Music as Medicine: How Adolescents Can Use Music to Benefit Their Mental Health

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AUTHOR BIO

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ABSTRACT

This paper aims to discover techniques in which music can be used to treat anxiety and depression in adolescents. Studies have demonstrated that music plays a significant role across cultures in affecting mood, performance, and physiological functions. Focusing on adolescents' mental health, this research further explores these findings and looks at the aspects of music that have the power to change one's mental and physical state. This paper covers a comprehensive literature review of studies in recent years. These findings connect music's effectiveness in calming or uplifting an individual to their preference and culture, suggesting that there is no universal song or music genre that is guaranteed to treat mental illness in adolescents. However, given the observed effectiveness of certain music on consolation, performance, and mood, music is still a viable form of medicine – though subjective – when it comes to youth mental health.

Keywords**:** *music, emotion, stimuli, mental illness, adolescent, cognitive, psychology, health, student, anxiety, depression*

EMOTIONAL RESPONSES TO MUSIC

The various elements of music all play a role in manipulating one's emotional and/or mental state. Certain features such as pitch, tempo, and melody may evoke certain corresponding emotions in people. For example, the MER (Music Emotion Recognition) (Tables 1 and 2), created by Yi-Hsuan Yang and Homer H. Chen, is an index that uses common characteristics of music to associate them with specific emotions (Panda et al., 2020). Additionally, music can affect one's neurobiological state in various ways. Researchers created a framework with eight emotional mechanisms that may be activated when listening to music (Juslin et al., 2015). For example, the brain stem reflex responds to volume and speed changes, and episodic memory is when a memory from the past is activated by the music (Juslin et al., 2015). Self-reports from listeners showed that the brain stem reflex caused the most surprise and the episodic memory conditions caused the most nostalgia and happiness (Juslin et al., 2015). Furthermore, the nature of one's reception of music may reflect their problem-solving skills. Attentive-analytical listening (Leipold & Loepthien, 2015) is a less ego-centric cognitive process of music reception. The listener focuses on different aspects of a musical piece, which include melody, rhythm, dynamic, and harmony, and combines them to create their impression of and inferences on the piece they hear (Leipold & Loepthien, 2015). Researchers found this listening method to be related to accommodative coping, where one reframes a goal or problem to reduce their personal stress (Leipold & Loepthien, 2015). People who use emotional listening have feelings that are activated by the music they hear (Leipold & Loepthien, 2015). This method is more subjective and can contribute to emotional regulation and adaptation (Leipold & Loepthien, 2015). Emotional listening is positively related to rumination – when thoughts, usually negative ones, occur repeatedly and lead to overthinking, increased stress, and daydreaming (Leipold & Loepthien, 2015). From this research, it can be deduced that music's effect on humans involves an orchestra of different facets to elicit emotions and physiological responses.

Table 1

MER: Relations Between Melodic Elements and Emotions (Panda et al., 2020)

TABLE 3
RELATIONS BETWEEN RHYTHM AND EMOTION.

ME	*Value*	*Associated emotions*
Tempo	Fast	Several, among which happy, graceful, vigorous, pleasant, active, angry, fearful, energy arousal and tension arousal [32]; happy, anger, fear [33]; high arousal, e.g., happy, stressful, amusing [39]
	Slow	Several, among which serene, dreamy, dignified, serious, tranquil, sentimental, dignified, sad, peaceful [32]; sad, tender [33]
Tempo and Note Values	High tempo (150 bpm) and sixteenth notes	High arousal: happy, amusing, expressive, stressful [39]
	Moderate to fast tempo (120 or 150 bpm) and sixteenth notes	Surprised [39]
	Slow to moderate tempo (90 bpm) and whole and half notes	Sad, boring, relaxing, expressionless [39]
Rhythm Types	Regular/smooth	Happy, glad, serious, dignified, peaceful, majestic [32]; happy, anger [33]
	Irregular/rough	Amusing, uneasy [32]
	Complex	Angry [32] [33]
	Varied	Joyful [32]; fear [33]
	Firm	Dignified, vigorous, sad, exciting[3] [27], sad [32]
	Flowing/fluent	Happy, dreamy, graceful, serene [27], gay [32]
Rests	After tonal closure (a sequence which starts and ends in the same key)	Lower tension [32]
	After no tonal closure	Higher tension than observed if after tonal closure [32]

Table 2

MER: Relations Between Rhythm and Emotion (Panda et al., 2020)

TABLE 1
RELATIONS BETWEEN MELODIC ELEMENTS AND EMOTIONS.

ME	*Value*	*Associated emotions*
Pitch	High	Surprised, angry, fearful, happy [33] and others [32]; increased tense arousal [32]
	Low	Sad, bored, pleasant, increased valence [32]; sad, tender [33]
Pitch variation	Large	Happy, active, surprised [32]; happy [33]
	Small	Angry, bored, disgusted [32]; angry [33]
Pitch range	Wide	Joyful, fearful, scary [32]; happy, fearful [33]
	Narrow	Sad [32]; sad, tender [33]
Melodic intervals	Large	Powerful [34]
	Minor 2nd	Melancholic [34], sad [33]
	Perfect 4th, major 6th, minor 7th	Carefree [32]; happy (perfect 4th) [33]
	Perfect 5th	Carefree, active [32], happy [33]
	Octave	Carefree, positive, strong [32]
Melodic direction and contour	Ascending	Happy, fearful, surprised, angry, tense [32]
	Descending	Sad, bored, pleasant [32]
Melodic movement	Stepwise motion	Dull melodies [35]
	Intervallic leaps or skips	Exciting melodies [35]
	Stepwise and skipwise leaps	Peaceful melodies [35]

HOW TEMPO AND GENRE OF SONGS CAN AFFECT BEHAVIORAL AND PHYSIOLOGICAL RESPONSES

However, music has more direct effects on one's mental and physical state as specific facets of and genres of music are found to evoke corresponding emotions, behaviors, hormonal responses, and thoughts in people. First, music can arouse (in this context: energize) a listener. Researchers conducted an online survey for undergraduate students (N = 794; 73.5% females and 26.5% males) in the psychology subject pool of a large mid-western urban university and found that rap/hip-hop; electronica/dance; and soul/funk made the subjects feel more aroused (Cook et al., 2017). Furthermore, according to correlated rises and dips in salivary oxytocin and cortisol levels, slow music can aid relaxation while fast music can help one to feel energized and active (Ooishi et al., 2017). In another study, when subjects listened to fast-tempo music, a measurement called lnLF/lnHF went up significantly (Ooishi et al., 2017). This measurement is related to the ratio of "low frequency" to "high frequency" nerve activity and indicates a different kind of change in nerve activity compared to slow music, suggesting a bodily response different from relaxation and more similar to energization (Ooishi et al., 2017). Heart rate had no notable change, indicating a different effect on the body compared to slow music (Ooishi et al., 2017). After listening to twenty minutes of slow music, lnHF went up significantly while heart rate decreased, indicating relaxation (Ooishi et al., 2017). Oxytocin, dubbed the "love hormone", helps one relax and bond with loved ones upon release ("Oxytocin: The Love Hormone - Harvard Health," 2021). Cortisol is a main stress hormone that helps regulate energy, metabolism, and one's fight-or-flight response, and high levels of it are associated with feelings of stress ("The Role of Cortisol in the Body," 2023). Furthermore, a blood pressure study suggests that classical music is most helpful with lowering blood pressure (Trappe & Voit, 2016) in which high levels are associated with anxiety, stress, and depression (Kretchy et al., 2014). When the researchers compared the effects of different types of music, they found that Mozart and Strauss – both classical artists – had similar effects on blood pressure (Trappe & Voit, 2016). The drop in blood pressure with Mozart was not remarkably different from that with Strauss, and even silence slightly lowered the subjects' blood pressure (Trappe & Voit, 2016). However, the music by ABBA, a Swedish pop band, resulted in a smaller decrease in blood pressure compared to silence and classical music (Trappe & Voit, 2016). This may be compared to the findings of Ooishi et al., as in both studies, there was a certain type or facet of music that either affected or did not affect one's physiological response. There were no significant differences in blood pressure, heart rate, or cortisol levels between gender and age groups (Trappe & Voit, 2016).

Other than being a tool to self-energize, music can also help one cope with negative emotions. Classical and folk music was a popular choice for dealing with sadness (Cook et al., 2017), and certain teenagers– especially girls– experience sadness when listening to sad music, while others find comfort in it (ter Bogt et al., 2019). In fact, since ancient times humans have taken an interest in art conveying misery; this was named the "tragedy paradox" – the situation in which people try to eliminate sadness from their lives yet find it "pleasurable in an aesthetic context" (Sachs et al., 2015). In a study that defined sad music as "music that is self-identified as sad by a young western audience, socialized in a cultural context where American, British, and Dutch popular music is dominant", researchers conducted interviews on 1686 adolescents, 44% of whom were female and 56% male (ter Bogt et al., 2019). They found that 72.7% of respondents did not experience unhappiness when listening to sad music, and that 17.0% of adolescents felt unhappy (ter Bogt et al., 2019). More girls (24.9%) tended to feel sad compared to boys (10.7%) (ter Bogt et al., 2019). Furthermore, most participants (74.0%) did not feel consoled in their negative emotions when they listened to sad music (ter Bogt et al., 2019). However, some girls (20.9%) and boys (9.9%) said sad music

could actually help console them (ter Bogt et al., 2019). The researchers found that feeling saddened or comforted by sad music was linked to several environmental factors, including negative family environment, bullying from peers, feelings of anxiety or depression, negative self-comparison to others, and low self-esteem (ter Bogt et al., 2019). Moreover, the researchers found that feeling sad and feeling comforted by sad music were positively correlated, and this connection was stronger in boys (ter Bogt et al., 2019). Girls who felt sad listening to sad music had lower self-esteem compared to boys who felt sad (ter Bogt et al., 2019).

Background music is beneficial for adolescents who are studying or performing tasks, especially genres which originate from their own culture. In an experiment on 13-14-year-old Indian students, researchers considered three conditions of background music: no music (A), Indian music (B), and Western music (C) playing in a classroom while students took *David's Battery of Differential Abilities* (DBDA), a verbal exam (Mohan et al., 2020). Results showed that there was a significant increase in performance when Indian music was played compared to no music (Mohan et al., 2020). The researchers also found that performance was slightly higher with Western music compared to no music, but the increase was not as notable as with Indian music (Mohan et al., 2020). Further research with these students looking at physiological functions could suggest a similar effect on heart pressure (Trappe & Voit, 2016) or heart rate (Ooishi et al., 2017) in the participants from the Indian music that lessened stress and therefore may have improved performance. Additionally, the participants voiced increased preference for Indian music than for Western music (Mohan et al., 2020), suggesting that music familiar with one's culture is more suitable for productivity and performance.

HOW LISTENING TO PREFERRED MUSIC AFFECTS THE BODY AND BRAIN

Listening to preferred music may increase activity in the DMN (Default Mode Network) in the brain, which may help with one's inner cognition such as abstract thought processing and critical thinking (Hodges & Wilkins, 2015). The DMN is a group of interconnected parts of the brain that becomes less active when one's attention is focused outwards but is engaged when attention is turned inward; for example, during introspection or daydreaming (Hodges & Wilkins, 2015). Neuroscientist Dr. Valerie Reynolds states "...that it was not the genre of music or whether the music had lyrics, but, more important, whether the person liked it, that changed the patterns of brain functional connectivity" (Hodges & Wilkins, 2015). Relating to Reynolds' statement, the findings of musically-induced neuroplasticity suggest that one can program their brain to associate music with a calming effect (O'Kelly, J. W., 2016). For example, musicians activate numerous neuronal systems over and over again with practice of their repertoire, and they have muscle memory with the songs they know (O'Kelly, J. W., 2016). This may imply that, with time, repeated listening to certain music in various situations can program one's brain to associate a song or genre of music with an emotion or experience; however, statistics to prove this relationship have yet to be found.

In another study, researchers deduced that the "...results suggest that listening to preferred music may be a more effective way of reducing feelings of stress and cortisol levels and increasing positive emotions than relaxing without music" (Helsing et al., 2016). They also believed that, despite there being certain elements (e.g. mode, rhythm, tempo, pitch, harmony) of music that affect a person's mental state in certain manners, there is not a universal genre of music that evokes the same emotion in all listeners (Helsing et al., 2016). Through a study where women listened to music for thirty minutes a day, researchers found that the participants felt positive emotions more intensely and had lower cortisol levels than those who did not listen to it (the control group), and that preferred music had a stronger effect on the lowering of these hormones' levels (Helsing et al., 2016). In summary, Helsing et al.'s

all-women study found that the experiment group experienced more intense positive emotions during the intervention weeks compared to the control group (Helsing et al., 2016). The relationship between stress and positive emotions varied between the two groups, suggesting that the intervention may have influenced how the participants responded to stress (Helsing et al., 2016). Additionally, feeling a sense of control was related with lower stress levels and increased positive emotions for both groups (Helsing et al., 2016). Overall, there was not a significant difference in cortisol levels between the two groups during the intervention weeks (Helsing et al., 2016). These findings can connect back to the study where Indian music was the most effective in improving Indian students' performance (Mohan et al., 2020). It is possible that, due to finding this music familiar and more desirable because of its link to their culture, the students preferred this music more and their stress and emotions were improved through listening to it.

HOW ADOLESCENTS CAN USE MUSIC FOR THEIR WELLBEING

Lastly, music can be utilized to treat people's mental health conditions in a therapeutic manner. Music therapy can help improve children's self-esteem, depression symptoms, and social skills in the short term (Porter et al., 2016). In a study on adolescents and children in a music therapy program,

> 53% [of participants] had a diagnosis which included anxiety [agoraphobia, social phobias, specific (isolated) phobias, other phobic anxiety disorders, phobic anxiety disorder, unspecified], 37% had a diagnosis which included depression (depressive reaction, psychogenic depression and reactive depression), while 19% had a diagnosis which included autism (childhood autism, atypical autism, Rett syndrome, other childhood disintegrative disorder, overactive disorder associated with mental retardation and stereotyped movements, Asperger syndrome, other pervasive developmental disorders, pervasive developmental disorder, unspecified). (Porter et al., 2016)

The therapy sessions involved a participant choosing an instrument and playing it or singing to express their emotions, following the Alvin model of 'Free Improvisation' (Porter et al., 2016). Children and adolescents in the experimental group (the ones who received the therapy) demonstrated improvement in self-esteem, depression, and social skills at week 13 (Porter et al., 2016). However, these results were not sustained through week 26 (Porter et al., 2016). The researchers stated that their findings were "small but clinically significant" for subjects 13 years and older (Porter et al., 2016). However, adolescents can learn to use music for their mental health with the help of music therapists and the HUMS (Healthy-unhealthy Uses of Music Scale) (McFerran et al., 2018). In this study, various participants between the ages of 13 to 23 underwent interviews with licensed music therapists that discussed their results on the HUMS and K10 taken prior to the intervention; through two of these sessions, many participants saw optimistic results and changes in mindset around music therapy according to Table 3 (McFerran et al., 2018). The HUMS is a 13-question scale that evaluates whether a person's use of music is beneficial or harmful to their mental health (McFerran et al., 2018). Participants took a K10 (Kessler Psychological Distress Scale) before and after the intervention; scores ranged from 10 (likely to be well) to 50 (likely to have a severe disorder) (Worksafe QLD, 2003). During intervention, researchers recorded the adolescents' responses; for example, one said:

> When I was sad, I didn't think about music impacting my mood, I just thought of it as my friend, and I'd put depressing songs on because I felt sad. So it comforted that sadness, and I would go for long walks, but it wouldn't be effective. I feel like if I hadn't had that session I would have done the same thing today, and I would have been still

> feeling sad now. Instead, it definitely made me be more mindful about songs generally. (McFerran et al., 2018)

These findings suggest that, although Porter et al.'s study results were not sustained, it was still possible to change one's mindset around using music as therapy. In addition, a study found that in adolescents and young adults, females were more likely to find consolation in music compared to males (ter Bogt et al., 2017). The statistics received from the survey study are as follows:

> Respondents definitely use music for consolation. Most adolescents (69.8%) and young adults (69.2%) indicated that they use music as a source of consolation. Furthermore, both females (73.9%) and males (58.3%) as well as respondents with lower (71.6%) and higher education (65.2%) indicated that they use music as a source of consolation. Overall, 69.4% of the respondents indicated using music as a source of consolation. (ter Bogt et al., 2017)

A unique finding was that virtually all people who stated they preferred pop music used it as a method for self-consolation (ter Bogt et al., 2017). This brings up the possibility of gender playing a role in one's music therapy experience. Porter et al.'s study had a high dropout rate (Porter et al., 2016), and if many females left the study, perhaps that was the reason why the treatment was not effective in the long term. Additionally, the gender of participants in McFerran et al.'s study was not disclosed, and its effectiveness could be attributed to a possible majority of females in the tested group.

Table 3

Change in Distress Levels as Measured by K10, HUMS, Session Total (McFerran et al., 2018).

K.S. McFerran, C. Hense, A. Koike, & D. Rickwood
Accepted in Clinical Child Psychology and Psychiatry

15	Counselling and music therapy	34	*4*	30	23	4
21	Stress management	24	*2*	22	25	4
17	Depression, queer depression.	43	*2*	41	26	3
15	Sadness	21	*2*	19	19	2

Table 1: *Change in distress levels as measured by K10, HUMS, session total*

Age	**Participant provided description of reason for attending headspace**	**Pre K10**	**Change**	**Post K10**	**HUMS**	**# of Sessions**
19	Depression	50	*23*	27	22	2
17	Anxiety related issues	37	*17*	20	21	2
13	Support for depression, anxiety and paranoia	38	*15*	23	33	2
13	About my stress	21	*11*	10	19	2
15	Music	35	*9*	26	17	2
14	To understand what's going on with me	19	*8*	11	27	2
17	Anxiety and mild depression	27	*8*	19	26	2
19	To improve mental health in regards to depression	27	*7*	20	28	3
19	Psychology and healthy-unhealthy uses of music	27	*5*	22	20	2

METHODOLOGY

Using Google Scholar with various keywords (e.g. adolescents, music, emotions, etc.), around thirty research papers from various databases were initially gathered for the literature review. They ranged from the years 2015 to the 2020s, many of which were surveys or experiments. In gathering information, emphasis was placed on the researchers' results or findings and whether they could be applied to the research conducted in this paper.

CONCLUSION

Through the literature review, multiple pieces of information collected from the survey

were confirmed. However, there were limitations to both research methods. First, the survey had a small sample size of 14 people, who were female adolescents that attended a predominantly-white boarding school. This type of sample could not represent the general population as it lacks diversity in socioeconomic status, gender, age, and culture/heritage. The literature review had its limitations too, as the papers reviewed were written between the years 2014 and 2023, leaving room for outdated information. Additionally, these papers had limitations of their own; for example, one study was conducted only on women.

However, from the information gathered, it is clear that music, regardless of genre, is a powerful tool that people can use to treat their mental health. As seen above, participants reported various types of music to be helpful in reducing anxiety, depression, and stress, and many of their preferences depended on culture and age, both external factors. Of course, there are certain physical factors as well, given that listening to music did help lower blood pressure (Trappe & Voit, 2016) and cortisol (Ooishi et al., 2017) in certain studies, and these effects may or may not in turn affect one's mental state. In future works or surveys, having participants rate their anxiety before and after intervention, and monitoring heart rate and blood pressure, would allow for a deeper level of analysis on adolescents' response to each music clip.

One researcher says,

> No matter the differences of age, gender, ethnicity, socioeconomic status, or any other real or perceived variable, at heart we are united by the fact of being human. Music has the capacity to tap into this central aspect of our humanity to reveal, explore, and share what it is that makes us both corporately the same and yet individually unique. (Hodges et al., 2015)

In conclusion, no matter the person, music is a language everyone can speak. It brings humanity together, from the Hofburg Palace to Fenway Music Hall. It was not the certain types of music that evoked emotions but the memories and preferences that are unique to each individual. In the future, it is hoped that more adolescents will become aware of how they use music and wield music in a way that creates a better mindset and lifestyle.

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