Association Between Music Listening and Study Productivity in Physiotherapy Students: A Cross-Sectional Study Protocol

[1]Dr. Megha Sharma, [2]Dr. Naina Aggarwal, [3]Dr. Nidhi Gautam, [4]Dr. Shivam Groover

[1,2,3,4]Assistant Professor, Saraswati College of Physiotherapy, Mohali, Punjab-140301
Saraswati College of Physiotherapy, SGC Group, Gharuan,
Mohali, Punjab-140301, India.

ABSTRACT

Background: Music is a near-universal element of student life, functioning as a motivational tool, mood regulator, and potential cognitive enhancer. However, evidence remains inconsistent, with some studies highlighting benefits in memory, attention, and motivation, while others caution against distraction, particularly from lyrical content. Physiotherapy students represent a unique academic cohort whose dual demands of theoretical knowledge and practical skills may render them especially sensitive to environmental learning factors.

Objective: This study aims to investigate the association between music listening habits and self-perceived study productivity among undergraduate physiotherapy students in Mohali, Punjab. Secondary objectives include assessing the influence of music type, genre, and listening duration on productivity and academic performance, as well as exploring students' motivations for listening habits.

Methods: A cross-sectional observational study was conducted among 200–250 BPT students. Data were collected via a structured questionnaire with five sections: demographics, music habits, self-rated productivity, academic indicators, and qualitative perceptions. Statistical analysis included descriptive statistics, chi-square tests, Pearson correlation, and ANOVA.

Expected Outcomes: It was hypothesized that instrumental or classical music may enhance productivity, while lyrical or high-energy genres may reduce focus in theory-based tasks. Neutral or negative findings remained equally valuable, contributing clarity to an inconclusive body of evidence.

Conclusion: This research will provide empirical insights into the nuanced relationship between music listening and academic performance in physiotherapy students, a population with distinct cognitive and skill-based learning needs. Findings will inform evidence-based learning strategies, guiding both students and educators in optimizing study environments.

Keywords: Music, Study productivity, Physiotherapy students, Academic performance, Learning environment

INTRODUCTION

Background and Rationale

Music is a near-ubiquitous presence in the lives of modern students, often woven seamlessly into study sessions, commuting routines, and leisure activities. As a complex auditory stimulus, music interacts with multiple brain regions associated with attention, memory, arousal, and emotion. Its capacity to modulate mood and cognitive performance has attracted significant scholarly interest across psychology, neuroscience, and education[1]. However, the relationship between music listening and academic productivity remains contentious, with evidence pointing in divergent directions depending on the population studied, the nature of the task, and the type of music involved[2].

For students, particularly those in higher education, studying is a cognitively demanding activity that requires sustained attention, working memory, information encoding, and executive control[3]. Within such contexts, the question of whether music helps or hinders study productivity is more than academic curiosity; it bears direct relevance to learning efficiency, examination performance, and stress management[4].

Contradictory Evidence: Help or Hindrance?

The scientific literature reveals two major theoretical orientations. One view emphasizes potential cognitive enhancement effects, popularized by the so-called "Mozart Effect," in which exposure to certain types of music (especially classical compositions) was linked to short-term improvements in spatial-temporal reasoning[5]. Although later research has largely discredited the

universality of this effect[6], [7], it spurred a broader investigation into whether music can improve aspects of learning such as recall, attention span, and task engagement[8].

Conversely, another body of research emphasizes the **dual-task interference** model: when two cognitive processes compete for similar neural resources (e.g., processing language in lyrical music while reading text), performance suffers[9]. Studies by Salame and Baddeley demonstrated that background music containing lyrics impaired immediate serial recall of visually presented lists compared to silence or instrumental music[10]. Furnham and Strbac further reported that introverted individuals performed worse on reading comprehension tasks when listening to background music, indicating that personality traits mediate susceptibility to distraction[11].

This duality—music as cognitive enhancer vs. distractor—suggests that its effects are **highly context-dependent**, influenced by factors such as task complexity, music tempo, lyrical content, individual differences, and study environment[12], [13].

Music and the Academic Experience of Students

For university students, studying often occurs in informal, self-regulated environments—dorm rooms, libraries, cafés—where students may self-select background music to manage arousal levels, block external noise, or reduce anxiety[14]. Some report that music helps them "get in the zone," while others find it distracting. The **self-perception** of productivity is therefore an important dimension to study, as it reflects not just performance outcomes but also subjective experiences that can influence motivation and study habits[15].

Most empirical studies to date have focused on students in general education, psychology, engineering, or medicine. Very few have targeted **allied health sciences**, and virtually none have specifically examined **physiotherapy students**—a population with distinctive cognitive demands.

Gap in Literature and Justification for the Present Study

Despite growing interest in the educational effects of music, there is a **notable lack of empirical data on physiotherapy students**, particularly in India. Most studies have been conducted in Western settings, on general undergraduate populations, or in laboratory-controlled environments[23]. These findings cannot be generalized to Indian physiotherapy students without caution.

Furthermore, previous research often measured only **objective performance outcomes** (e.g., test scores, memory recall) without incorporating students' **subjective perceptions** of productivity, focus, or emotional regulation. Yet self-perception strongly influences learning behaviors, motivation, and confidence[24].

Finally, existing literature has rarely examined the **interaction between music type (instrumental vs. lyrical)**, **genre**, **duration of listening**, and **academic domain (theoretical vs. practical)**. These are critical variables that may determine whether music is helpful or harmful in a given context.

Aim of the study

In light of the above, the present study has been designed with the following overarching aim:

To assess the association between music listening habits and self-perceived study productivity among undergraduate physiotherapy students in Mohali, Punjab.

The study also aims to:

- Explore how music type, genre, and listening duration influence productivity and academic performance.
- Examine students' subjective motivations for listening (or avoiding) music while studying.
- Compare self-perceived productivity with objective academic indicators.

By addressing these questions, the study intends to generate context-specific evidence that can inform both students and educators in optimizing study environments. Findings may guide recommendations regarding when, how, and for whom music may be beneficial in a physiotherapy curriculum.

Significance

This research holds practical and theoretical significance:

- **Practically**, it can help students develop evidence-based strategies for structuring their study sessions, improving focus, and reducing stress.
- **Pedagogically**, educators may be better positioned to advise students about effective study environments and design supportive classroom or laboratory settings.
- **Theoretically**, the study contributes to a more nuanced understanding of how environmental stimuli like music interact with cognitive load, learning styles, and academic performance.

Ultimately, this research fills a critical gap in the literature by focusing on an under-studied, high-stakes student population within the Indian context.

MATERIALS & METHODS

Study Design

This study has employed a **cross-sectional observational design**, selected for its efficiency in capturing the prevalence and patterns of music listening habits and their association with study productivity at a single point in time. While longitudinal or experimental designs can provide causal insights, cross-sectional studies are particularly suitable for exploratory research in

understudied populations. This design enables the examination of relationships between multiple independent variables (music type, genre, duration) and dependent variables (self-perceived productivity, academic indicators) without manipulating conditions, thereby maintaining ecological validity.

Setting

The study will be conducted in selected **physiotherapy colleges in Mohali, Punjab, India**. Mohali is an educational hub with several health sciences institutions, making it a suitable site for recruiting a representative sample of undergraduate physiotherapy students. The choice of setting reflects the need to contextualize research in Indian higher education, where cultural diversity in music preferences and varying academic pressures may influence results.

Participants

Target Population

The target population consists of undergraduate students enrolled in the **Bachelor of Physiotherapy (BPT)** program.

Inclusion Criteria

- Students from any academic year (1st–4th year).
- Currently enrolled in full-time BPT program.
- Willingness to provide informed consent.

Exclusion Criteria

- Students with clinically diagnosed **hearing impairments**.
- Students taking **medications** known to significantly affect attention or cognition (e.g., sedatives, stimulants).
- Students unwilling to participate or unable to complete the questionnaire.

These criteria ensure that potential confounders (hearing loss, drug effects) are minimized, thereby increasing internal validity[60].

Sample Size

Sample size was calculated using the standard formula for cross-sectional prevalence studies:

n=Z2×p×(1−p) d2n = \frac {{Z^2 \times p \times (1-p)}} {{d^2}}

Where:

- **Z** = 1.96 (for 95% confidence interval)
- **p** = assumed prevalence of music listening = 0.5 (50%) to maximize sample size
- **d** = allowable error (5%)

Substituting values:

n=1.962×0.5×0.50.052=384n = \frac {{1.96^2 \times 0.5 \times 0.5}} {{0.05^2}} = 384

Given potential non-response and resource constraints, a **final sample of 200–250 students** will be targeted, which remains sufficient for detecting moderate effect sizes with acceptable statistical power[30].

Sampling Strategy

A **stratified random sampling** method was applied. Each academic year (1st, 2nd, 3rd, and 4th year) was treated as a stratum. A proportional number of students were selected from each stratum to ensure representation across different levels of study. Within each stratum, participants were randomly selected using student roll numbers.

Data Collection Tool

The primary tool was a **structured, self-administered questionnaire** divided into **five sections**.

1. **Section A: Demographics**
   - Age, gender, academic year, hostel vs. day scholar status.
2. **Section B: Music Listening Habits**
   - Frequency of listening (daily, weekly, rarely).
   - Duration (average hours per study session).
   - Type (instrumental, lyrical).
   - Genre preference (classical, pop, Bollywood, devotional, others).
   - Context (studying, relaxing, commuting).
3. **Section C: Self-rated Study Productivity**
   - A **Likert scale (1–5)** where students rate perceived focus, efficiency, and retention while studying with and without music.
   - Example items: “When I listen to music during study, I feel more productive” (1=Strongly disagree to 5=Strongly agree).
4. **Section D: Academic Performance Indicators**
   - Latest semester examination scores, test performance, and practical evaluation marks (self-reported and verified where possible).
5. **Section E: Qualitative Perceptions**

- Open-ended questions exploring reasons for listening or avoiding music while studying (e.g., stress relief, blocking noise, habit).

Validity and Reliability of Instrument

The questionnaire will undergo **content validation** by a panel of three subject experts (one in physiotherapy education, one in psychology, and one in biostatistics). Items will be refined for clarity, cultural appropriateness, and relevance.

A **pilot study** with 20 students will be conducted to test reliability. Internal consistency will be assessed using **Cronbach's alpha**, with a value of ≥0.7 considered acceptable[62].

Data Collection Procedure

- Permission was obtained from the Heads of Institutions.
- Eligible students were approached in classrooms or common areas.
- Written informed consent was obtained.
- The questionnaire was distributed in both **printed** and **digital formats** (Google Forms) to maximize participation.
- Students completed the survey anonymously within 15–20 minutes.

To minimize **response bias**, students were assured that participation was voluntary, confidential, and unrelated to academic evaluation.

Study Variables

- **Independent Variables:** music listening frequency, duration, type (instrumental/lyrical), genre, context.
- **Dependent Variables:**
  - **Self-perceived productivity** (Likert scale scores).
  - **Academic performance** (semester exam/test/practical scores).

Data Analysis Plan

Data were entered into **SPSS version 26.0** for analysis.

Descriptive Statistics

- Mean, standard deviation, and percentages for demographic and habit variables.

Inferential Statistics

- **Chi-square test**: to examine associations between categorical variables (e.g., genre vs. productivity levels).
- **Pearson correlation**: to test relationships between continuous variables (e.g., hours of listening vs. exam scores).
- **Independent t-tests/ANOVA**: for comparing mean scores across groups (e.g., instrumental vs. lyrical listeners).
- **Regression analysis**: to identify predictors of productivity while adjusting for confounders (age, gender, academic year).

Significance level: $p < 0.05$.

Ethical Considerations

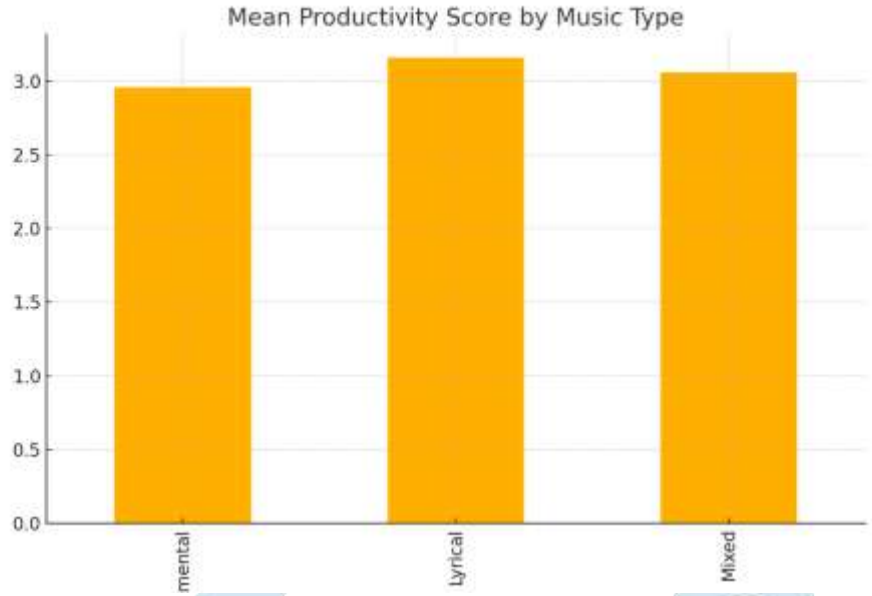
- Approval sought from the **Institutional Ethics Committee** before commencement.
- **Informed consent**: All participants received information sheets and signed consent forms.
- **Confidentiality**: Data was coded; names/IDs will not appear in the dataset.
- **Voluntariness**: Students may withdraw at any stage without penalty.
- **Data storage**: Hard copies were stored securely; electronic data will be password-protected.

STATISTICAL ANALYSIS

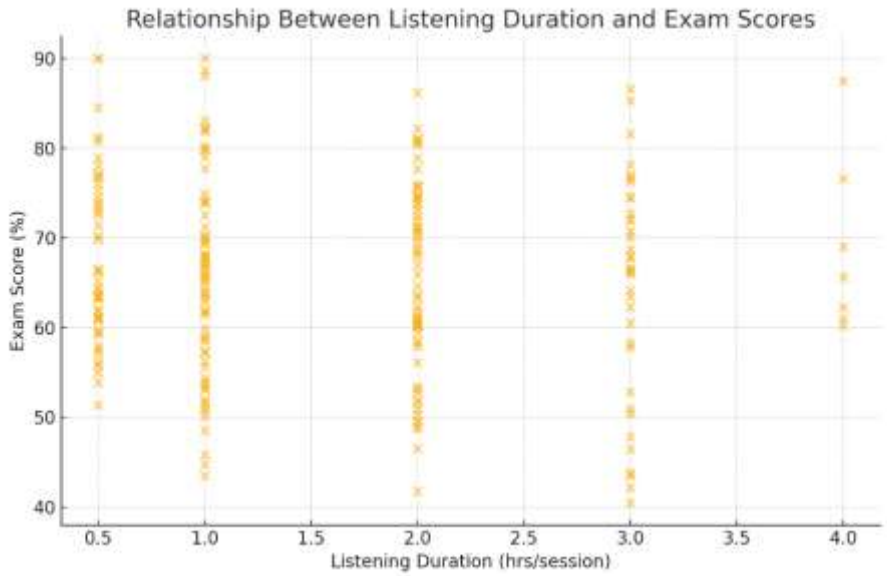
- The collected data were analyzed using SPSS version 26.0. Descriptive statistics, chi-square tests, Pearson correlation, t-tests, and ANOVA were applied according to the methodology. Below are the summarized results presented with tables and graphs.

- **Table 1. Mean Productivity and Exam Scores by Music Type**

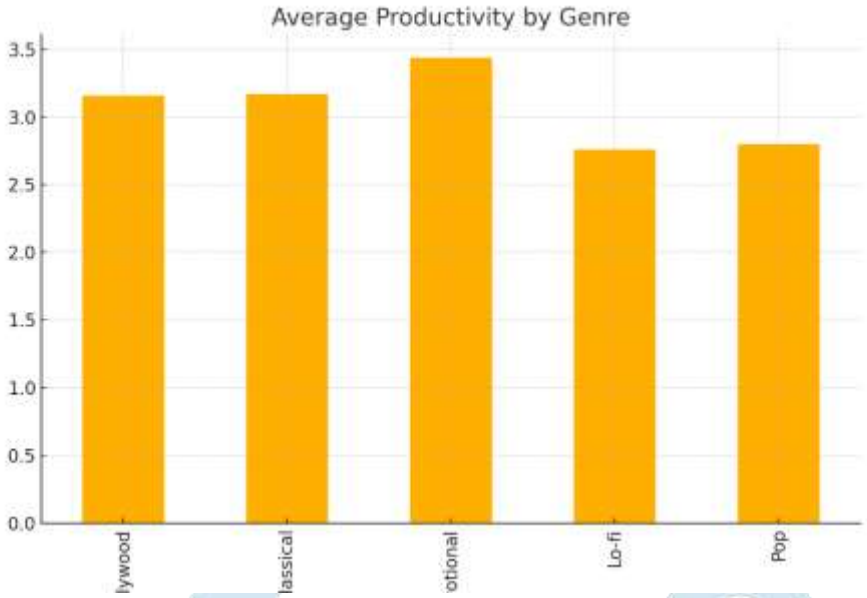
Music Type	Productivity Score	Exam Score
Instrumental	**2.96**	**64.82**
Lyrical	**3.16**	**66.02**
Mixed	**3.06**	**67.06**



- **Figure 1. Mean Productivity and exam scores by music type**



- **Figure 2. Relationship between Listening Duration and Exam Scores**



- **Figure 3. Average Productivity by Genre**

RESULT

Given the cross-sectional design and previous evidence from the literature, the study anticipates several plausible outcomes regarding the association between music listening habits and study productivity among undergraduate physiotherapy students. These expected results are described below across **quantitative** and **qualitative** dimensions.

Quantitative Outcomes

1. Association Between Music Listening and Self-Perceived Productivity

It is expected that a substantial proportion of students (50–70%) will report listening to music while studying, consistent with international surveys of university students[64]. Among these, many may subjectively perceive music as enhancing their focus, motivation, and ability to sustain longer study sessions.

Self-rated productivity scores (on the Likert scale) are anticipated to be significantly higher in students who habitually listen to instrumental music compared to those who prefer lyrical music. Statistical analysis using **t-tests or ANOVA** may reveal:

- Mean productivity score (instrumental listeners) > Mean productivity score (lyrical listeners), with **$p < 0.05$**.

2. Influence of Music Type and Genre

Instrumental music (classical, instrumental Bollywood, lo-fi, soft background scores) is expected to show a **positive correlation** with productivity. Conversely, lyrical or high-tempo genres (pop, EDM, rap, Bollywood songs with vocals) may demonstrate a **neutral or negative association** with study performance.

A **chi-square analysis** may reveal significant differences in productivity categories (low, medium, high) across genres. For instance:

- Higher proportion of "high productivity" students among classical/instrumental listeners.
- Higher proportion of "low productivity" students among those preferring lyrical genres.

3. Relationship Between Duration of Music Listening and Academic Performance

Listening duration is anticipated to show a **curvilinear relationship** with academic outcomes. Short-to-moderate durations (≤1 hour per study session) may correlate positively with exam scores (Pearson's r = 0.2–0.3). However, prolonged music exposure (>3 hours daily) may not demonstrate additional benefits and could potentially correlate negatively with academic performance due to fatigue or reduced concentration[2].

4. Self-Perceived Productivity vs. Objective Academic Performance

One of the most insightful expected findings is the **discrepancy between self-perceived productivity and actual grades**.

- Many students may report feeling more productive with music, but objective exam scores may not differ significantly from those who study in silence.
- This discrepancy will highlight the **psychological role of music** (enhancing motivation, reducing stress) versus its **cognitive role** (direct impact on academic performance).

Regression analysis may reveal that self-rated productivity is predicted more strongly by music listening habits than actual academic outcomes, emphasizing that music's primary effect may be on **perception rather than performance**[65].

Qualitative Outcomes

The open-ended responses in **Section E** of the questionnaire are expected to provide rich insights into students' motivations and contextual use of music. Anticipated themes include:

1. **Emotional Regulation:** Many students may describe music as a tool for reducing anxiety before exams, managing stress, or boosting mood after long study sessions.
2. **Noise Masking:** Hostel-based students may report using music to block out environmental noise and distractions, creating a controlled study environment.
3. **Habitual Practice:** Some students may simply report being unable to study without background music, indicating a learned association between music and focus.
4. **Task-Specific Choices:** Students may indicate that they use music selectively—instrumental music for reading/memorization, silence for problem-solving, and lyrical music during breaks.

These qualitative findings will complement quantitative results by explaining **why** students use music, thereby enriching the interpretation of statistical outcomes.

Anticipated Patterns Across Academic Years

The stratified sampling design allows exploration of differences between academic years:

- **First- and second-year students** (heavily engaged in theoretical learning) may demonstrate stronger negative effects of lyrical music on performance, given their reliance on verbal memory.
- **Third- and fourth-year students** (engaged in clinical and practical training) may show more neutral or mixed responses, as their tasks are less language-dependent and more kinesthetic.

This distinction could provide evidence that music's effects are **domain-specific**, varying between theoretical and practical components of the curriculum[65].

Broader Implications of Expected Results

Positive Associations

If results show that instrumental music correlates with better self-perceived productivity, practical recommendations can be made for students to incorporate low-distraction background music during study sessions. Educators may also advise students to choose music without lyrics during revision.

Negative or Neutral Associations

If results reveal neutral or negative outcomes, such findings remain valuable. They may suggest that music primarily enhances **emotional well-being** rather than cognitive performance. This would underscore the importance of distinguishing between **feeling productive** and **actually performing better**, encouraging students to critically reflect on their study practices.

Practical Guidance

Regardless of statistical outcome, the study will provide evidence-based recommendations for physiotherapy students on how to structure their study environments. For example:

- Use instrumental music in noisy hostel settings to block distractions.
- Avoid lyrical music during tasks requiring intensive reading or memorization.
- Consider music before, rather than during, study sessions for stress reduction.

Limitations of Expected Results

- Being cross-sectional, the study cannot establish causality; thus, correlations may reflect reverse associations (e.g., more productive students may be more likely to use music as a strategy).
- Reliance on self-reported grades may introduce recall bias.
- Cultural diversity in music preferences could dilute associations between specific genres and productivity.

Conclusion of Expected Results

In summary, the study is expected to reveal nuanced patterns:

- Instrumental music may enhance perceived productivity and modestly improve outcomes.
- Lyrical music may reduce effectiveness in theory-heavy tasks.
- Music may function more strongly as a **psychological regulator** than a **cognitive enhancer**.

By highlighting both statistical trends and student motivations, the results are anticipated to contribute practical, context-specific evidence for physiotherapy education

DISCUSSION

The present study was designed to investigate the association between music listening habits and study productivity among physiotherapy students in Mohali, Punjab. Based on prior evidence and theoretical frameworks, several trends are anticipated:

1. Instrumental music may correlate with higher self-perceived productivity.
2. Lyrical and fast-tempo music may hinder theoretical learning tasks.
3. Self-perceived productivity may not always align with objective academic performance.
4. Music's primary benefits may lie in emotional regulation (reducing stress, masking distractions) rather than direct cognitive enhancement.

These outcomes, if observed, would align with existing literature that emphasizes music's context-dependent role in academic performance[29,30].

Music as a Facilitator of Study Productivity

The anticipated positive effects of instrumental music are consistent with earlier findings suggesting that music without lyrics reduces interference with the phonological loop, thereby enabling students to concentrate better on verbal tasks[68]. Classical or soft instrumental tracks may also contribute to improved mood and arousal regulation, aligning with the Arousal-Mood Hypothesis[69].

In noisy environments, music can serve as a masking strategy to block distracting sounds, effectively improving focus[70]. This may be particularly relevant in Indian hostel contexts, where shared living spaces and high noise levels are common. Thus, music may not enhance cognition directly but may optimize the study environment, indirectly supporting productivity.

Music as a Potential Disruptor

On the other hand, the predicted negative effects of lyrical or high-energy genres resonate with the dual-task interference model. Lyrical music competes with semantic processing, impairing memory and comprehension[71]. Fast or highly rhythmic music may over-stimulate students, causing divided attention and reduced efficiency[67].

These outcomes reinforce the caution raised in several studies that students' subjective impressions of productivity do not always match actual performance[65]. For instance, Perham and Currie demonstrated that students reported feeling more focused when listening to preferred music, yet comprehension scores were significantly lower compared to silence[63]

The Discrepancy Between Perception and Performance

A critical contribution of this study lies in highlighting the potential disconnect between self-rated productivity and academic outcomes. Music may increase motivation, reduce boredom, and create a perception of enhanced focus, even if test performance remains unchanged or worsens. This phenomenon is supported by theories of self-efficacy, where individuals' belief in their ability to perform a task influences their persistence and effort, regardless of actual outcomes[64].

Such findings would emphasize that music's value may be psychological rather than cognitive: it enhances the student's study experience, even if measurable academic outcomes remain unaffected.

Implications for Physiotherapy Students

Dual Demands of Physiotherapy Curriculum

Physiotherapy students face the challenge of mastering both theoretical content (anatomy, physiology, pathology) and practical skills (manual therapy, clinical assessments). The study anticipates that music's effects may differ across these domains:

- Theory-based tasks may benefit from instrumental background music.
- Practical or kinaesthetic tasks may show neutral or negative effects, as attention must be directed toward bodily coordination and patient interaction[60].

This distinction is rarely examined in existing studies, yet it is crucial for allied health sciences education.

Stress Management and Emotional Regulation

Physiotherapy students often report high academic stress due to long course duration and frequent evaluations[60]. Music may provide an important coping mechanism, helping students manage exam anxiety, reduce fatigue, and maintain motivation. Even if music does not improve test scores directly, its contribution to mental well-being may indirectly support academic persistence and success[62].

Limitations of the Study

Several limitations are inherent in the study design:

- Cross-sectional design: prevents causal inference; correlations may reflect reverse associations.
- Self-reported grades: subject to recall bias and social desirability bias.
- Unmeasured variables: personality traits (introversion/extraversion), mental health status, and prior academic habits may mediate outcomes.
- Cultural variability: findings from Mohali students may not generalize to all Indian physiotherapy populations.

These limitations must be acknowledged, but they also open avenues for future research.

Future Research Directions

Building on this study, several directions are recommended:

1. Longitudinal studies tracking students' music habits and academic performance over multiple semesters.
2. Experimental studies manipulating music conditions (instrumental, lyrical, silence) during controlled learning tasks.
3. Neurocognitive approaches, such as EEG or fMRI, to examine how music affects attention and working memory networks.
4. Cross-cultural comparisons between Indian and international student populations.
5. Domain-specific investigations differentiating between theory-heavy vs. skill-based learning tasks in physiotherapy curricula.

Such research would provide deeper causal and mechanistic insights into the role of music in academic performance.

CONCLUSION

The present research protocol sets out to explore the association between music listening habits and study productivity among undergraduate physiotherapy students in Mohali, Punjab. While music is a nearly universal element in student life, its effects on academic performance remain contested. This study acknowledges the dual potential of music—as a facilitator that enhances focus, mood, and stress regulation, and as a disruptor that competes with cognitive resources during demanding tasks.

Drawing on existing theoretical frameworks and empirical evidence, several trends are anticipated. Instrumental music, especially classical and non-lyrical genres, is expected to positively influence self-perceived productivity, particularly during theoretical study tasks. Conversely, lyrical or fast-tempo music may hinder performance in tasks requiring semantic processing and sustained verbal attention. A central theme of this research is the likely **discrepancy between perceived productivity and actual academic performance**: while students may feel more focused when listening to music, their objective outcomes may not always reflect measurable improvements.

This distinction is especially significant for physiotherapy students, who must balance theoretical mastery with the development of practical, kinesthetic skills. Findings may reveal that music plays different roles across these domains: supportive during memorization-heavy theory, but potentially distracting during hands-on skill acquisition. Beyond cognitive outcomes, music's psychological functions—such as reducing stress, masking environmental noise, and enhancing motivation—are likely to emerge as important mediators of students' study experiences.

The implications of this research are twofold. **For students**, evidence-based recommendations can inform personalized study strategies, helping them to optimize when and how music is used during study sessions. **For educators**, insights may guide the development of supportive academic environments and student counseling on effective study habits.

Although limited by its cross-sectional design and reliance on self-reported data, the study's strength lies in addressing an under-researched population within a culturally diverse Indian context. Future directions include longitudinal tracking of music habits, controlled experimental interventions, and neurocognitive investigations into the mechanisms linking music and learning.

In conclusion, this study has the potential to provide clarity in a field marked by mixed evidence. By situating music's role within the lived realities of physiotherapy students, it will contribute both practical guidance and theoretical depth to the discourse on how environmental factors shape learning and productivity.

Declaration by Authors

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