful dance tunes, without human vocals, against dissonant songs which demonstrated increased activation in blood oxygen level dependent signals in the limbic region during the presence of dissonant music. Similarly to Blood & Zatorre (2001), decreased blood oxygen level dependent signals were recorded when listening to the joyful dance tunes, while increased levels were presented in the ventral striatum and insula, and general basal ganglia (Koelsch et al., 2006). The nucleus accumbens, activated when listening to music, is supplied with nerves from dopaminergic brain stem neurons that decide behavior in response to incentivising behavior. When achieving a desire or goal, positive emotion is evoked which is reflected in listening to music (Koelsch, 2009).

Alongside positive emotions, music can elicit relaxation and psychophysiological responses in the human body. When relaxed, a decrease of activity in the sympathetic nervous system can be observed that ultimately lowers heart rate and blood pressure (Benson et al., 1977). Further studies looking at physiological changes in arousal and the body have been conducted suggesting that different music elements can alter these states. It has been found that classical music helps to induce a relaxation response, and “happy” music tends to evoke positive emotions compared to “sad” music. Additionally, tempo, rhythm, volume, and harmonics can influence these states (Hernandez-Ruiz, 2018). In a study conducted by Hernandez-Ruiz (2018)

they looked at the manipulation of tempo, volume, and timbre and how it affected relaxation responses, which is an element in reducing symptoms of anxiety disorders. It was found that the treatment group that listened to music with slower tempos similar to human biorhythms and mellower timbres experienced more significant relaxation responses than those who listened to faster and higher pitched timbre based music. Slower tempo music has been shown to decrease arousal (Nilsson, 2009), and mellower timbres may help increase relaxation responses (Blanaru et al., 2012). Overall it was found that relaxation responses could be induced with an ideal tempo correlating with biorhythms such as tempos around 65 beats per minute (Elliott et al., 2011; Gomez & Danuser, 2007; as both cited in Hernandez-Ruiz, 2018). Inducing relaxation ultimately lowers arousal states which can prevent feelings of tension or excessive energy rooted in anxiety (Niven & Miles, 2013). Thus music therapy can pose as a form of treatment to help induce such relaxation states, and subsequently reduce anxiety.

Music therapy has served as a legitimate and significant therapy modality for a multitude of disorders, including major depressive disorder. In a study by Wu (2002), undergraduate students from I-Shou University in Taiwan were recruited for a study to observe the effect of music therapy on depression levels. All participants were diagnosed with major or minor depression, low self esteem, or anxiety. In the experimental group, participants received 10 sessions of music therapy over 10 weeks, with a duration of two hours per session. Wu analyzed the changes in anxiety, depression, pain and drowsiness among the participants and found that no instant treatment effect was seen for depression, but a significant treatment effect was observed in a 2 month post study evaluation completed by the participants for depression. The researchers did find a significant reduction in anxiety symptoms in the treatment group. Music therapy has also been proven to act as an emotional regulator among patients in palliative care. In a study

completed by Horne-Thompson & Grocke (2008), a single music therapy session was provided for 25 participants in an inpatient hospice service with the goal of observing anxiety levels before and after the session. It was found that there was a significant reduction of anxiety symptoms among the treatment group, and additional decreases in pain and drowsiness were observed. Music therapy has also been shown to reduce symptoms of post-traumatic stress disorder in a study conducted by Bensimon (2022). Music therapists working with traumatized communities were interviewed and explained that music, specifically active music therapy that incorporates body integration has the capacity to bypass other sensory stimuli and provide a sense of wholeness and relaxation to patients. Furthermore, the therapists described the common phenomena among PTSD patients and music therapy of life story integration that allowed for the trauma to be embedded into the natural flow of a life story through the use of music. Ultimately this allowed for emotional and cognitive integration which further supports that negative emotions can be more calmly explored through creative therapies such as music.

For the proposal of this study, it is important to focus on the significant effects music therapy has had on a particular disorder, generalized anxiety disorder. A decent amount of literature has been produced in recent decades surrounding the efficacy of music to treat GAD symptoms. Laura et al. (2015) developed a quasi-experimental study of participants who were clinically diagnosed with depression and anxiety. The treatment group was asked to listen to light music for 3 days, 20 minutes a day while the control group were to not implement any new treatment. A significant decrease in both anxiety and depression were observed between baseline and posttreatment among the treatment group, while anxiety and depression remained constant among the control group. Weaver et al. (2020) conducted a study with a woman named who had acute myeloblastic leukemia and was asked to participate in 30 minute music therapy sessions



for an unreported study period. Using a tempo between 66-72 beats per minute which was aligned with Ms. S's biorhythms, the sessions resulted in decreased anxiety levels and increased relaxation for the patient. In another study conducted by Gutiérrez & Camarena (2015), participants who all were classified as having GAD without any comorbidities received either receptive or active music therapy for 12 sessions. Receptive music therapy is defined as the use of pre-recorded music without active participation by the patient or therapist, while active music therapy involves both the patient and therapist in music creations and listening. Following the 12 sessions, depression and anxiety levels were seen to be significantly reduced (Gutiérrez & Camarena, 2015).

### **Music and Mood Regulation**

It has been established in extensive literature that different types of music have significant effects on tension, mental clarity and mood. In a study conducted by McCraty et al. (1998), participants were assigned to a within participants study in which they listened to grunge rock, classical, designer, and new age music for 15 minute increments and reported their mood modulations. It was found that the designer music, specifically crafted to evoke feelings of relaxation, alongside classical music increased feelings of caring and mental clarity. Contrastingly, grunge rock music significantly increased feelings of sadness, tension, and hostility among the participants.

Additionally, studies have assessed what types of music can improve mood from a baseline state of sadness. Garrido and Schubert (2013) examined misconceptions about catharsis in which many people reported improved mood following listening to sad music. However, the sad music itself did not actually improve mood, but created more agitation among individuals. Rather, the music allows for a creative outlet for people to process negative emotions which in

turn improves mood (Trapnell and Campbell, 1999). Additionally, music overall alongside music perceived as “sad” has a higher capacity for absorption which describes becoming deeply involved in a stimulus, allowing for enjoyment of the emotional arousal without the typical unpleasant feelings that accompany sadness (Garrido and Schubert, 2011). However, more often than not, sad music can worsen states of anxiety and rumination thought patterns among individuals who experience disorders such as generalized anxiety disorder. Many individuals with GAD lack mood regulation skills such as preventing rumination, which is the involuntary focus on negative thoughts and stimuli (Garrido, 2009). This behavior prolongs feelings of sadness and anxiety, alongside downregulating motivation which ultimately aids in improving mood (Forbes & Dahl, 2005). When lacking mood regulation skills, the music choices that encourage negative stimuli may in fact worsen symptoms of GAD. Garrido and Schubert (2013) demonstrated participants who all experienced rumination pattern thoughts reported increased scores of depression and mood disturbance after listening to “sad” music. However, over the 2 month study period, scores of increased mood stability and decreased depression after listening to “happy” music. Thus it is important to understand what music could contribute to worsened states of being, and thus provide more efficacious music styles in clinical settings to help such individuals.

### **Tempo, Key and Timbre**

This study will focus on tempo, key and timbre in music and their subsequent efficacies in reducing symptoms of generalized anxiety disorder using a music therapy treatment method. It is important to understand the musical elements to be modulated, and how it may result in varying degrees of symptom presentation among the participant sample.

Tempo is defined as the speed at which music is played. It can be described in “beats per minute” which provides a numerical value for the tempo. It informs the musician how many beats are in one minute, which can vary depending on the time signature that assigns beats to either quarter notes or eighth notes. It may also be referred to using Italian terminology, which is considered to be the language of music. This study will look at adagio tempo, which indirectly translates to “at ease” in music terminology, which corresponds to music ranging from 60-76 beats per minute, and allegro tempo, known as the “sweet spot” tempo, which correlates to music ranging from 109-132 beats per minute (Masterclass, 2021). The manipulation of tempo has the ability to elicit various emotions and arousal states, such as how slow tempi may induce relaxation responses (Liu et al., 2018). Liu et al. (2018) studied fast (> 120 bpm), medium (76-120 bpm) and slow tempi (60-76 bpm) and observed differences in emotion using fMRIs. Cognitively, the cerebellum and basal ganglia, alongside motor regions such as the supplementary motor area and premotor cortex are activated when perceiving tempo, which can be seen in fMRIs (Levitin and Tirovolas, 2009). It was found that arousal was highest for music with a fast and medium tempo, followed by slow tempo. Lower arousal strongly correlates with feelings of calmness and relaxation, which in turn may lower symptoms of immediate and long term anxiety (Parncutt, 2014).

The key of music describes the seven distinct pitches that are repeated in a musical piece that allow for harmonically consonant sounds. While Western music has a total of 12 distinct pitches, a piece of music will always only utilize seven of them, and seven pitches for a piece can be determined by looking at the key and key signature. A key signature is represented with sharps and flats that depending on the number present, indicates the key. All chords built upon the seven notes in a specific key will be consonant, a combination of frequencies that sound

musically pleasant, as opposed to dissonant, frequencies that do not sound pleasant together, which tends to present itself in keys in a minor tonality (Masterclass, 2022). Minor tonalities differ from major tonalities because the 3rd pitch in the scale is flattened or lowered by a half step, while in the major scale, it remains stable. This flattening ultimately produces a much more somber and darker chord that often can be heard as slightly dissonant (Nemeroff, n.d.). It has been found that music listeners consistently assign positive labels to music in major keys, and negative labels to music in minor keys (Hevner, 1935; Hevner, 1936; as both cited in Parncutt, 2014). This is largely credited to the inherent level of dissonance in the minor triad, or the fundamental chord in the minor scale, and more complex tonal structure found within music written in minor keys (Parncutt, 2014). Cognitively, key or tonal relations in music are processed in the right temporal and left dorsolateral prefrontal cortices (Zatorre et al., 1998). Blood oxygenation level dependent responses observed using fMRIs demonstrated that major versus minor tones activate the thalamus, dorsal cingulate cortex and bilateral inferior frontal gyri (Levitin & Tirovolas, 2009). Specifically, minor tones and chords activate the amygdala, brain stem, and cerebellum (Pallesen et al., 2005; Green et al., 2008; as both cited in Levitin & Tirovolas, 2009). Major tones however activate the bilateral ventral and left dorsal striatum, alongside the parahippocampal gyrus and left anterior cingulate. Associated with these tones is “happy” classical music, which can be associated with inducing positive and anxiety reducing emotional states (Levitin & Tirovolas, 2009).

Timbre is defined as the sound or tone quality a note carries on various musical instruments and human voices. While the same pitch can be produced on different instruments, they will each evoke a distinct timbre which can be highlighted between the different families of instruments. The production of timbre is credited to the variances in overtones and sonic

envelope, how much changes over time, that instruments possess. When a musician plays a note, a fundamental frequency for the specific pitch is produced. However, overtones are also a product of playing the note which are defined as additional frequencies that are part of the harmonic series within a scale. Certain instruments may have variances in overtones such that the fundamental frequency may be more audible in higher pitched instruments, while the overtone frequencies may be the dominant sounds in lower pitched instruments, ultimately producing various timbres. The sonic envelope of an instrument also affects the listener's perception of unique timbre due to four factors: attack, decay, sustain and release. Attack is described as the amount of time it takes for a pitch to reach its loudest peak, decay is the length of time it takes for a pitch to reach sustained level after its loudest peak, sustain is the volume of sound after peak loudness until the player stops actively playing the pitch, and release is the amount of time it takes for the sound to decay to silence after the musician stops actively playing the note (Masterclass, 2021). It is found that instruments and vocalists have significantly different sonic envelopes such that the differences in timbre may be exaggerated than between instruments in the same family. There are seven common descriptions of timbre, particularly highlighting breathy and vibrato timbres that are common among vocalists. Breathily timbre describes sound with an audible airflow, and vibrato describes when frequencies oscillate quickly. String instruments tend to hold a rich timbre that describes sounds balanced with multiple overtones.

Timbre can evoke emotion due to the fundamental structure it provides for music itself. Studies have shown that the sounds different instruments produce are categorized to different emotions (Balkwill & Thompson, 1999; Behrens & Green, 1993; Gabrielsson, 2001; Gabrielsson & Juslin, 1996; Juslin, 1997; as all cited in Hailstone et al., 2009). Emotional expression as

related to music can be conveyed in a single pitch, which is perceived according to the timbre of an instrument or voice. Studies looking at human lesions showed that damage to the posterior temporal lobe resulted in a loss of pleasure and emotional responsiveness when listening to music due to damage to timbre perception (Hailstone et al., 2009). Hailstone et al. (2009) conducted a study to observe timbre and perceived emotion using designed melodies with instruments commonly used in Western music such as piano, violin, and trumpet where participants were subsequently asked to classify the music as making them feel happy, sad, angry or fearful. A significant effect was found such that the piano, which holds a string and percussive timbre, elicited the most happy emotions, while violins were equally rated sad with the other instruments used in the study. The emotional classification of violins may be attributed to the lower presence of harmonic overtones in violins, however they did indicate lower arousal states which is associated with reductions in anxiety symptoms (Hailstone et al., 2009).

### **Research Aims**

It is evident through extensive literature that music therapy is a legitimate treatment modality, backed by neuroimaging and self report measures that have demonstrated the psychophysiological changes that occur in the body when listening to music to induce feelings of relaxation, lowered states of anxiety and depression, mental clarity and increased positivity. Music serves as an emotional regulator by engaging the sensorimotor and emotional processing centers of the brain, alongside controlling the release of hormones that evoke happy and sad states of being in the basal ganglia. However, the emotional regulation of music is largely dependent on the type of music presented, subsequently affecting the perceived emotion of the music. The purpose of the proposed study is to examine whether the manipulation of musical tempo, key, and timbre can have an effect on the symptoms of generalized anxiety disorder. This

study will look at adagio versus allegro tempo, major key versus minor key, and instrumental versus vocal timbre, and how combinations incorporating all three elements impact the presentation of GAD symptoms in a clinical population. This experiment may provide a more extensive understanding of how music therapy can prove more efficacious in treating individuals with generalized anxiety disorder by examining what types of music yield the best results on average.

### **Hypotheses**

It is hypothesized that music therapy utilizing music with adagio tempo music will significantly reduce GAD severity more than music therapy using allegro tempo music. Parncutt (2014) suggested that music accompanied with a faster tempo increases arousal and subsequent feelings of tension or excessive energy that prevents a pause in patterns of rumination and anxiety. Secondly, it is hypothesized that music therapy using major key music will significantly reduce GAD severity more than music therapy using minor key music. As Hevner (1935; 1936; as both cited in Parncutt, 2014) discusses, people tend to assign an unpleasant label to music in minor keys as the inherent dissonance of many harmonic chords due to the flattened 3rd in the scale increased feelings of tension and arousal. Third, it is hypothesized that music therapy with string instrumental music will significantly reduce GAD severity more than music therapy with vocal music. As previously discussed by Hailstone et al. (2009), musical timbre among string family instruments elicited positive emotions among participants, while timbres that lacked overtone qualities were perceived as more unpleasant and negatively. Vocal timbre produces less overtones than other instruments, which may cause for more response among the instrumental group conditions. Additionally, it is hypothesized that music therapy in a major key, adagio tempo, and instrumental timbre will demonstrate a supersize additive effect such that GAD

severity is reduced more than between all other conditions. As it has been demonstrated by Hernandez-Ruiz (2018) that decreased arousal and subsequent feelings of relaxation, which help to mediate symptoms of chronic anxiety, can be induced with timbres of multiple overtones; tempos aligned with one's natural biorhythms, and keys associated with "happiness" (Levitin & Tirovolas, 2009), it may suggest that the combination of adagio tempo, major key music, and string instrumental timbre will produce a supersized additive effect in reducing symptoms of generalized anxiety disorder. Lastly, it is hypothesized that individuals with higher baseline anxiety scores on the GAD-7 item self-report scale will demonstrate significantly more GAD severity reduction than those with lower baseline anxiety scores.

### **Proposed Method**

#### **Participants**

As calculated on SPSS software, a series of one-way ANOVA power analyses set at a standard deviation equal to 5.44 as determined in Spritzer et al., 2006; as cited in Rutter & Brown, 2017, and variance in hypothetical participants scores across all eight study conditions set to  $X=2$ ; it was found that  $N=152$  participants are required for this study to achieve power equal to 0.80 at a Cronbach's alpha equal to 0.05. Participants, who will be recruited using a convenience sampling method, will access applications for the study through social media posts and tangible signage at a college campus and the surrounding community. All participants will be screened to ensure they have sufficient GAD symptoms. After completing the application online, participants will be asked to meet over a video-meeting platform service with a professional psychologist recruited for the experiment to complete the anxiety assessment and provide brief demographic questions. To qualify, participants must be between the ages of 18 and 24, and demonstrate moderate to severe anxiety. It is expected that gender identity of the



participants will be more or less equally spread between male, female and nonbinary identifying. Additionally, it is expected that the majority of participants will be enrolled in college.

Compensation of paid-for cognitive behavioral therapy sessions once a week and a monetary award of 50 U.S. dollars each or aid to continue CBT treatment without fees will be awarded to every participant in the study.

### **Materials**

The Generalized Anxiety Disorder-7 item Assessment Scale, GAD-7, developed by Dr. Robert L. Spritzer is a scale widely used to assess the presence and severity of generalized anxiety disorder using a retroactive time frame of two weeks. The scale is a self-report assessment containing 7 items, however it will be completed in the presence of a researcher, that describe the most salient symptoms of generalized anxiety disorder such as “feeling anxious, nervous or on edge” (Rutter & Brown, 2017). The items are rated on a 4 point Likert scale of values ranging from 0-3. A score of 0 indicates experiencing the described symptom “not at all” over the previous 2 weeks whereas a score of 4 indicates experiencing the symptom “nearly every day” over the retroactive time frame. Traditionally, scores from each item are summed to produce a total value between 0 and 21 that are broken down into varying severities of GAD. The total values of 0-4 indicate minimal anxiety, 5-9 indicate mild anxiety, 10-14 indicate moderate anxiety, and 15-21 indicate severe anxiety. In this study, to account for any possible errors in full completion of the GAD-7 item assessment scale at either the commencement of the study or the conclusion of the study, the total scores will be summed based on the completed items on the scale. Additionally, baseline GAD scores will serve as a control variable, accounting for any potential significant variances in scoring between participants when the study begins.

Participants will also be provided with an online survey questionnaire to be completed during the video-call qualification portion of the study regarding basic demographic questions. They will be asked to provide their gender identity, age, residential location, and typical music listening hours and genre preferences. All demographic variables will not be analyzed in this study, but will be collected for further analysis in future studies assessing personal relationships to music based on location and individual preference, and its effect on the significance of music therapy on lessening symptoms of anxiety.

### **Procedure**

This study is designed under an experimental framework in order to control for and manipulate any variables. All participants will be recruited using a convenience sampling method. Participants will be contacted by the researchers to establish a video call with a professional psychologist to complete the GAD-7 item self-assessment scale, and complete the demographics survey. In order to participate, participants must be within the ages of 18-24, and qualify as having moderate to severe anxiety on the GAD-7 item scale. Sufficient GAD scores to qualify are scores ranging between 10-21, on the GAD-7. The scores of those who qualify will act as a baseline measurement of anxiety levels to be used for later analysis at the completion of the experiment period. The initial scores on the scale will be recorded and used for later analysis.

Participants will then complete an informed consent form detailing the parameters of the study. Any participants who no longer wishes to continue to participate in the study may leave the study at any point. Participants will be set up for CBT sessions once a week for the entirety of the 10 week study period at the clinical therapy clinic where the music therapy listening sessions will also occur. All participants will be advised to attend the CBT sessions to ensure sufficient treatment for GAD. It is to be noted that the participants will not all have the same

therapist in CBT or music therapy listening sessions due to the large volume of participants, but each individual will have one therapist to conduct both sessions each week for the full duration of the experiment. Differences in therapists will be controlled for through an intensive screening process accounting for their specialties, years of experience, and will receive standardized treatment manuals and training to follow for all intervention groups.

After all initial measures have been completed, participants will be randomly assigned to one of eight conditions not known to the participant, creating a blind study. Each condition will vary in the type of music used in the listening sessions. Every condition will use three of the following qualities, with one quality from each category: tempo, timbre, and key. Tempo will vary between adagio tempo (pieces ranging from 66-76 bpm) which is categorized as slow tempo, or allegro tempo (pieces ranging from 109-132 bpm). Timbre will vary between vocal timbre, which describes pieces with human vocal melodies ranging from bass to soprano voices, or instrumental timbre, which in this study will describe pieces with string instrumental melodies including piano. Lastly, key will vary between pieces in the key of C major (which is considered to be a very “happy” key), or pieces in the key of D minor (which is considered to be a very “melancholic” key). The eight conditions are as stated: 1) adagio tempo, instrumental timbre, and key of C major, 2) adagio tempo, instrumental timbre, and key of D minor, 3) adagio tempo, vocal timbre, and key of C major, 4) adagio tempo, vocal timbre, and key of D minor, 5) allegro tempo, instrumental timbre, and key of C major, 6) allegro tempo, instrumental timbre, and key of D minor, 7) allegro tempo, vocal timbre, and key of C major, or 8) allegro tempo, vocal timbre, and key of D minor. No condition will reflect the lack of music therapy sessions..

CBT and music therapy listening sessions will occur on days in which a participant is available, but all participants will receive an hour of CBT a week and 30 minutes of music

therapy a week for 10 weeks. Should a participant miss a session of either CBT or music therapy, they may reschedule for the same week, but not for any following week to avoid doubling up on sessions within a week. Both therapy sessions will occur in the centrally located therapy clinic in person and under the supervision of a clinical psychologist, who will relay information to the researcher regarding the participant, condition, type of session and day to avoid any possible increased anxiety from the researcher's presence in a more intimate and vulnerable environment. During the music therapy listening sessions, participants will hear a mix of musical genres ranging between pop, classical, and jazz to allow for consistent rotations of song selections to avoid constant repetition between the 10 music therapy listening sessions each participant will attend over the course of the study. All song selections however will hold the characteristics of the musical properties described above including range of tempo, specific musical key and type of instrument or voice. At the conclusion of the last music therapy listening session, participants will complete the anxiety measure. They will then receive compensation and an elective full debriefing of the study.

### **Ethical Considerations**

Participants likely will benefit from being part of this experiment because they will receive 10 weeks of cognitive based therapy treatment without any fees, which for participants who did not receive CBT prior to the commencement of the study and for those who did can greatly improve emotional and cognitive states relating to levels of GAD (Stein & Sareen, 2015). Additionally, participants will be able to receive music therapy sessions without charge for the entirety of the study, which may provide additional aid in more significantly remedying symptoms of GAD. While certain conditions are predicted to be less effective at reducing GAD symptoms, emotional distress may be reversed with access to CBT and debriefing. Furthermore,

music therapy is a highly accessible form of therapy that may eventually be self-administered at any needed time after assessing what music may be most effective for an individual. Thus it is important to expand the breadth of research in this field to provide treatment for a much larger population.

This experiment also may provide a significant addition to the scholarly knowledge base surrounding treatment for a highly prevalent condition such as GAD. This study is expanding upon a relatively new form of therapy, to provide new literature into how music therapy is significant and valid as a non-traditional form of therapy, and more specifically on how to utilize this therapy method to be most effective.

Despite the clinical nature of this study, participants will not be exposed to more than minimal risk. Controlled measures have been carefully put in place to ensure that any potential emotional harm done to participants is temporary and reversible, and can be remedied. It is important to note that some of the music therapy conditions that include music that may increase arousal and agitation can temporarily increase anxiety levels in a participant, however any possible negative emotional or physical states a participant may express can be addressed and supported through the professional cognitive based therapy sessions provided to all participants for the entirety of the study period. While all participants will be receiving one CBT session per week, they may ask for a brief session with a professional following the listening session if they feel any significant states of distress to reverse such emotional damage. As the study does have conditions that are predicted to not be as effective in reducing symptoms of GAD, it is important that all participants have access to help immediately and more long term throughout the duration of the study.

Furthermore, all participants will be required to provide informed consent at the commencement of the study in order to participate. An opportunity for debriefing will be given to all participants at the closing of the study. There will be no deception in this study, however a complete breakdown of hypotheses will not be provided until the end of the 10 week study period. Additionally, the participants will be fully competent and able to provide informed consent, however participants will be considered a vulnerable population since they will have diagnosable levels of anxiety. Such participants will be recruited using a convenience sampling method via social media and email, and any participation is completely voluntary.

Voluntary information to share includes minimal personal information such as participants' gender identity, residential location, and personal experiences with music and mood to utilize for potential future research looking at prior relevance of music and the efficacy of music therapy on mitigating symptoms of GAD. However, the report and assessments of GAD levels may be considered sensitive and uncomfortable to some participants as it revolves around mental health and there will be measures put in place to protect their comfort levels and feelings of safety to the highest extent possible. All participants will be informed of the procedures of the study, and will also be debriefed at the closing of the study to ensure complete transparency between the researcher and participant, especially given the delicate subject matter of the experiment.

As this experiment is quite sensitive in its focus, participants will be asked at multiple checkpoints about their willingness to continue the experiment to ensure that participants feel welcome to address their concerns or change their mind whenever they feel fit. Additionally, in the dissemination of results, all personal information and reports of participants' anxiety symptom levels will be kept confidential in order to protect participants. Should the participant

prefer not to share their data, they may request that the researcher remove them from the data set without penalty, as participation in this study is completely voluntary and the comfort and safety of the participants is the highest priority. The benefits in conducting and participating in this study far outweigh the risks it holds to its participants.

### **Anticipated Results**

This study utilizes a 2 (tempo; adagio versus allegro) x 2 (key; C major versus D minor) x 2 (timbre; string instrumental versus vocal) between-participants design to assess the impact of modulating structural musical aspects on reducing symptoms of generalized anxiety disorder. For all analyses conducted, the summed anxiety scores are assessed two separate times, once at the commencement of the study and once at its closing.

A 3-way (tempo, key and timbre) factorial analysis of covariance, ANCOVA, with covariate (baseline anxiety scores) interactions will be conducted to analyze all data and related hypotheses.

It is anticipated that adagio tempo music will significantly reduce scores of GAD severity more than allegro tempo music. As Liu et al. (2018) described, arousal when listening to slow tempo music was significantly decreased in comparison to fast tempo music, which is often associated with physiological states of calmness and relaxation, as opposed to tension (Niven & Miles, 2013). An additional hypothesis anticipates that music presented in the key of C major will significantly reduce GAD severity more than music in the key of D minor. Parncutt (2014) describes the inherent dissonance of minor tonalities, which is associated with negative emotions and states of unpleasantness (Kastner & Crowder, 1990). Furthermore, major tonalities in Western culture have been assigned labels of “happy” and positive emotional valence, which can be credited to the harmonic consonance in major scale chord progressions (Hevner, 1935). It is

hypothesized that string instrumental music including piano will significantly reduce GAD severity more than vocal music. Vocal music tends to produce less audible overtones than lower pitched and resonant instruments such as ones belonging to the string family (Masterclass, 2021). As Hailstone et al. (2009) described, instruments with multiple overtones allow for evocation of most positively perceived emotions which may result in the string instrumental conditions to be more effective in reducing GAD symptoms.

It is additionally hypothesized that the condition including music in a major key of C, adagio tempo, and instrumental timbre will perform significantly better such that GAD severity is reduced more than between all other conditions. A supersized additive effect of all three musical elements in the reduction of GAD severity is anticipated due to literature supporting the positive psychophysiological effects adjusting musical qualities has on feelings of relaxation and arousal. Lastly, it is anticipated that individuals with higher baseline anxiety scores will demonstrate significantly higher reductions in symptoms of GAD than those with lower baseline GAD scores. This is suggested because such individuals may not have experienced successful treatment under traditional therapy modalities, or may have not had any treatment prior to the commencement of the study which may result in more drastic changes in the scores from baseline to post-study on the GAD-7 item scale.

### **Scholarly Merit**

While literature within the field of music therapy has increased in recent decades, there are significant gaps that have stunted the growth and legitimacy of this nontraditional therapy modality. It is evident that music can serve as a tool for emotional regulation (Horne-Thompson & Grocke, 2008), but it is important to expand the research within this field to better understand how accessible forms of therapy such as music can be most effective for individuals who may



want to look outside of traditional methods of treatment or complement their treatment. With an increasing population experiencing chronic anxiety, it is necessary to legitimize and understand the mechanisms of additional treatment options.

This study focuses on exploring and understanding the impact of manipulating structural elements of music on reducing symptoms of generalized anxiety disorder. While it is understood that music therapy is effective to treat anxiety (Gutiérrez & Camarena, 2015), little is known about what specific elements could be adjusted to allow music therapists to better support their patients in treating them most effectively, and avoid any possible temporary or long-term negative states of being following music therapy sessions. This is an urgent gap in literature that needs to be closed as over 50% of patients with GAD do not respond to traditional forms of therapy, psycho and pharmacotherapy methods included (Stein & Sareen, 2015). This allows for future pathways to examine how efficacy of music therapy can vary and be adjusted for individuals with different socio cultural relevances of music or even creating new types of music that combine the most anxiety reducing aspects of music to implement in music therapy sessions. More specifically, music therapy that is designed to reduce symptoms by adjusting structural elements such as tempo, key and timbre could result in higher success rates in the reduction of symptoms of GAD by avoiding music that may inadvertently increase symptoms.

### **Broader Impacts**

Expanding research through this study and other literature involving music therapy may benefit individuals on a local, national and global level. Locally and nationally in the United States, individuals suffering from anxiety disorders such as generalized anxiety disorder could experience significant relief, both immediate and long term, through the use of music therapy. The global sociocultural influences on music and emotion may impact different populations

participating in clinical trials with music. However, structural elements of music remain consistent across cultures, and can be applied to various styles of music and personal preferences to successfully mitigate symptoms of chronic anxiety.

Society at large also has the potential to benefit from the dissemination of the results of this study due to the highly accessible nature of music therapy. It also may provide short term relief for individuals who suffer from GAD, or do not belong to a clinical population. This study additionally may provide a stronger foundation for the validity and normalcy of alternative methods of therapy that can be self-administered or be accessible to individuals of varying socioeconomic statuses to provide larger relief to larger populations.

Providing more foundation and support for the integration of music therapy among traditional therapy modalities also allows for the inclusion of many underrepresented groups who may not have previously benefited from treatment. Individuals who lack verbal communication skills such as dementia patients, or individuals who suffered traumatic brain injuries may receive effective care for disorders such as GAD through specific music therapy treatment that does not require verbal communication (Zoppi, 2020). Additionally, individuals who may have disabilities that prevent them from exiting their home or care facilities may receive treatment from their homes, or even self-administer treatment with the guidance of a professional. Patients with motor diseases such as Parkinson's may also be more represented and cared for through the integration of music therapy, specifically music therapy that consistently reduces arousal and increases relaxation due to the auditory and behavioral movement pattern connection using music (Hillecke et al., 2006). Overall, people may experience holistic improvements in mental, emotional and physical well-being through easily accessible music therapy listening sessions, whether they have GAD, another disorder, or simply want to experience an uplift in mood.

Expanding research in this field may also increase cooperation in the medical field between practitioners in specialized fields, and benefit patients who may receive combination treatment methods.

Music therapy may serve as a useful form of nontraditional treatment to help reduce the severity of symptoms of generalized anxiety disorder. Whether it is used in conjunction with first-line treatments such as CBT, or by itself, this treatment modality offers unique opportunities to be accessible and effective for a significantly larger population of patients. It is important that there is an expansion of research within this field to provide more options for individuals who may be struggling to mitigate symptoms of anxiety. Thus it is crucial to understand what specific elements of music may allow for significant improvement, such as the proposed study here. By analyzing the modulation of structural musical elements: tempo, key, and timbre, on its effects on lowering GAD symptom severity, researchers, therapists, and patients may begin to comprehend the power that exists in music.

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