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Musical Training and the Perception of Positive Music Listening Emotions as Medicine for the Brain

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ABSTRACT

Although much research has been conducted on the benefits of the music-listening experience and neural responses to music listening, no previous study has examined the potential congruency of the experience of listening to music and the perception of emotional responses to music listening. Two hundred individuals participated as respondents in a survey on the experience of music listening, its impact on mood, and perception of emotions associated with music listening. Survey participants were categorized as nonmusicians and musicians, or musicians with < 7 years of experience and musicians with > 7 years of experience. This study hypothesized that a greater percentage of musician respondents would associate music listening with positive emotions in comparison to nonmusicians due to benefits of musicianship on the brain as described in the literature. A Google Form survey was used to collect responses. Pie chart analyses of survey data revealed that, in comparison to nonmusicians, there was greater variation between musician responses to questions asking about the association of positive emotions (e.g. confidence, comfort) with listening to music, and that a greater percentage of musician respondents associated negative emotions (i.e. anger) with listening to music in comparison to nonmusicians. Furthermore, a smaller percentage of musicians with more years of experience associated listening to music with positive emotions (i.e. comfort) in comparison to musicians with fewer years of experience. These results add to previous studies that indicate music can improve well-being and that musicians generally have a more developed recognition of emotions.

Introduction

Music is often understood as a universal language that can evoke emotions that words cannot. In recent years, music has been further recognized for its therapeutic value. Music is known to help alleviate stress and anxiety and release various “happy chemicals” in the brain (Boso, 2006). Lesser known may be the long-term social and emotional benefits that music education can have. Additionally, the phenomenology–the way individuals perceive experiences and the value that experiences hold (Smith, 2018)– of the music listening experience could potentially increase the benefits of music listening on the brain. Understanding the benefits of music and the perception of positive musical emotions on self-esteem, emotional management, and well-being of musicians could further reveal the importance of implementing musical training into education for its positive long-term impact on quality of life.

This paper primarily intends to answer the following question: What differences exist between musicians and nonmusicians in their perception of emotions elicited by listening to music, and what could these differences tell us about the effect of musicianship on emotional well-being?

The foundation of this research rests on literature about the mental and physical benefits of music listening and musical training, as well literature engaging the phenomenology of music, coupled with survey results (n=20) meant to elicit respondents’ perception of the benefits of musical training on emotional intelligence.

Literature Review

Long before the development of the academic fields of psychology and neuroscience, music has been incorporated into various community and cultural practices for its value as a healing mechanism. Greek physicians used instrumental vibration to help with digestion, mental well-being, and sleep. In his book, De Anima, Aristotle wrote that flute music gave rise to strong emotions and could purify his soul (Meymandi, 2009). In the Old Testament of the Bible, David's harp is described as an instrument that had the ability to ward off evil spirits (I. Samuel, Chapter 16, Verse 14–23). Throughout history, music in various forms has been recognized as a way to evoke indescribable emotions, heal both those who perform and those who listen, and to bring people together.

More recent neuroscientific and psychological studies on the effect of music on the brain have begun to shed more light on the various mental and physical benefits of music experience, whether that be through listening or training.

Listening to music releases certain biochemical mediators, such as endorphins, endocannabinoids, dopamine and nitric oxide (NO), which could be helpful for emotional management in general, but also for managing neurological disorders through music therapy (Boso, 2006). The increase of dopamine that occurs when listening to music can benefit mental health and decrease stress (Váradi, 2022). Furthermore, listening to pleasant music activates parts of the brain associated with reward and pleasure (Koelsch, 2010).

However, listening to music may not only have mental benefits but physical benefits as well. The release of NO, a chemical that can eradicate bacteria and viruses, into the bloodstream through listening to pleasant music could potentially prevent bacterial or viral infections (Boso, 2006). In a study where surgical patients were asked to listen to music, music listening effected a decrease in pain and stress for the patients (Boso, 2006).

Interestingly, listening to and processing music does not only activate one hemisphere nor one specific region of the brain, but various cerebral structures combined (Warren, 2008; Blood, 1999). The network that processes musical emotions includes areas such as the insula and 'limbic system', which comprises the amygdala, hippocampus, and their cortical and subcortical connections (Warren, 2008).

Although various neural networks from both hemispheres process musical emotions, the regions activated may vary among individuals since personal experiences, culture, listening history, and more, can affect an individual's listening experience (Boso, 2006). For example, in Western music, happy and sad emotions are often associated with major and minor keys, respectively, one example of how culture impacts the perception and processing of music (Vuust, 2022).

While listening to music already has strong benefits for well-being, playing and interacting with music are even more effective in improving certain neural, cognitive, and even social mechanisms. For example, musical collaboration and dance are both constructive methods of creating strong social connections (Váradi, 2022). Additionally, musical communication improves recognition of verbal communication and human facial expressions, verbal memory, and focus (Váradi, 2022; François, 2015).

Music education has been shown to have a positive influence on emotional intelligence (Váradi, 2022). Additionally, music engagement can increase self-confidence, self-awareness, maturity, and learning motivation (Váradi, 2022). Through white matter modifications, musical training has been shown to strengthen connections between different areas of the brain (François, 2015). Musicians have also exhibited signs of change in most areas of auditory pathways (François, 2015). Furthermore, a study showed that musicians display better neural processing of speech sounds than nonmusicians, which may indicate that representation of sounds in the brainstem is more accurate in musicians than nonmusicians (François, 2015). Benefits of musical training appear from a young age and persist through adulthood, even if the period of training only lasts a few years long (François, 2015). The multitude of long-term positive emotional, intellectual, and social benefits of musical training indicate the importance of implementing music into education from a young age.

This paper hypothesizes that, according to the literature, if musicians are aware of or associate music playing and listening with its positive experience and benefits, then, in comparison to nonmusicians, musicians will elicit more positive emotions (e.g. happiness, confidence, comfort) while listening to music due to emotional and social benefits of musical training.

Methods

As an extension of reviewing the literature regarding the impact of music listening and training on the brain, 200 individuals of different age groups and cultural backgrounds were surveyed on their experience of music listening and/or musical training. Respondents were recruited through the author's personal connections, such as peers, friends, family, and more. This may explain why survey participants were largely between the age range of 13-34 and American citizens. Results were obtained by using a Google Form to collect responses and then analyzed using pie charts on Google Sheets. The survey asked questions meant to evoke the respondent's self-perception of their musical experience and emotions associated with listening to or playing music (see Appendix). Questions with other musical emotions during music listening (e.g. "Do you feel awe when you listen to music?") and questions specifically for musicians (e.g. "Do you feel more confident when you play music?") were also included in the survey for context in hopes that they would provide useful data. However, the survey questions this paper analyzes provided the most helpful information.

Results

It is first important to note that the majority of survey participants were between the ages of 13-34 (Figure 1), which may indicate that the survey results are more biased towards individuals in these more hormonal states. With a larger sample size and a more even spread among age ranges, survey results on music and association of emotions with music listening may differ from this survey's results.

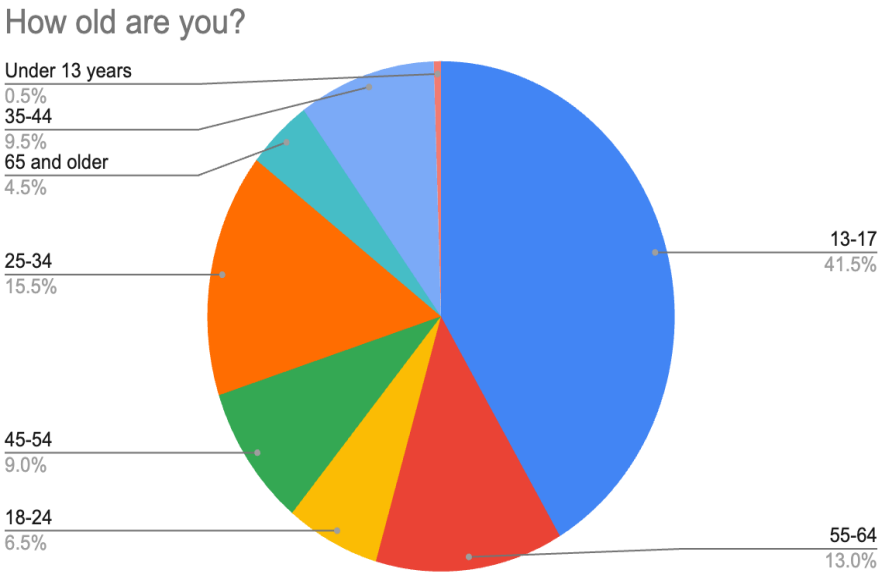

Figure 1. Responses to "How old are you?"

Additionally, the majority of survey participants were U.S. citizens, which may explain the highest percentage of music listening preference to be in the "pop" genre, as in "popular" music (Figure 2). With a larger sample size and a more even spread among various countries of citizenship, more disparity among music tastes might be observed.

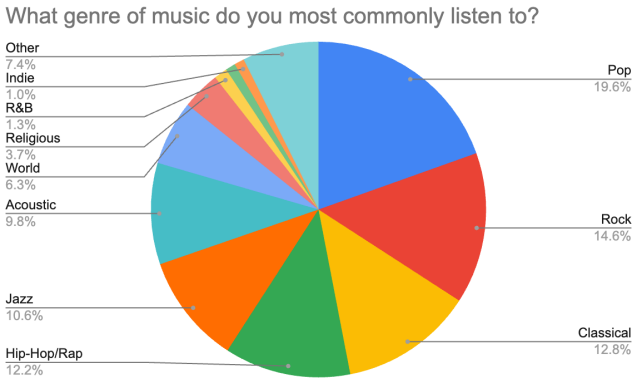

Figure 2. Responses to "What genre of music do you most commonly listen to?" Survey participants were given the option to select as many music genres as they believed they enjoyed listening to.

The vast majority of the 200 survey respondents replied with "Yes" when asked if they enjoyed listening to music and that they did so frequently (Figure 3), which may show that most people associate music listening with pleasure, as one would imagine that fewer people seek out pain over pleasure, though it is worth noting that sensation seeking isn't entirely uncommon (Sagioglou & Greitemeyer, 2020). If music listening is frequent and associated with pleasure, this may suggest that regardless of what specific emotions music listening may induce based on other factors (genre, repertoire, key, rhythm, etc.), the pleasurable experience of listening to music may generally have a beneficial effect on emotional wellbeing and mood.

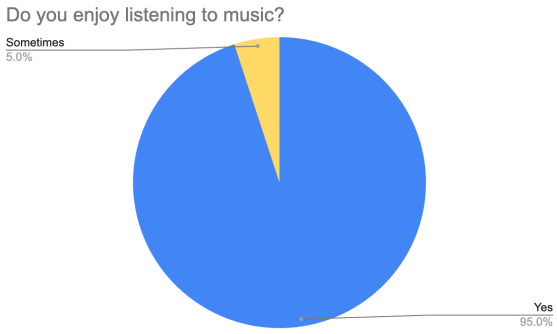

Figure 3. Responses to "Do you enjoy listening to music?"

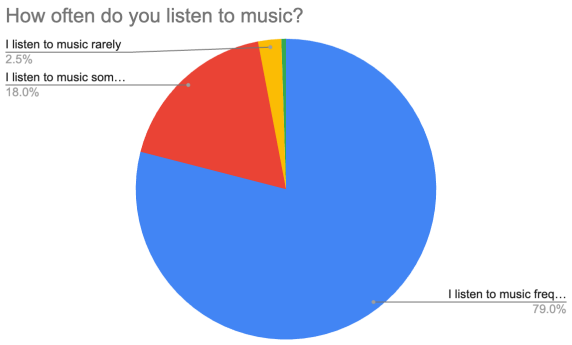

Figure 4. Responses to "How often do you listen to music?"

Furthermore, when asked what descriptors best captured the mood of music that individual survey participants listened to, more than 50% of respondents claimed that they listened to music that evoked positive emotions: "Happy and upbeat" or "Calming and soothing" (Figure 5). When asked how music listening generally affected their mood, a similar percentage of survey respondents found music listening to uplift their mood (Figure 6). This may indicate that a majority of people tend to favor listening to music with positive emotions that have the ability to uplift their mood. However, this fact does not discount the positive effects of listening to music that may be associated with more negative emotions, such as the "intense and complicated" or "sad and pensive" options. Regardless of whether the listener classifies a song or piece of music with positive (e.g. happy) or negative (e.g. sad) emotions, favored music induces more activity in the brain's reward circuits (Vuust, 2022).

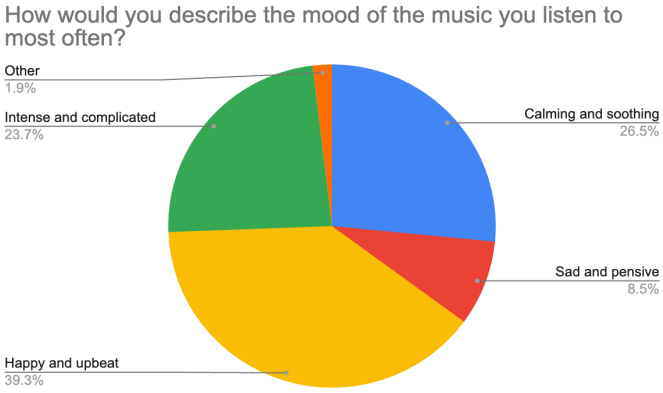

Figure 5. Responses to "How would you describe the mood of the music you listen to most often?"

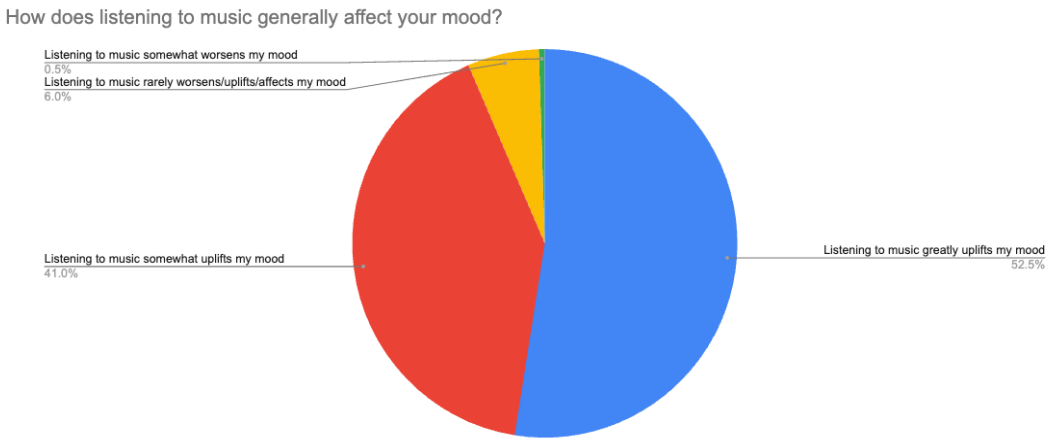

Figure 6. Responses to "How does listening to music generally affect your mood?"

When asked about musical emotions and responses to music listening, a majority (64.5%) of respondents claimed to feel more confident when listening to music and an even larger majority (73.5%) generally associated music listening with feelings of comfort (Figure 7, Figure 8). These results seem to be in support of the 93.5% majority who responded that listening to music greatly or somewhat uplifts their mood (Figure 6) in that music listening is perceived by most participants as a mechanism capable of having a positive effect on emotional well-being and mood.

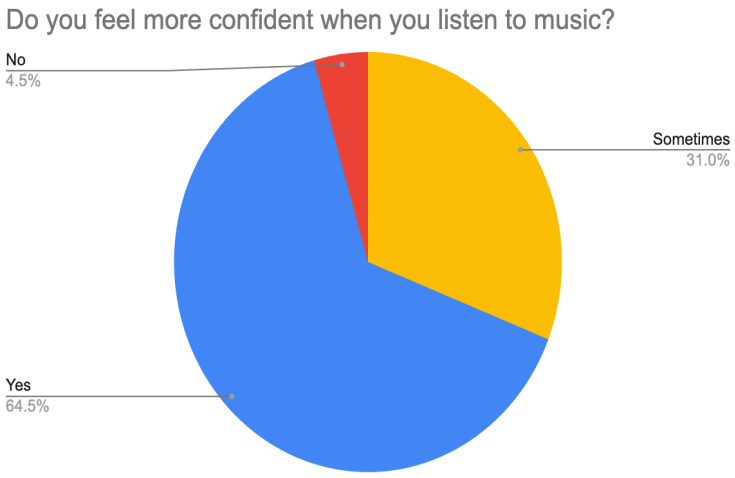

Figure 7. Responses to "Do you feel more confident when you listen to music?"

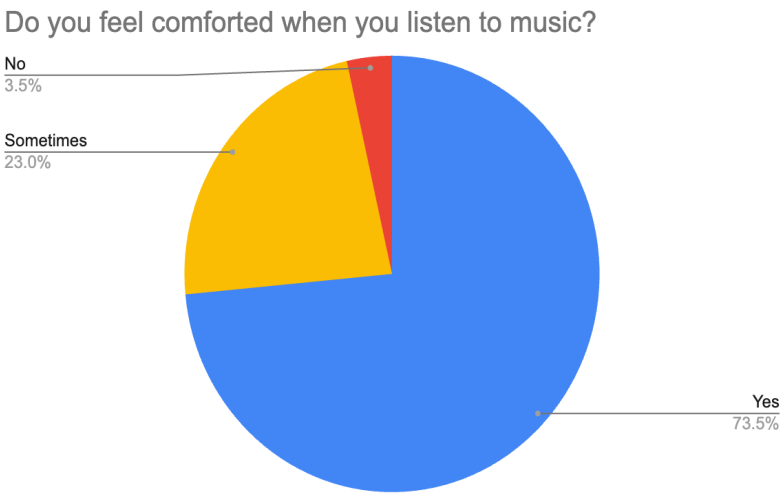

Figure 8. Responses to "Do you feel comforted when you listen to music?"

When comparing feelings of confidence associated with music listening between the group of nonmusician and musician respondents, however, no significant difference was observed (Figure 9). While it is expected that musicians may feel more confident when playing music that they have successfully played on their own before, minimal difference between the two groups' responses was recorded. The similarity between the two groups can be better understood if these results are attributed to an individual's general feelings of self-confidence. Although this would have to be further tested, it may be expected that even if the sample size was larger, and the ratio between nonmusicians and musicians was equal, there may not be much difference still because confidence is more difficult to measure due to its complexity in comparison to amygdala emotions; confidence is the result of interactions between different parts of the brain and, during music listening, may instead be linked to an individual's long-term self-esteem (Bang, 2022).

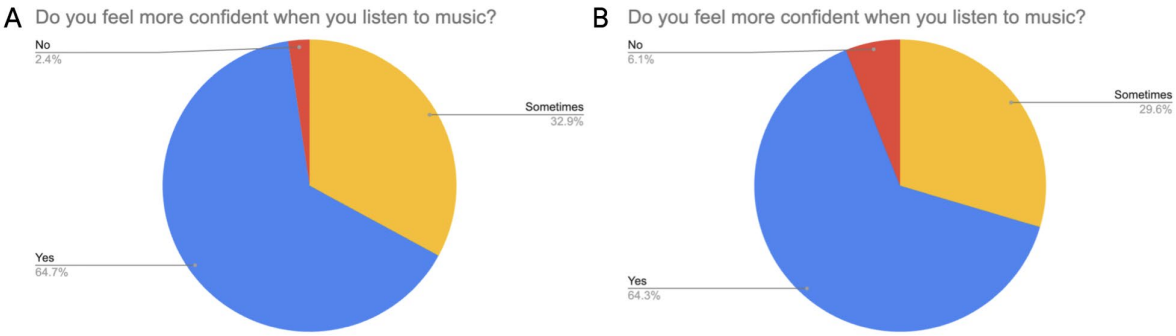

Figure 9. Comparison of responses of nonmusicians (9A) to responses of musicians (9B) to "Do you feel more confident when you listen to music?"

In contrast, when comparing feelings of comfort associated with music listening between nonmusicians and musicians, a slightly larger majority of musicians (74.8%) replied that they felt comforted by music listening in comparison to nonmusicians (71.8%) (Figure 10). However, among musicians, there was a 6.1% response of "No," while there were no negative responses among nonmusicians. This may be evidence of a

different relationship between musicians and comfort than between nonmusicians and comfort. It could be the case that musicians internalize listening to music from a critical perspective, triggering competition and focus in the prefrontal cortex (Decety et. al, 2004; Trafton, 2014) or dopamine as a rewarding motivator (Love, 2015), where nonmusicians may feel something more like nostalgia, which involves self-reflection, autobiographical memory, regulatory capacity, and reward (Yang et al., 2022). Additionally, it is unclear whether respondents interpreted the question as asking if the act of listening to music is comforting (attitude toward listening experience) or if music is capable of comforting them (attitude toward emotional self-regulation). In future studies, this question can be further adapted to elicit more useful information.

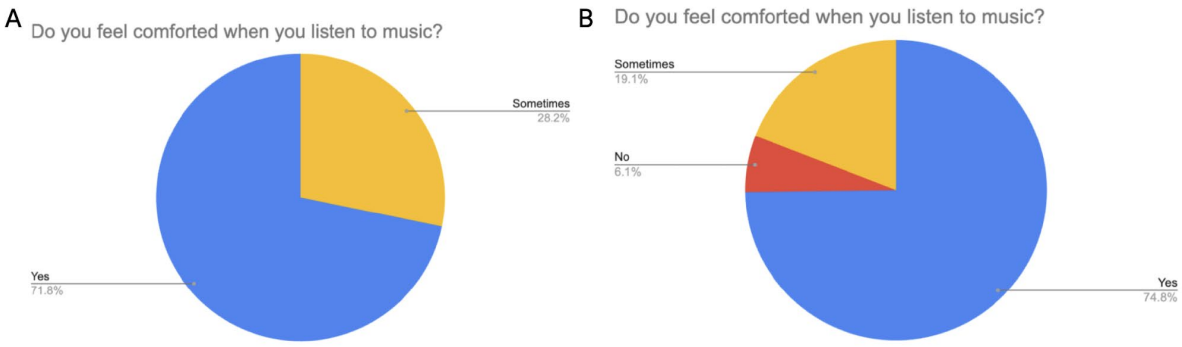

Figure 10. Comparison of responses of nonmusician participants (10A) to responses of musician participants (10B) to "Do you feel comforted when you listen to music?"

In a more in-depth analysis of musicians' responses to this question of "Do you feel comforted when you listen to music?," there was a greater percentage of "Sometimes" and "No" responses from more experienced musicians (> 7 years of experience) in comparison to less experienced musicians (< 7 years of experience) (Figure 11). This may indicate that more experienced musicians feel a broader variety of emotions than less experienced musicians or non-musicians due to more experience associating different emotions with playing certain pieces, which in turn transforms their music listening experience. For instance, if a musician had already performed a piece, then it may be expected that, while listening to the piece again, the piece elicits feelings of confidence in the musician because the musician is confident in their ability to play the piece. Thus, these results may convey that the more experienced musicians have interacted with music in a way that nonmusicians do not, the more likely they are to feel more case-specific emotions when listening to music, depending on the song, its melody, or genre.

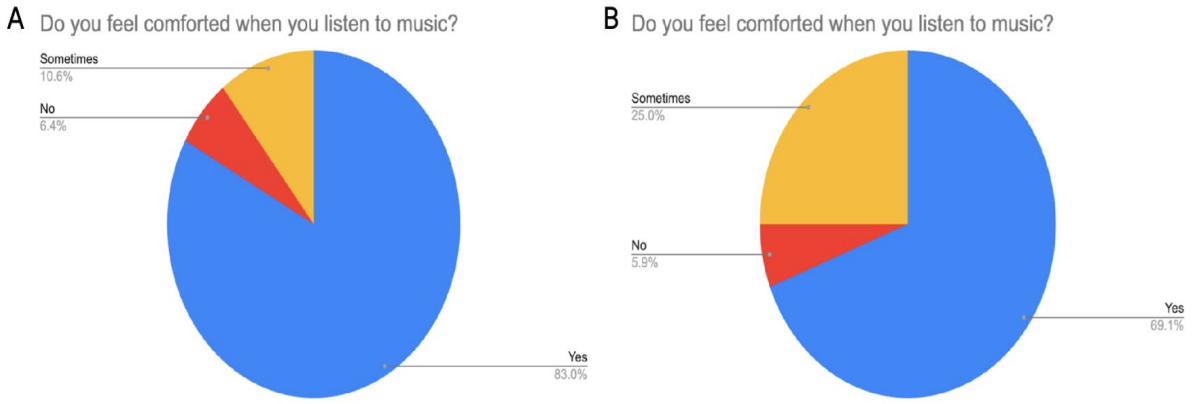

Figure 11. Comparison of responses of musician participants with < 7 years of experience with musical training (11A) to responses of musician participants with > 7 years of experience with musical training (11B) to "Do you feel comforted when you listen to music?"

Interestingly, when comparing feelings of anger associated with music listening between non-musicians and musicians, a majority of 81.2% of nonmusicians responded with "No" to feeling anger when listening to music, while a smaller majority of 63.5% of musicians responded with "No" to feeling anger when listening to music (Figure 12). Furthermore, while there were no "Yes" responses among nonmusicians, a 7.8% of musicians responded with "Yes" to feeling anger while listening to music. It makes sense that musicians have higher percentages of feelings of anger when listening to music if musicians have more activity in the amygdala in response to music listening, since general feelings of anger activate the amygdala (Dougherty, 2011). On the other hand, anger is a simple emotion, and it might be expected that the emotions felt by a musician listening to music are of a more complex nature, assuming they involve other brain activity in the areas responsible for not only memory but also understanding. The survey questions also lacked a differentiation between those who sought out music to *quell* anger and those for whom music *caused* anger. Future research should consider the language that would best elicit the information at issue.

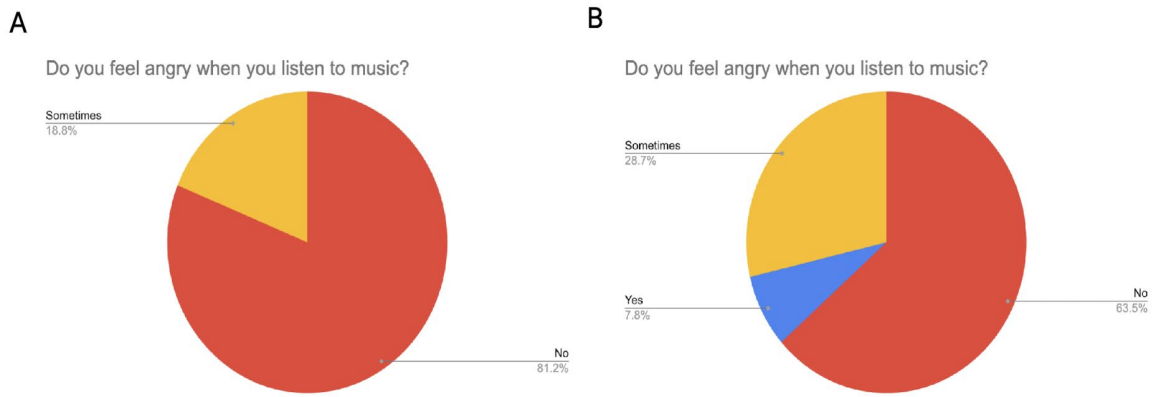

Figure 12. Comparison of responses of nonmusicians participants (12A) to responses of musician participants (12B) to "Do you feel angry when you listen to music?"

Discussion

The survey showed a strong correlation between music listening and positive emotions, and showcased differences between emotions perceived through the music listening experience by nonmusicians and musicians.

The paper's initial hypothesis that musicians, in comparison to nonmusicians, would produce more positive emotions during music listening due to the benefits of musical training was rejected by further analysis of survey results. While a majority of musicians still associated positive emotions with music listening (i.e. 64.3% of musicians responded that listening to music makes them feel confident and 74.8% of musicians responded that listening to music makes them feel comforted), musicians consistently associated a greater variation of emotions with music listening, including negative emotions, in comparison to non-musicians (i.e. 6.1% of musicians claimed they did not feel comforted while listening to music, while no nonmusicians claimed to not feel comfort while listening to music, and while 81.2% of nonmusicians replied that they did not feel anger while listening to music, a smaller majority of 63.5% of musicians replied that they did not feel anger while listening to music, with 7.8% of musicians even replying with "Yes" to feeling anger while music listening) and musicians with more years of experience (> 7 years of experience) exhibited more variation in emotions associated with music listening in comparison to musicians with less years of experience (< 7 years of experience) (i.e. when asked if they felt comfort during music listening, 83% of musicians with < 7 years of experience responded with yes, while a smaller majority of 69.1% of musicians with > 7 years of experience responded with yes). These outcomes show that it is not the case that musicians will feel more positive emotions while listening to music in comparison to non-musicians. Instead, these results may reveal that musicians develop stronger emotional intelligence, recognition of musical emotions, and increased specificity in their association of certain pieces or types of music with different emotions in comparison to nonmusicians if it is the case that musician's enhanced ability to recognize emotions, verbal communication, and facial expressions (Váradi, 2022) also applies to their ability to recognize emotions while listening to music.

Perceptions of preferred music listening tastes differed among survey participants. However, 93.5% of survey participants responded that music listening either greatly uplifted or somewhat uplifted their moods. Additionally, a 64.5% and 73.5% majority of survey respondents answered "Yes" when asked if they felt more confident and if they felt comforted when listening to music, respectively, indicating that generally, music listening is associated with positive emotions. These results parallel the literature which states that varying music taste preferences and emotions associated with different genres or 'moods' of music (e.g. happy, sad, intense) do not necessarily correlate to positive or negative feelings or responses in the brain (i.e. "happy" music does not necessarily induce positive emotions and "sad" music does not necessarily induce negative emotions); rather, preferred music directly activates the brain's reward circuits (Vuust, 2022).

Importantly, this survey must generally be understood as having a phenomenological approach. Aside from its factual questions, such as "How old are you?", most, if not all music listening related questions required survey respondents to reflect on their own perception of their music listening experience and emotions that they did or did not feel. It is not only important to understand the literature and the experience of music listening on the brain itself, but also perception of the music listening experience, which the survey aimed to achieve. Consciousness of positive feelings towards music listening coupled with the actual experience and release of biochemical mediators may theoretically further the benefits of music listening on an individual's mental health. If an individual believes or is aware that music listening is a positive experience, then it may be expected that their brain will respond positively when the individual listens to music they enjoy. This theory can be better understood through music tastes and how they function. If an individual enjoys a specific genre of music and is aware of their enjoyment of music from that genre, the brain's reward circuits will be activated if the individual listens to that genre of music that they like (Koelsch, 2010). Likewise, it may be expected that awareness of the mental and emotional benefits of music listening can increase the benefits of the music listening experience itself.

Conclusion

The notion of music listening being perceived by the listener as a positive experience, whether as a source of pleasure or of deep healing, has been affirmed by self-reflective survey response data combined with the literature of music on the brain. The fact that most survey respondents believe music to be greatly or somewhat uplifting to mood suggests that music listening can be an effective mechanism for improving mental and emotional well-being, whether that be short or long-term.

Additionally, as discovered through the self-reflective nature of this survey, the perception of music listening as a positive experience may imply that music listening is associated with a pleasurable experience to some and therefore has even more of a beneficial effect when perceived as favorable, which a majority of survey respondents asserted.

Lastly, an observable difference between nonmusician and musician respondents as well as differences between less-experienced musicians (< 7 years of experience) and more-experienced musicians (> 7 years of experience) have indicated not only that it is possible musical training can increase recognition of emotions when listening to music, but also that the more years of experience that an individual has may further increase recognition of emotions when listening to music, and therefore be beneficial to emotional and social intelligence.

These results show the necessity of incorporating music into daily life in its many forms. When just listening to music, it has the power to benefit one's emotional state. When learning music, musicians may be able to increase emotional awareness through pure listening. The literature has additionally illustrated the many ways in which music works both as a healing mechanism and a positive influence on emotional awareness, and, in that way, previous literature supports the survey results in this study. The author's hope for this paper is that it further illustrates the power of music to reach places of the mind that words, when only spoken, can not. Music should be further recognized and implemented into policies in areas like education and mental health treatment for its profound and priceless impact.

Limitations

One limitation of this research is the demographics and sample size of survey respondents. As previously mentioned, a majority of survey respondents (63.5%) were in the 13-34 age range, which indicates that the survey may have been more biased towards individuals in more hormonal states. Additionally, the majority of survey respondents were U.S. citizens, which may explain survey results for music taste revealing "pop" music as the most popular response. Having a larger sample size that includes a wider range of age, nationality, and background demographics could help in attaining a broader variety of perspectives.

Another limitation of the survey was the phrasing of the survey questions. For example, it is possible that while one survey respondent interpreted the question "Do you feel sad when you listen to music?" as asking if listening to music is sad or if music elicits a feeling of sadness within them. In the future, having more clear and specific questions could help to avoid misinterpretation of the questions by survey respondents and also in attaining accurate respondent data.

Lastly, as a part of the self-reflective approach that this survey took, and because it has already been established that there is a difference between an experience and one's perception of that experience, survey results may not be fully accurate because it asks individuals to reflect on their perception of the music listening experience without acquiring any experimental data about the neuroscientific process that occurs in their brain when listening to music. While this paper argues that an individual's perception of music listening as a positive experience furthers the benefits of the "real" experience of listening to music, it is important to recognize this

survey-based analysis as a useful, but limited, method of understanding the effect of music listening on the brain.

Future Studies

Future studies could touch on the following questions posed by the survey research:

1. What differences are observed between neural activity in a musician's brain versus a nonmusician's brain while listening to music?
2. What discrepancies and similarities are there between the perception of emotions elicited through music listening and the brain's actual emotional response during music listening?
3. What differences are there between the psychological, emotional, social, or physical benefits of music education for an adolescent versus as an adult?
4. How would responses vary across different respondent demographics?

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