

The Impact of Music on Human's Body and Its Response

Xiaoxi Ni^{1,a,*}

¹Hebei University of Economics and Business, No. 47, Xuefu Road, Xinhua District, Shijiazhuang, Hebei Province, China

a. babibucubi@gmail.com

*corresponding author

Abstract: This paper provides a nuanced exploration of the intricate and profound influence of music on the intricate tapestry of human psychology and physiology. It takes an in-depth dive into the extensive body of literature, elucidating how music serves as a powerful catalyst for shaping emotions, cognition, and various physiological parameters, encompassing heart rate, blood pressure, and stress hormone levels. By delving into this complex interplay, the paper uncovers the interconnectedness of these effects, revealing the remarkable potential for applying this knowledge in diverse fields. From the therapeutic applications of music in healthcare settings to its role in optimizing exercise and emotional regulation, the implications are far-reaching. This paper synthesizes the existing research, offering a holistic understanding of the symbiotic relationship between music and human well-being, ultimately paving the way for innovative approaches to harness the harmonious union of music and our physical and mental states.

Keywords: music, emotional regulation, physiological response

1. Introduction

Music holds a unique and profound place in human culture and society. Its influence extends beyond mere entertainment, affecting both the mind and body. This paper delves into the holistic impact of music, addressing the research question: How does music influence both the mind and body? The structure of the paper is divided into sections, each focusing on a specific dimension of this complex relationship.

2. The Psychological Impact of Music

2.1. The Influence of Music on Emotions and Mood

The emotional impact of music is a well-documented and intricate phenomenon, with numerous studies shedding light on the diverse ways music can influence emotions and shape mood. Within this exploration, we delve into music's profound impact, covering aspects such as tempo, underlying mechanisms, therapeutic applications, and the origin of music itself.

Tempo and musical compositions' speed significantly influence emotional responses to music. A study delved into this relationship, revealing that tempo plays a pivotal role in shaping emotional experiences [1]. The findings indicate that faster tempos often evoke excitement and happiness, while slower tempos tend to induce relaxation and introspection. Notably, these effects are not exclusive to

musicians but extend to individuals of varying musical backgrounds. This research underscores the vital role of tempo as a critical determinant of emotional states. Juslin and Västfjäll have contributed substantially to our understanding of the underlying mechanisms responsible for emotional responses to music [2]. Their influential work delves into the intricate processes that contribute to the emotional impact of music. The study highlights the significance of various musical elements, such as rhythm, harmony, and melody, in shaping emotional responses. By doing so, it offers profound insights into the complexity of music's emotional influence, emphasizing the multifaceted nature of this phenomenon.

Raglio introduced an innovative approach to music therapy known as "Therapeutic Music Listening." This study exemplifies the therapeutic potential of music in evoking emotions and enhancing psychological well-being. Patients participating in Therapeutic Music Listening reported heightened emotional awareness and improved emotional regulation. This approach signifies a promising development in music therapy, underscoring music's capacity to shape and enhance emotional well-being [3]. In a study by Mori, titled 'Decoding peak emotional responses to music from computational acoustic and lyrical features'[4], the scope of this discussion is extended. This research suggests that the origin of music does not limit its ability to evoke emotions. Mori's work indicates that emotions can be elicited even by music created through artificial means, challenging preconceived notions about music's emotional impact. This field extension provides new avenues for exploration and potential applications in various domains, opening doors to a deeper understanding of how music, regardless of its source, can evoke robust emotional responses.

In conclusion, these studies collectively highlight the universal and multi-faceted nature of music's influence on emotions and mood. They underscore the pivotal role of tempo, the complexity of underlying mechanisms, the potential for innovative therapeutic applications, and the surprising reach of music's emotional impact, even beyond human composition. This comprehensive view forms the foundation for further exploration into the emotional impact of music and its applications in various fields.

3. Cognitive and Psychological Well-being

The interplay between music and human cognition and psychological well-being is a multifaceted phenomenon that transcends mere emotional responses. The profound impact of music extends across a spectrum of cognitive and emotional experiences, with different genres invoking distinct effects. This section delves into the cognitive and psychological dimensions of music, with a particular focus on the genres of shoegaze and indie music.

3.1. Shoegaze Music and Cognitive Enhancement

Shoegaze music, characterized by its immersive and introspective soundscapes, has gained recognition for its potential to enhance cognitive functions and creative thinking. Bands such as Slowdive and My Bloody Valentine craft dreamy, layered compositions that provide a captivating backdrop for cognitive exploration and artistic expression. While empirical research is still emerging in this area, anecdotal evidence suggests that the genre's unique qualities may lead to heightened focus and creative inspiration.

Thoma conducted a study titled 'Emotion regulation through listening to music in everyday situations' in the *Cognition & Emotion* journal, highlighting the broader cognitive and emotional benefits of music [5]. Their findings suggest that music, when chosen intentionally, has the power to influence emotional states and, by extension, contribute to cognitive well-being. Furthermore, Dobek in their study titled 'Music modulation of pain perception and pain-related activity in the brain, brain stem, and spinal cord: a functional magnetic resonance imaging study' published in *The Journal of*

Pain, focused on pain perception, but their research underscores the broader cognitive effects of music [6]. Their functional magnetic resonance imaging study provides insights into how music modulates neural activity, potentially influencing cognitive functions beyond pain perception. Although the study does not directly address shoegaze music, it sheds light on music's capacity to influence brain activity, suggesting implications for cognitive enhancement.

3.2. Indie Music and Psychological Resilience

The indie music world is marked by its versatility and ability to foster psychological well-being. The upbeat and melodic tunes created by indie bands serve as a powerful medium for promoting feelings of positivity and emotional resilience. Whether it's the soothing melodies of indie folk or the energetic rhythms of indie rock, this genre's diversity in emotional effects underscores its significance in enhancing psychological well-being.

Individual responses to music's cognitive and psychological effects can vary, influenced by personal preferences, past experiences, and cultural backgrounds. Nevertheless, these genre-specific effects on cognition and psychological well-being underscore the remarkable capacity of music to influence human psychology in diverse ways. As a therapeutic and personal growth tool, music plays a pivotal role in shaping cognitive and emotional dimensions of well-being.

4. The Physiological Response to Music

4.1. Heart Rate and Blood Pressure

One of the most extensively studied aspects of music's impact on physiology is its effect on heart rate and blood pressure [5]. This research reveals music's capacity to elicit both calming and stimulating responses, depending on various factors such as tempo and genre. For instance, faster tempos often induce heightened heart rates, while slower tempos promote relaxation. The intricate dance between music and cardiovascular parameters provides insights into how music can play a vital role in regulating emotional states and stress responses.

4.2. Stress Hormone Levels

The influence of music on pain perception and related neural activity has emerged as a compelling area of study [7]. Functional magnetic resonance imaging (fMRI) studies, such as the work by Dobek, have shown that music can significantly affect pain perception and alter neural activity in regions associated with pain processing. This line of research opens doors to the potential use of music in pain management and rehabilitation. The ability of music to modulate pain-related activity provides a promising avenue for individuals coping with chronic pain and undergoing medical procedures.

5. Musical Tempo and Human Perception

Another intriguing dimension of music's physiological influence revolves around its potential to modulate stress hormone levels, particularly cortisol. Thoma delved into how individuals employ music for emotion regulation in their daily lives, emphasizing music's ability to influence stress hormone levels across various contexts[5]. This highlights music's versatility as a tool for stress reduction and emotional well-being.

These diverse studies collectively underscore the multifaceted relationship between music and human physiology. They reveal music's potential to influence various aspects of health and well-being. While significant progress has been made in understanding music's effects on the body, the field remains ripe for further exploration. Continued research will uncover the full extent of music's physiological impact and delve deeper into the underlying mechanisms that drive these responses,

ultimately enhancing our understanding of this powerful connection between sound and the human body.

5.1. Impact of BPM (Beats Per Minute)

The tempo and Beats Per Minute (BPM) of music are pivotal factors in shaping emotional and physiological responses, as demonstrated by a range of academic studies. Understanding the influence of BPM in music is crucial for comprehending its profound impact on energy levels, relaxation, and perception.

For instance, Patania's study in 2020, delved into the psychophysiological effects of different tempo music on endurance versus high-intensity performances, highlighting the impact of music tempo on physical performance and its role in optimizing exercise and endurance[8]. This study emphasizes how music's BPM can be a valuable tool in enhancing physical performance, offering insights into its potential application in sports and exercise contexts.

Liu investigated the effects of musical tempo on emotional experiences among both musicians and non-musicians [9]. Their research provides valuable insights into the emotional and psychological responses associated with varying tempos in music. The findings of this study reveal the intricate connection between tempo and emotional states, enriching our understanding of how music can evoke specific feelings and moods.

Bramley, Dibben, and Rowe contributed to understanding music tempo's influence on arousal and behavior, particularly in laboratory virtual roulette settings[10]. Their work offers a unique perspective on how rhythm can affect decision-making and behavior in controlled environments. It showcases the practical applications of tempo modulation in influencing human behavior, underscoring its relevance in various settings. Furthermore, Singer conducted a study on temporal predictability and its association with changes in music-induced pleasantness[11]. Their research sheds light on the dynamic nature of emotional responses to music, particularly in relation to tempo and predictability. This study highlights the ongoing changes in music-induced emotions and how they relate to temporal aspects of music, contributing to our comprehension of the intricate interplay between musical elements and emotional experiences.

These academic studies collectively underscore the critical role of BPM in music, shedding light on how it can modulate listeners' energy levels, mood, and overall perception. The complex relationship between tempo and physiological responses enhances our understanding of music's profound impact on the human body, presenting promising avenues for further exploration and practical applications in various domains, including exercise, emotion regulation, and decision-making.

5.2. Rhythmic Entrainment

Music's rhythm possesses a remarkable ability to synchronize with the body's natural rhythms, profoundly impacting both physical and mental states. This phenomenon, known as rhythmic entrainment, has been the subject of extensive research in various contexts.

For example, Bharathi explored the potential role of rhythmic entrainment and music therapy intervention for individuals with autism spectrum disorders, shedding light on its therapeutic applications in neurological conditions [12]. That delved into the neurobiological foundations of neurologic music therapy, emphasizing the role of rhythmic entrainment in motor system function [13]. Additionally, Power investigated neural entrainment to rhythmic speech in children with developmental dyslexia, revealing the connection between rhythm and cognitive processes [14].

These academic studies collectively emphasize the intricate relationship between music, rhythm, and the human body's physiological and cognitive responses. Rhythmic entrainment plays a pivotal

role in elucidating how music can impact motor functions, emotional experiences, and cognitive processes, providing valuable insights into the potential therapeutic applications of music. Understanding these mechanisms deepens our comprehension of the profound connection between sound and physiology, offering promising avenues for both research and practical applications.

6. Conclusion

The review reveals the interconnected nature of music's effects on the human mind and body. The tempo and rhythm of music are critical factors influencing emotional and physiological responses. These effects are seen in various genres and have potential applications in healthcare, exercise, and emotional regulation. The findings underscore the importance of considering music as a holistic tool for improving human well-being. knowledge in various fields, such as music

Music's impact on the human body is a complex interplay of emotional, cognitive, and physiological responses. Understanding this interconnection opens up exciting possibilities for applications in fields like music therapy, healthcare, exercise, and emotional regulation. As research in this area continues to evolve, we gain deeper insights into the transformative power of music on human well-being, offering promising prospects for future exploration and practical utilization.

References

- [1] Liu, Y., Liu, G., Wei, D., Li, Q., Yuan, G., Wu, S., Wang, G., & Zhao, X. (2018). Effects of musical tempo on musicians' and non-musicians' emotional experience when listening to music. *Frontiers in Psychology*, 9. <https://doi.org/10.3389/fpsyg.2018.02118>
- [2] Juslin, P. N., & Västfjäll, D. (2008). Emotional responses to music: the need to consider underlying mechanisms. *The Behavioral and brain sciences*, 31(5), 559–621. <https://doi.org/10.1017/S0140525X08005293>
- [3] Raglio A. A novel music-based therapeutic approach: the Therapeutic Music Listening. *Front Hum Neurosci*. 2023;17:1204593. Published 2023 Jul 14. doi:10.3389/fnhum.2023.1204593
- [4] Mori K. Decoding peak emotional responses to music from computational acoustic and lyrical features. *Cognition*. 2022 May;222:105010. doi: 10.1016/j.cognition.2021.105010. Epub 2022 Jan 5. PMID: 34998244.
- [5] Thoma, M. V., Ryf, S., Mohiyeddini, C., Ehlert, U., & Nater, U. M. (2012). Emotion regulation through listening to music in everyday situations. *Cognition & emotion*, 26(3), 550–560. <https://doi.org/10.1080/02699931.2011.595390>nts and con
- [6] Dobek, C. E., Beynon, M. E., Bosma, R. L., & Stroman, P. W. (2014). Music modulation of pain perception and pain-related activity in the brain, brain stem, and spinal cord: a functional magnetic resonance imaging study. *The journal of pain*, 15(10), 1057–1068. <https://doi.org/10.1016/j.jpain.2014.07.006>
- [7] Koelsch S, Fuernmetz J, Sack U, et al. Effects of Music Listening on Cortisol Levels and Propofol Consumption during Spinal Anesthesia. *Front Psychol*. 2011;2:58. Published 2011 Apr 5. doi:10.3389/fpsyg.2011.00058
- [8] Patania, V. M., Padulo, J., Iuliano, E., Ardigò, L. P., Ćular, D., Miletić, A., & De Giorgio, A. (2020). The psychophysiological effects of different tempo music on Endurance versus High-Intensity performances. *Frontiers in Psychology*, 11. <https://doi.org/10.3389/fpsyg.2020.00074>
- [9] Liu, Y., Liu, G., Wei, D., Li, Q., Yuan, G., Wu, S., Wang, G., & Zhao, X. (2018). Effects of musical tempo on musicians' and non-musicians' emotional experience when listening to music. *Frontiers in Psychology*, 9. <https://doi.org/10.3389/fpsyg.2018.02118>
- [10] Bramley, S., Dibben, N. orcid.org/0000-0002-9250-5035 and Rowe, R. orcid.org/0000-0001-5556-3650 (2016) Investigating the influence of music tempo on arousal and behaviour in laboratory virtual roulette. *Psychology of Music*, 44 (6). pp. 1389-1403. ISSN 1741-3087 <https://doi.org/10.1177/0305735616632897>
- [11] Singer, N., Jacoby, N., Hendler, T. and Granot, R., 2023. Feeling the Beat: Temporal Predictability is Associated with Ongoing Changes in Music-Induced Pleasantness. *Journal of Cognition*, 6(1), p.34.DOI: <https://doi.org/10.5334/joc.286>clusions.
- [12] Bharathi G, Jayaramayya K, Balasubramanian V, Vellingiri B. The potential role of rhythmic entrainment and music therapy intervention for individuals with autism spectrum disorders. *J Exerc Rehabil*. 2019;15(2):180-186. Published 2019 Apr 26. doi:10.12965/jer.1836578.289
- [13] Thaut MH, McIntosh GC, Hoemberg V. Neurobiological foundations of neurologic music therapy: rhythmic entrainment and the motor system. *Front Psychol*. 2015;5:1185. Published 2015 Feb 18. doi:10.3389/fpsyg.2014.01185
- [14] Power, A. J., Mead, N., Barnes, L. L., & Goswami, U. (n.d.). Neural entrainment to rhythmic speech in children with developmental dyslexia. *Frontiers in Human Neuroscience*. <https://doi.org/10.3389/fnhum.2013.00777>