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Original Research Article

# Impact of Music Listening on Cardiorespiratory Parameters in Home-Quarantined COVID-19 Patients

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**Conflict of interest: Nil**

**Abstract:**

**Background:** Quarantine, a crucial preventative measure during epidemics like the coronavirus outbreak, has advantages but also has drawbacks and complications such as anxiety, fear, and depression. Listening to music is a novel approach to patient care in hospitals. The purpose of this study is to examine the impact of music listening on respiratory and cardiovascular parameters in COVID-19 patients under quarantine, as well as the feasibility of implementing it in these patients' presence.

**Objective:** The objective of the study is to assess how music listening affects respiratory and cardiovascular parameters in COVID-19 patients who are quarantined.

**Methods:** The interventional study, carried out in Kanpur, involved sixty COVID-19 patients who were placed under quarantine. Thirty patients were assigned to the listening group, and another thirty patients were assigned to the control group. Before and after listening to music, baseline measurements of cardiovascular and respiratory parameters were made, including Spo2, respiratory rate, and tidal volume. Microsoft Excel was used for data entry and assembly. SPSS version 21.0 (IBM Corp., Armonk, NY), a licensed statistical program, was used for data analysis.

**Results:** Each of the following parameters was significantly lower in the post-music listening group compared to the baseline pre-music listening group HR (87.29±12.98vs. 81.57±10.56, p<0.000*), BP systolic (132.69±13.45vs. 126.46±12.89, p<0.000*), and BP diastolic (85.26±12.89vs. 81.89±11.67, p<0.000*). Conversely, the HR (86.34±13.94 vs. 85.89±11.81, p=0.766), BP systolic (133.16±13.48 vs. 132.12±12.45, p=0.477), and BP diastolic (86.35±13.36 vs. 85.34±11.48, p=0.245) of the control group all decreased slightly but not significantly. Spo2, respiratory rate, and tidal volume were compared before and after listening. After listening to music, the tidal volume rose significantly (p<0.01*), from 523.21±31.45 to 576.67±41.21 ml. The respiratory rate in the post-music listening group dropped from 20.12±3.13 to 18.32±4.91 compared to the baseline; this difference was statistically significant (p<0.000*). Conversely, in the post-parameters, the respiratory rate of the control group decreased from 21.01±3.15 to 20.89±3.21 per minute (p = 0.811). Tidal volume increased from 512.12±61.90 to 514.04±69.32 in the post-parameters compared to the baseline, but the difference was not statistically significant (p = 0.347).

**Conclusion:** The study shows that listening to music considerably enhances respiratory and basal cardiovascular parameters in COVID-19 patients who are quarantined. The results show that music listening can be offered on-site to COVID-19 patients as an intrinsically linked, non-pharmacological form of treatment.

**Keywords**: COVID-19 Anxiety, Fear And Anxiety, Cardiorespiratory Fitness, Cardiovascular Prevention, Respiratory Parameters, Music Listening, COVID-19.

## Introduction

Quarantine is an effective solution for early epidemics, particularly coronavirus outbreaks. [1] 42.5% of carriers are asymptomatic, and even after a full recovery, a person may still have the virus for ten days. [1] However, there are negative psychological effects of quarantine, like confusion, irritation, and anger. [1] Infected people are under more stress due to their fear, financial hardship, and social isolation, which weakens their immune systems and increases their chance of catching the coronavirus. Mental health conditions may also increase the risk of infections during a pandemic. [1] Public anxiety, psychological suffering, and major health system issues have all been brought on by the COVID-19 pandemic. Separated from their families during an uncertain period, patients in quarantine may experience respiratory disorders, depression, anxiety, fear of death, insomnia, agitation, discomfort, pain, immobility, frustration, and difficulty relaxing. Listening to music can be used as an additional, non-pharmacological way to reduce anxiety and respiratory symptoms while a patient is in the hospital [2-4] While music listening is the methodical application of musical experiences intended to achieve therapeutic goals by a trained music therapist, music medicine (MM) entails passively listening to pre-recorded music provided by medical staff. [5,6] Research has shown that patients with serious illnesses benefit from music therapy in terms of both physical symptoms and psychological distress. [6,7] Playing music can induce a relaxed state without the need for medication, lowering blood pressure and respiratory rate, improving the quality of sleep, reducing anxiety during mechanical ventilation, and potentially reducing the amount of tranquilizers and analgesics used by ventilator patients. [7,8]

Research on the effects of music listening among COVID-19 patients in isolation in India is, however, lacking. This study aims to evaluate the effect of music listening on COVID-19 patients who are quarantined. In particular, the study will examine the potential effects of music listening on respiratory and discomfort levels as well as basal cardiovascular parameters.

## Material and Methods

Written consent from the patients was obtained from Kanpur for the pre-post-interventional research. Sixty male and female COVID-19 patients in quarantine were included in this study.

The listening group and the control group were divided into two groups, each consisting of thirty patients. Before and after music sessions, baseline cardiovascular variables were assessed in both groups. These comprised respiratory markers such as respiratory rate (RR), tidal volume (TV), and saturated oxygen (Spo2). Cardiovascular parameters like heart rate (HR) and systolic and diastolic blood pressure (SBP and DBP) were also measured. Those who were brought to the COVID unit and had ages ranging from 40 to 65 made up the study participants. Patients with chronic pain syndrome, hearing impairments, or psychiatric or mental conditions were not included in this study. The study's participants wore headphones that played pre-recorded, low-pitched, low-volume instrumental music intended for relaxation and meditation for thirty minutes each day, spaced eight hours apart. [5] For a total of 72 hours, this was carried out. The control group also received headphones and went without music for the same period of time. For three days, music listening was given once, at eight in the morning, for thirty minutes, eight hours apart.

**Statistical Analysis:** Microsoft Excel was used for data entry and assembly. A licensed analytical tool, SPSS version 21.0 (IBM Corp., Armonk, NY), was used for data analysis. The data were displayed using the mean and standard deviation (SD). To determine whether the differences between the pre- and post-listening assessments were statistically significant, a non-parametric test known as the paired Student t-test was utilized. A p-value was considered significant if it was less than or equal to 0.05.

## Results

Thirty patients, twelve males and eight females, with a mean age of 47.35±5.31 years, a BMI of 22.67±2.61, made up the listening group. On the other hand, the control group consisted of 20 males and 10 females, with a mean age of 45.23±6.12 years and a BMI of 23.01±1.32. By examining pre- and post-data from the listening and control groups, we assessed basal cardiovascular parameters such as heart rate (HR), systolic blood pressure (SBP), and diastolic blood pressure (DBP), as well as respiratory parameters such as respiratory rate (RR), tidal volume (TV), and saturated oxygen (Spo2).

**Baseline cardiovascular measures in the groups that listened to music and the control group:** In the listening group, a comparison of pre- and post-music medicine parameters was made. All parameters in the post-music listening group were significantly lower than in the baseline pre-music listening group (Table 1): BP diastolic (85.26±12.89vs. 81.89±11.67, p<0.000*), BP systolic (132.69±13.45vs. 126.46±12.89, p<0.000*), and HR (87.29±12.98vs. 81.57±10.56, p<0.000*). On the other hand, there was a slight but non-significant decrease in the control group's HR (86.34±13.94 vs. 85.89±11.81, p=0.766), BP systolic (133.16±13.48 vs. 132.12±12.45, p=0.477),

and BP diastolic (86.35±13.36 vs. 85.34±11.48, p=0.245).

**Table 1: Comparison of pre and post basal cardiovascular (CV) parameters in the music listening group and control group**

| CV parameters | Music Listening group (n=30) | | | Control group (n=30) | | |
|---|---|---|---|---|---|---|
| | Before (Mean ± SD) | After (Mean ± SD) | p-value | Before (Mean ± SD) | After (Mean ± SD) | p-value |
| HR (bpm) | 87.29±12.98 | 81.57±10.56 | 0. 000* | 86.34±13.94 | 85.89±11.81 | 0.766 |
| SBP (mmHg) | 132.69±13.45 | 126.46±12.89 | 0.000* | 133.16±13.48 | 132.12±12.45 | 0.477 |
| DBP (mmHg) | 85.26±12.89 | 81.89±11.67 | 0.000* | 86.35±13.36 | 85.34±11.48 | 0.245 |

***p-value less than 0.05 is significant, SD- standard deviation, bpm- beats per minute, HR - heart rate, SBP - systolic blood pressure, DBP- diastolic blood pressure.**

**Respiratory parameters in the listening group and control group:** Prior to and following listening, Spo2, respiratory rate, and tidal volume were compared. The tidal volume significantly increased after listening to music, falling from 523.21±31.45 to 576.67±41.21 ml (p<0.01*). In the post-music listening group, respiratory rate decreased from 20.12±3.13 to 18.32±4.91 compared to the baseline; table 2 indicates that this difference was statistically significant (p<0.000*). On the other hand, the control group's respiratory rate dropped from 21.01±3.15 to 20.89±3.21 per minute (p = 0.811) in the post-parameters.

In the post-parameters, tidal volume increased from 512.12±61.90 to 514.04±69.32 relative to the baseline; however, the difference was not statistically significant (p = 0.347).

**Table 2: Comparison of baseline and post-therapy respiratory parameters in the listening group with the control group**

| Respiratory parameters | Music Listening group | | | Control group | | |
|---|---|---|---|---|---|---|
| | Before (Mean ± SD) | After (Mean ± SD) | p-value | Before (Mean ± SD) | After (Mean ± SD) | p-value |
| Respiratory rate | 20.12±3.13 | 18.32±4.91 | 0.000* | 21.01±3.15 | 20.89 ±3.21 | 0.811 |
| Tidal Volume | 523.21±31.45 | 576.67±41.21 | 0.01* | 512.12±61.90 | 514.04±69.32 | 0.347 |
| Spo2 | 96.27 | 97.98 | 0.001* | 96.19 | 96.42 | 0.581 |

***p-value < 0.05 Significant, SD- standard deviation, Spo2- Saturated oxygen.**

## Discussion

The physiological measurements of the listening group reveal a significant difference from those of the control group, demonstrating the efficacy of music listening. After listening to music, the listening group's heart rate, blood pressure's systolic and diastolic values, and respiratory parameters all significantly decreased.

The sympathetic nervous system may be adversely stimulated by anxiety and breathing, which can result in constriction, myocardial stimulation, and bronchoconstriction. [9] Listening to music has a beneficial effect on the parasympathetic nervous system, which causes physiological changes like deep breathing and muscle relaxation as well as a relaxation response. For COVID-19 patients, who frequently experience increased fatigue and breathing difficulties, this is critical.

Anxiety, pain, quality of life, heart rate, breathing rate, blood pressure, fatigue, and emotional state have all improved, according to earlier research. Listening to music can be beneficial for one's physical, emotional, and cultural well-being and is also reasonably priced with no known risks. Nevertheless, few studies involving COVID-19 patients in a challenging and complex environment have been done. Catecholamines play a role in the emotional experience of music and its physiological effects, but attitudes, expectations, affects, memory, imagination, and body self-awareness should all be considered when considering music listening's therapeutic potential. [10] The study's receptive music listening method assisted patients in locating and connecting with their own internal sources of confidence, helped them manage their breathing, and facilitated psychodynamic reactions. [11] Patients would passively listen to pre-recorded music while being accompanied by a music therapist as part of a music medicine listening session. Play lists can be instantly adjusted and modified while listening to music based on both verbal and nonverbal cues. [12]

Our findings corroborated those of Golino et al., who examined the effects of active music listening on critically ill patients. [13] Bradt and Dileo et al.'s findings are consistent with our study in that they show that patients on mechanical ventilation who regularly listen to music experience a decrease in their systolic blood pressure and respiratory rate, which results in a relaxing reaction. [8] They discovered lower hormone and heart rates. [8] According to a study, listening to music has a major physiological, psychological, and social impact

on COVID-19 patients who are quarantined without the use of pharmaceuticals. [14] It improves cognitive function and lowers blood pressure, heart rate, breathing, pain intensity, anxiety, sleep disturbances, and delirium episodes. These effects may be linked to psychophysiological changes that lead to a reduction in the sympathetic nervous system. [14] Additionally, we discovered that listening to music reduced RR and HR decreased significantly, which over time had negative psychological effects. It has been discovered that cortisol is a key respiratory response signal and that there is a correlation between the level of surgical trauma and cortisol concentration. [15] Cortisol, or inflammatory blood levels, were examined in patients as a potential indicator of respiratory-related anxiety in the Chlan et al. study. [16] Patient comorbidities, acute renal failure or insufficiency, or medications that may change cortisol levels contributed to the study's somewhat contradictory results. The study failed to find any connection between music therapy and cortisol levels in terms of reducing respiratory symptoms in general. [16] The type of music chosen affects how effective the listening is, and for confused patients, music listening has been shown to be very efficient in lowering agitation, pain, and anxiety. [14] Active music listening has been demonstrated to be a successful strategy for reducing anxiety when weaning off of mechanical breathing, according to a different study by Hunter et al. [17] They conducted in-person sessions, modifying the speed and loudness of the music in response to the patient's respiration and heart rate. [17] Anxiety levels dropped as a result, and breathing and heart rates significantly changed. [17] Our findings support this. A recent study found that there was a discernible decrease in anxiety, allowing the ventilator-dependent patient to listen to music whenever they pleased. [18]

Patients in critical care units frequently experience respiratory issues, especially those who are using mechanical ventilation. [18] Anxiety may be detrimental to the patient's overall health and ability to heal. [18] Critically sick patients typically respond well to music listening, which is why respiratory-reduction techniques are so popular in all medical specialties. Without the use of medication, it can lower anxiety during mechanical breathing, trigger a general relaxation response, and lessen the respiratory response. [3] Accordingly, the study's findings imply that listening to music greatly enhances the parameters related to basal cardiovascular health and also improves respiratory parameters.

The smaller sample size and poor methodological quality of the study present limitations. For in-depth understanding, a larger sample size study must be conducted in the future. There are no established methods for assessing how music listening affects patients' health or the listening sessions themselves. We suggest a study that is conducted only on females because the majority of the participants in our study are men.

## Conclusions

The study shows that listening to music while in isolation reduces heart rate, systolic and diastolic blood pressure, and RR, whereas increasing TV and spo2 in COVID-19 patients. This improves the patients' general respiratory health and basal cardiovascular functions. Notwithstanding difficulties with working environments and a paucity of research on the practice's experiences with COVID patients, the study advocates for the inclusion of music listening in clinical practice. It proves that, when used properly, listening to music can serve as a form of support during trying times. Further research into its potential to promote comfort, relaxation, reduce anxiety, affect physiological outcomes, and improve psychosocial support is suggested by the positive feedback from patients and the clinical impact.

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