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Harmonic Health Metrics: An Observational Study into Glycaemic Responses and Heart Rate Variability During Music Therapy Sessions

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ABSTRACT

Music therapy is acknowledged for its role in emotional well-being, yet its physiological effects are insufficiently explored in scientific literature. Understanding the measurable physiological outcomes of music therapy can enhance its integration into healthcare, potentially offering therapeutic benefits beyond subjective well-being. This study aimed to investigate the physiological impacts of music therapy, specifically on glycaemic responses and heart rate variability. The effects were compared between music therapy and silent sessions among 100 participants. Every participant underwent two separate sessions: One featuring music from genres like classical and Hindi Bollywood songs and another in complete silence. Critical parameters such as blood glucose, insulin levels, heart rate variability and average heart rates were scrupulously documented both prior to and following each session. Concurrently, participants also provided feedback about their levels of relaxation. Findings indicated a more pronounced decline in blood glucose levels during music sessions, averaging a drop of 5 mg dL^{-1}, as opposed to a 2 mg dL^{-1} drop in silent sessions. Insulin levels post the music sessions were markedly lower, pointing to enhanced insulin sensitivity. Additionally, heart rate variability measurements suggested that participants were more relaxed during the music sessions. Reinforcing these findings, a significant 85% of the participants reported increased relaxation during the music sessions. In essence, this study elucidates the physiological merits of music therapy, especially concerning metabolic and cardiovascular responses. Beyond just the anecdotal and perceived advantages, music therapy emerges as a promising tool for tangible physiological well-being.

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Key Words
Music therapy, physiological effects, glycaemic responses, heart rate variability, well-being

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INTRODUCTION

The harmonious interplay of music and the human spirit has been a fundamental aspect of our cultural and emotional expression for centuries[1]. From lullabies soothing infants to the rousing rhythms of battle cries, music has the remarkable power to evoke emotions, shape moods and influence our mental states[2]. Beyond the realms of art and culture, music has long been recognized for its potential to influence human physiology. Music therapy, a practice rooted in this understanding, has gained prominence as a complementary approach to traditional healthcare[3]. It involves the use of music to address emotional, psychological and physical needs, promoting overall well-being.

The perceptible relaxation and emotional comfort that music therapy imparts have been widely documented, with individuals often reporting feelings of reduced stress and increased tranquillity after music-based interventions[4]. This subjective improvement in emotional well-being has led to the widespread adoption of music therapy in various clinical settings, such as hospitals, rehabilitation centres and mental health facilities[5]. However, the physiological underpinnings of these subjective experiences remain an area of scientific exploration that warrants further investigation[6,7].

While the impact of music therapy on emotional and psychological states has received considerable attention, there is a notable gap in empirical research concerning its physiological effects. The subjective experiences of relaxation and well-being that individuals report after music therapy sessions suggest that music might influence key physiological processes. These processes include the regulation of blood glucose levels and heart rate variability, which have significant implications for overall health.

Understanding the physiological mechanisms through which music therapy operates is not only a matter of scientific curiosity but also holds potential implications for clinical practice. For example, if music therapy is found to have a positive impact on blood glucose levels, it could have applications in managing conditions like diabetes. Similarly, if music therapy can be shown to enhance heart rate variability, it may find a place in stress management and cardiovascular health interventions.

Aim and objectives: This study aims to bridge the gap between subjective well-being and objective physiological changes through music therapy. We have specific objectives: Assessing glycaemic responses to gauge its impact on metabolic activities, evaluating heart rate variability for insights into cardiovascular health and collecting participant feedback on relaxation and well-being. These combined efforts seek to illuminate the physiological mechanisms underlying music therapy, enhancing its integration into healthcare practices for improved well-being.

MATERIALS AND METHODS

Study design: An observational study conducted at the Shri Shankaracharya Institute of Medical Sciences in Bhilai, Chhattisgarh, India, spanning from May 2021 to April 2022, was designed to explore the physiological effects of music therapy. In this study, participants were recruited to engage in both music therapy and silent sessions and comprehensive measurements were recorded before and after each session. This observational approach allowed for a meticulous examination of how music therapy may influence various physiological parameters, shedding light on its potential therapeutic applications in a real-world setting.

Participants: 100 individuals, aged 18-65, with no history of severe medical conditions or hearing impairments, were selected through a random sampling method. Participants provided informed consent before participating in the study.

Intervention: Two distinct sessions were conducted for each participant: A silent session and a music therapy session. The music therapy sessions included various music genres (classical, hindi bollywood songs) to ensure diversity.

Data collection:

Glycaemic responses: Blood glucose levels were measured before and after each session using a standardized glucometer. Participants were instructed to fast for a minimum of 4 hrs before sessions to minimize the impact of food intake.

Insulin levels: Blood samples were collected before and after both sessions to measure insulin levels using enzyme-linked immunosorbent assay (ELISA) kits.

Heart rate variability (HRV): HRV was assessed as a key indicator of autonomic nervous system function. Baseline HRV measurements were recorded before each session using electrocardiogram (ECG) devices. Post-session HRV measurements were also recorded.

Heart rate: Average heart rate was monitored throughout the sessions using heart rate monitors.

Participant feedback: After each session, participants completed questionnaires assessing their perceived levels of relaxation and well-being. These questionnaires utilized a Likert scale for responses.

Data analysis: Descriptive statistics were used to summarize the demographic characteristics of participants. Paired t-tests were employed to compare pre- and post-session measurements for blood glucose, insulin levels, HRV and heart rate. The participant feedback data were analyzed to understand the subjective experiences associated with music therapy.

Ethical considerations: The study was conducted following ethical guidelines, with informed consent obtained from all participants. Confidentiality and anonymity of participant data were maintained throughout the study.

RESULTS

The "Harmonic Health Metrics" observational study sought to discern the effects of music therapy on glycaemic responses and heart rate variability across 100 participants. The evidence presents some compelling physiological benefits of music sessions over silent ones.

Firstly, examining glycaemic responses from Table 1, we observe that the music sessions induced a more substantial decline in blood glucose levels, decreasing by an average of 5 mg dL^{-1} as compared to a mere 2 mg dL^{-1} during the silent sessions. This more pronounced reduction could suggest that the music therapy has a tangible positive effect on metabolic activities, possibly by promoting relaxation and reducing stress-induced hormonal responses that could raise glucose. Furthermore, the average insulin levels after the music session were also notably lower than the silent session, hinting at a potential enhancement in insulin sensitivity.

From a cardiovascular standpoint, as evidenced in Table 2, the heart rate variability (HRV)-a key metric that often indicates the balance and resilience of the autonomic nervous system - was notably higher during the music session. A higher HRV generally points to a more relaxed and adaptive autonomic nervous system. In addition, participants' average heart rates were slightly reduced during the music session, a further indicator of relaxation.

Lastly, t he subjective feedback, as detailed in Table 3 and 4, dovetails with the objective metrics. A significant 85% of participants reported a heightened sense of relaxation during the music sessions. Additionally, the choice of music played could be a factor in these benefits, with half of the sessions featuring classical music, which is often linked to relaxation and cognitive benefits. The presence of hindi bollywood songs, making up the rest, indicates the study's comprehensive approach to various music genres and their potential differential impacts. In summary, the study underscores the profound potential benefits of music therapy, not just in subjective well-being but also in physiological responses.

Table 1: Glycaemic Responses and Duration of Sessions

Measurement	Silent session	Music session
Blood glucose (before session, mg dL^{-1})	95	94
Blood glucose (after session, mg dL^{-1})	93	89
Change in blood glucose (mg dL^{-1})	-2	-5
Duration of session (min)	45	45
Average insulin level (before, mU L^{-1})	10	10
Average insulin level (after, mU L^{-1})	9.5	8.5

Table 2: Heart rate variability and heart rate measurements

Measurement	Silent session	Music session
HRV (baseline, ms)	64	63
HRV (during session, ms)	65	72
Average heart rate (beats min^{-1})	75	72

Table 3: Participant Feedback on Relaxation

Feedback	Participants (%)
Felt more relaxed during the music session	85
Felt no difference between the sessions	10
Felt more relaxed during the silent session	5

Table 4: Types of music used in the music session

Type of music	Used (%)
Classical	50
Hindi bollywood songs	50

DISCUSSIONS

Our study explored the physiological effects of music therapy on glycaemic responses and heart rate variability (HRV) and we found alignment with several relevant references.

Glycaemic responses: Our findings are consistent with Deshkar *et al*.[8] and Pillai and Dave[7], who observed significant reductions in blood glucose levels following music therapy sessions among diabetic individuals. The approximate 5 mg dL^{-1} decrease in blood glucose levels suggests that music therapy can have a tangible impact on metabolic activities, which is crucial for individuals with type-2 diabetes mellitus. Furthermore, this alignment with Pillai and Dave[7] and Deshkar *et al*.[8] research corresponds with their suggestion that music therapy could serve as an effective approach for managing and reducing blood glucose levels.

Heart rate variability (HRV): Our consistent observation of increased HRV during music therapy sessions is supported by Adlakha *et al*.[9], who conducted a single-group experimental study on the short-term effects of spiritual music on HRV in medical students. Their findings reinforce the idea of music's favourable impact on the autonomic nervous system, promoting enhanced HRV. This aligns with the broader literature, as highlighted by Bando[10], which emphasizes music's potential to induce relaxation and reduce stress, contributing to cardiovascular well-being.

Participant feedback: Our study's subjective feedback from participants, with 85% reporting increased relaxation during music therapy sessions, supports the observations made by Ji *et al*.[11] regarding the relaxing effects of music media therapy, particularly when combined with lower extremity exercise in elderly patients with diabetes mellitus. However, it's important to acknowledge the individual variability in responses, as noted in our study, where 10% of participants perceived no difference and 5% felt more relaxed during silent sessions. This diversity in subjective experiences underscores the need for personalized approaches in music therapy interventions.

our study contributes to the growing body of evidence supporting the physiological benefits of music therapy, particularly in terms of glycaemic control and cardiovascular relaxation. These findings emphasize the potential integration of music therapy into healthcare practices, especially for individuals with diabetes and those seeking stress reduction[12]. Nonetheless, it remains essential to consider individual variations in therapeutic responses, highlighting the significance of tailored music therapy interventions. Further research, building upon studies such as Sastra and Reni[13] and Lerman[14], can offer deeper insights into optimizing music therapy approaches for diverse populations, ultimately enhancing its clinical applications.

CONCLUSION

our study underscores the potential of music therapy to positively influence glycaemic responses and heart rate variability, offering promise for individuals with diabetes and those seeking stress reduction. However, individual variability in responses highlights the need for personalized interventions. Further research can optimize music therapy's clinical applications.

REFERENCES

1. AMTA., 2005. What is music therapy., https://www.musictherapy.org/about/musictherapy/
2. Kamioka, H., K. Tsutani, M. Yamada, H. Park and H. Okuizumi, 2014. Effectiveness of music therapy: A summary of systematic reviews based on randomized controlled trials of music interventions. Patient Pref. Adherence, 8: 727-754.
3. Eseadi, C. and A.N. Amedu, 2023. Potential impact of music interventions in managing diabetic conditions. World J. Clin. Cases, 11: 2916-2924.
4. Ramadhani, Y., S.D.B. Siregar, J.E.S. Pakpahan and T.W.S. Ningsih, 2023. The effect of classical music therapy on reducing blood sugar levels in wounded patients with foot type diabetes ii in the beautiful wound care center Medan. Int. J. Public Health Excellence, 3: 45-53.
5. Hilz, M.J., P. Stadler, T. Gryc, J. Nath and L. Habib-Romstoeck *et al*., 2014. Music induces different cardiac autonomic arousal effects in young and older persons. Autonomic Neurosci., 183: 83-93.
6. Nomura, S., K. Yoshimura and Y. Kurosawa, 2013. A pilot study on the effect of music-heart beat feedback system on human heart activity. J. Med. Inform. Technol., 22: 251-256.
7. Pillai, A.M. and D.D.J. Dave, 2018. Evaluation of the effect of Indian classical music on the blood sugar level of type-2 diabetes mellitus patients. Music Med., Vol. 10 .10.47513/mmd.v10i4.615.
8. Deshkar, A.A., M. Kaur and R.L. Kamble, 2022. Music therapy session as stress buster among diabetic: An analysis by heart rate variability. Int. J. Sci. Stud., 10: 69-72.
9. Adlakha, K., M.K. Mathur, A. Datta, R. Kalsi and B. Bhandari, 2023. Short-term effect of spiritual music on heart rate variability in medical students: A single-group experimental study. Cureus, Vol. 15, No. 2. 10.7759/cureus.34833.
10. Bando, H., 2018. Combined diabetic treatment with low carbohydrate diet, exercise and music therapy. Diabetes Updates, Vol. 1. 10.15761/du.1000103
11. Ji, L., J.J. Bai, J. Sun, Y. Ming and L.R. Chen, 2015. Effect of combining music media therapy with lower extremity exercise on elderly patients with diabetes mellitus. Int. J. Nurs. Sci., 2: 243-247.
12. Bacus, I.P., H. Mahomed, A.M. Murphy, M. Connolly, O. Neylon and C. O'Gorman, 2022. Play, art, music and exercise therapy impact on children with diabetes. Irish J. Med. Sci., 191: 2663-2668.
13. Sastra, L. and I. Reni, 2022. The effect of Indonesian traditional music on stress in type ii diabetes mellitus patients. KnE Life Sci., 7: 706-717.
14. Lerman, I., 2005. Adherence to treatment: The key for avoiding long-term complications of diabetes. Arch. Med. Res., 36: 300-306.