EFFECTS OF SLOW-TEMPO MUSIC ON PAIN PERCEPTION AND EMOTIONAL WELL-BEING

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Citation:
Pipersania, N., & Sam, K. M. (2024). EFFECTS OF SLOW-TEMPO MUSIC ON PAIN PERCEPTION AND EMOTIONAL WELL-BEING. *Public Administration and Law Review*, (2(18), 86–93. https://doi.org/10.36690/2674-5216-2024-2-86-93

Received: April 26, 2024
Approved: June 24, 2024
Published: June 30, 2024

Abstract. *The research focuses on how slow-tempo music alleviates the pain perception in an individual. The study aimed to investigate the potential influence of slow-tempo music on pain perception and emotional well-being. Its objectives were twofold: first, to examine the influence of slow-tempo music on pain perception using the Pain Catastrophizing Model, and second, to explore the emotional well-being outcomes associated with exposure to slow-tempo music in pain scenarios. The pain threshold for an individual is described using the pain catastrophizing model of pain by Sullivan et al. As the name suggests, the key concepts include pain catastrophizing and emotional well-being. This study will focus on understanding how music, especially slow-tempo music may influence measures of pain and emotional well-being. 72 individuals aged 18-25 years will participate. Data collection will involve the utilization of psychometric testing. The assessment tools include the Geneva Music Induced Affect Checklist to gauge emotional responses to music, the Pain Catastrophizing Scale to assess individuals' tendency to magnify pain-related experiences, and the Positive and Negative Affect Schedule to measure general emotional states. The study analyzed correlations between pain perception, emotional well-being, and music preferences using Pearson correlation coefficients. It found weak positive correlations between pain perception (PCS) and emotional well-being (PANAS), and emotional well-being (PANAS) and music preferences (GEMIAC). However, these correlations were not statistically significant at the conventional 0.05 level. Additionally, a weak negative correlation was observed between pain perception (PCS) and music preferences (GEMIAC), which also lacked statistical significance. Therefore, the study couldn't confidently establish significant associations between these variables based on the sample data.*

Keywords: *slow-tempo music; pain perception; emotional well-being.*
JEL Classification: I14, I31
Formulas: 0; fig.: 0; table: 9; bibl.: 35

Introduction. Music has long been revered for its therapeutic qualities, capable of transcending mere entertainment to serve as a potent tool in enhancing human well-being. The intersection of music and health has garnered increasing attention within the realms of psychology and medicine, prompting extensive research into how different musical elements can influence mental and physical states. One particular area of interest is the impact of slow-tempo music on pain perception and emotional well-being.

Pain, an inherently subjective experience, is influenced by a myriad of factors including psychological and emotional states. Traditional pain management strategies have often relied on pharmacological interventions, but these come with a range of potential side effects and limitations. This has spurred a search for complementary and alternative therapies that can provide relief without adverse consequences. Among these, music therapy, particularly the use of slow-tempo music, has emerged as a promising candidate.

Slow-tempo music, characterized by its soothing and mellow rhythms, has been hypothesized to promote relaxation and reduce stress, thereby potentially alleviating pain and improving emotional well-being. The entrainment of physiological processes to the slow rhythms of such music can lead to a reduction in heart rate and blood pressure, fostering a state of calm that may mitigate pain sensations. Moreover, the emotional resonance of music can influence mood states, potentially transforming the perception of pain and enhancing overall quality of life.

Literature review. Music has emerged as a significant non-pharmacological complement to traditional pain management due to its safe, nonaddictive properties (Bernatzky et al., 2011). Historically used for healing across various cultures, from ancient Egypt to Greece, music has shown potential in managing pain without the adverse effects associated with pharmaceuticals (Lu et al., 2023).

Over the past five years, global interest in non-pharmacological pain management methods has increased, with a focus on the benefits of music listening. Research indicates that music can influence both the physical sensation of pain and the emotional response to it, making it a valuable tool either alongside conventional treatments or in situations where medication is less effective or undesirable (Mitchell & MacDonald, 2006). Health professionals find music to be a safe, low-cost, and readily accessible intervention (McCaffery, 1992).

Two primary theories explain music's impact on pain: distraction of attention and emotional engagement. The distraction theory posits that engaging in an external task, such as listening to music, reduces cognitive resources available for pain perception (Mitchell, MacDonald, & Brodie, 2006). This is supported by "limited capacity" models of attention, which suggest that emotional engagement with music provides a strong distraction (Shiffrin, 1988; Robinson, 1998). Music's ability to capture attention through its patterns of harmony, rhythm, and dynamics further supports this theory (Mitchell et al., 2008).

Pain perception is influenced by cognitive, emotional, and physiological factors. The Pain Catastrophizing Model, proposed by Sullivan et al., highlights three key sub-components: rumination, magnification, and helplessness. Rumination involves a persistent focus on pain- related thoughts, magnification exaggerates the threat of

pain stimuli, and helplessness reflects a perceived inability to cope with or control pain (Sullivan et al., 1995). Pain catastrophizing is associated with increased pain perception, greater disability, and poorer treatment outcomes in chronic pain conditions, making it a critical focus for pain management interventions (Quartana et al., 2009).

Slow-tempo music, characterized by fewer beats per minute, is linked to relaxation, tranquility, and introspection (Knight & Rickard, 2001). Modern research has validated the therapeutic benefits of music on various health outcomes, including pain perception (Garza-Villarreal et al., 2014). The therapeutic effects of slow-tempo music on pain are hypothesized to be mediated through distraction from pain, modulation of emotional states, and enhancement of coping mechanisms. By diverting attention, inducing relaxation, and promoting adaptive coping strategies, slow-tempo music can reduce the perceived intensity of pain and the impact of pain catastrophizing (Eccleston & Crombez, 1999; Mitchell et al., 2006).

Contemporary musical preferences play a crucial role in the effectiveness of music as a therapeutic tool. This study focuses on pop/rock and Bollywood slow-tempo music, reflecting the preferences of the target population to enhance the ecological validity of the study. Familiar and emotionally engaging music can be particularly effective in distracting from pain and promoting emotional well-being (Rentfrow & Gosling, 2003).

Emotional well-being, conceptualized through constructs like happiness, subjective well-being, and satisfaction with life, can be significantly enhanced by music. Research in positive psychology has shown that music can increase pleasure, engagement, and meaning in individuals' lives (Lamont, 2011). Music is a powerful tool for achieving peak experiences and enhancing emotional well-being, providing significant therapeutic advantages and fostering overall well-being (Gabrielsson, 1995; Rickard, 2011). This study aims to explore the relationship between slow-tempo music, pain perception, and emotional well-being, contributing to the development of innovative non-pharmacological interventions for pain management (Garza-Villarreal et al., 2014; Mitchell et al., 2006).

Aims. The study aimed to investigate the potential influence of slow-tempo music on pain perception and emotional well-being. Its objectives were twofold: first, to examine the influence of slow- tempo music on pain perception using the Pain Catastrophizing Model, and second, to explore the emotional well-being outcomes associated with exposure to slow-tempo music in pain scenarios. The study tested several hypotheses: whether there are significant correlations between pain perception and emotional well-being, whether slow-tempo music significantly affects emotional well-being, and whether slow-tempo music significantly influences pain perception.

Methodology. The study involved 72 participants aged 18-25, with exclusions for those who were unable to read and write or were undergoing psychiatric treatment. A convenient sampling technique was employed to gather data. The research utilized a quantitative approach with a single-group design. The independent variable was slow-tempo music, while the dependent variables were pain perception and emotional well-being. Control variables included age, gender, previous pain

experiences, and individual pain thresholds.

Data was collected through Google Forms using several psychometric tools: the Geneva Music Induced Affect Checklist (GEMIAC), the Pain Catastrophizing Scale (PCS), and the Positive and Negative Affect Schedule (PANAS). The GEMIAC assessed affective responses to music, the PCS measured levels of pain catastrophizing, and the PANAS evaluated emotional well-being.

Participants were required to read and sign an informed consent form before completing the questionnaires. This form included details about the study's purpose, assurances of anonymity and confidentiality, and information on the participants' right to withdraw at any time. Clear instructions were provided for each questionnaire.

The collected data was entered into the Statistical Package for Social Sciences (SPSS) tool for analysis. Descriptive statistics were generated to understand the distribution of the data. The data was then subjected to the Shapiro-Wilk test for normality and the Pearson Correlation test to determine correlations between variables. Despite a comprehensive analysis, the study found no statistically significant correlations between slow-tempo music exposure and pain perception or emotional well-being.

Result. The collected data is analyzed through SPSS (Statistical Package of Social Sciences), and the obtained results are organized and categorized into different sections as Socio-demographic profile, dependent variables, and independent variables.

Table 1. Socio-demographic profile of the sample

		Frequency(N) N= 72	Percentage (%)
			34.73%
Gender	Male	25	
			65.28%
	Female	47	

Source: systematized by the authors

Table 1 displays the frequency-wise distribution and percentage of the sociodemographic variables of the participants. Socio-demographic details collected in the present study include gender.

Table 1 represents the frequency distribution of socio-demographic details. The majority of the participants are females (n=47) with 65.27%.

Pie Figure 1 pictorially depicts Education Qualification classification of participants.

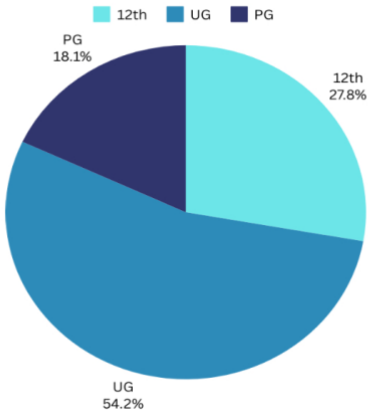

Figure 1. Education Qualification classification of participants

Source: systematized by the authors

Pie Figure 2 pictorially depicts the Socioeconomic Status classification of participants.

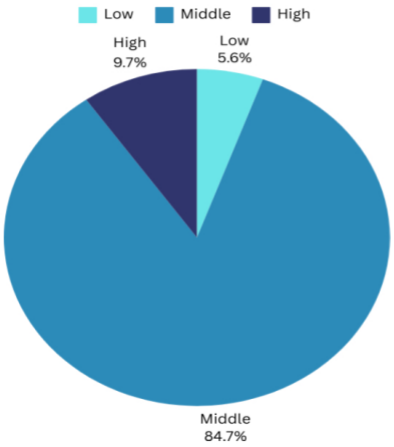

Figure 2. Socioeconomic status classification of participants

Source: systematized by the authors

Pie Figures 1 and 2 pictorially displays the distribution of participants based on their education qualification and socioeconomic status. Most of the participants are Undergraduates with 54.2%, Most of the participant's Socioeconomic status is middle with 84.7%.

Table 2. Descriptive statistics of slow tempo music, pain perception, and emotional well-being

Description	GEMIAC	PCS	PANAS
Mean	43.7083	20.0833	61.4167
Standard Error of Mean	0.78658	1.48923	0.78890
Median	43.0000	18.0000	61.0000
Standard Deviation	6.67439	12.63658	6.69402
Skewness	0.626	0.434	0.046
Kurtosis	2.374	-0.375	-0.408

Source: systematized by the authors

Table 3. Tests for normality for slow tempo music, pain perception, and emotional well-being

Shapiro-Wilk			
Variables	Statistic	df	Sig
GEMIAC	.962	72	.057
PCS	.969	72	.069
PANAS	.984	72	.494

Source: systematized by the authors

Table 3 describes the distribution of the data. Shapiro-Wilk significance is considered to check the normality of the test, it was found that the values are greater than the p-value i.e. (p=0.05) which means the data is found to follow a normal distribution, therefore suitable non-parametric tests were used to analyze the data. The scatter plots below represent the normal distribution.

Table 4. Pearson correlation coefficient on slow tempo music, pain perception, and emotional well- being

		PCS	PANAS	GEMIAC
PCS	Pearson Correlation Sig. (2-tailed)	1	.222	-.067
			.061	.577
	N	72	72	72
PANAS	Pearson Correlation	.222	1	.186
	Sig. (2-tailed)	.061		.118
	N	72	72	72
GEMIAC	Pearson Correlation Sig. (2-tailed)	-.067	.186	1
		.577	.118	
	N	72	72	72

Source: systematized by the authors

Table 4 presents the Pearson correlation coefficients between GEMIAC (Geneva Music-Induced Affect Checklist), PCS (Pain Catastrophizing Scale), and PANAS (Positive and Negative Affect Schedule). The analysis revealed very weak and statistically non-significant correlations between these variables:

GEMIAC and PCS: The correlation coefficient is r = -0.067 with a p-value of 0.577, indicating no meaningful relationship between music-induced affect and pain catastrophizing levels.

GEMIAC and PANAS: The correlation coefficient is r = 0.186 with a p-value of 0.118, suggesting that variations in music-induced affect do not significantly impact overall emotional states as measured by PANAS.

PCS and PANAS: The correlation coefficient is r = 0.222 with a p-value of 0.061, showing no significant correlation between pain catastrophizing tendencies and general emotional states.

These findings indicate that there are no statistically significant correlations between music- induced affect, pain catastrophizing, and emotional well-being in the study population. Thus, changes in music-induced affect do not appear to meaningfully impact pain perception or emotional states based on this data.

Discussion and conclusion. The study aimed to delve into the potential influence of slow-tempo music on pain perception and emotional well-being among young adults aged 18-25. Utilizing a quantitative approach with a single-group design, data was collected from 72 participants through the Pain Catastrophizing Scale (PCS)(Sullivan et al., 1995), the Geneva Music Induced Affect Checklist (GEMIAC) to assess music preference (Gabrielsson, 1995), and the Positive and Negative Affect Schedule (PANAS)(Watson et al., 1988) to gauge emotional states. The research sought to establish correlations between these variables to explore whether slow-tempo music could serve as a viable modality for pain management and emotional regulation.

The findings revealed weak correlations that did not achieve statistical significance, suggesting nuanced relationships between the variables studied. Specifically, the correlation between PCS and GEMIAC scores showed a slight negative trend ($r = -0.067$, $p = 0.577$), indicating that individuals with higher pain catastrophizing tendencies tended to have marginally lower preferences for slow-tempo music (Sullivan et al., 1995). Similarly, the correlation between PANAS and GEMIAC scores yielded a weak positive association ($r = 0.186$, $p = 0.118$), suggesting that higher emotional well-being might be linked to a slightly stronger preference for music, although this finding did not reach statistical significance (Watson et al., 1988).

Despite these non-significant correlations, the study underscores several implications. It tentatively supports the notion that slow-tempo music could potentially contribute to pain management and emotional well-being, albeit subtly and possibly influenced by individual differences not fully captured in this study. The use of established psychometric tools like PCS and PANAS provided a robust foundation for exploring these complex psychological interactions (Sullivan et al., 1995; Watson et al., 1988). However, the study's limitations, such as its relatively small sample size and reliance on self-reported measures, suggest caution in generalizing the findings to broader populations.

To advance understanding in this field, future research could employ larger and more diverse samples to enhance the reliability and applicability of results. Integrating qualitative methods alongside quantitative assessments could offer deeper insights into participants' subjective experiences with music and its effects on pain and emotional states. Longitudinal studies would be beneficial to explore the enduring impacts of music exposure over time, while randomized controlled trials could provide stronger evidence of causal relationships between slow-tempo music and changes in pain perception and emotional well-being (Cepeda et al., 2006; Hsieh et al., 2005). Moreover, investigating underlying psychophysiological mechanisms through advanced techniques like neuroimaging could elucidate how music influences brain function and pain pathways, further substantiating its potential therapeutic benefits in clinical settings (Garza-Villarreal et al., 2014). These avenues of research hold promise for refining therapeutic approaches involving music and expanding its role in promoting health and well-being.

Author contributions. The authors contributed equally.

Disclosure statement. The authors do not have any conflict of interest.

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