Original Research

Impact of Live Therapeutic Music on Stress Levels Among Healthcare Workers in COVID-19 Critical Care Units

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Abstract

Background: The Coronavirus pandemic has resulted in stressful work environments above what is considered normal for acute care settings. Chronic stress is known to have adverse effects on physical and emotional health and may lead to higher risk for job burnout and decreased quality of patient care.

Objectives: To examine the role of live therapeutic music (LTM) on stress reduction among healthcare workers (HCWs) in a COVID-19 intensive care unit.

Methods: A descriptive design was used. A convenience sample of 60 HCWs working in two COVID-19 critical care units were included. Each participant attended one 30-minute LTM session during a 12-hour shift. Self-reported data for stress was collected pre and post-intervention. Pearson's correlation and paired samples t-test were used for data analysis.

Results: Participants reported significantly higher degrees of life stress than the U.S. national average (t (59$)$ = 5.43, p = .001) and was highest among those in nursing support roles. Higher life stress was significantly associated wth higher pre-intervention stress (r =.59, p=.001). This study revealed a significant reduction in current stress levels, post-intervention ($t(59)$=12.48, p = .001

Conclusion LTM was effective in reducing HCWs' stress levels. A 44.74% reduction in perceived stress scores were observed.

Introduction

Hospital settings are generally understood to be stressful work environments. The Coronavirus pandemic of 2019 increased stress for healthcare workers (HCWs) due to a higher acuity of care and mortality rates for patients infected with the virus.[1,2] Chronically high levels of stress experienced by HCWs during this time may have long-term negative physical and emotional consequences.[3] During previous viral outbreaks, HCWs in direct contact with infected patients were 70% more likely to experience Post Traumatic Stress Disorder (PTSD) and 74% more likely to experience psychological distress compared to HCWs who had little contact.[4,5] Higher rates of burnout among HCWs can, in turn, lead to an increase in medical errors, decrease in quality of care, and negative patient outcomes.[3,5,6]

For decades, researchers have studied how certain sounds affect the human body; specifically, the impact that music may have on the autonomic nervous system and its potential for reducing one's stress or anxiety. Music Healing refers to the use of musical elements to impact a client's health and level of functioning. Therapeutic bedside programs are forms of music healing since they emphasize the characteristics of the chosen music as the elements that positively impact the client's health.[7] The organization, Music for Healing & Transition Program™ Inc. (MHTP) defines Live Therapeutic Music (LTM) as music that is intended to alleviate a physical, emotional, or mental concern. It is acoustic music played or sung live in a variety of healthcare settings, to enhance the healing atmosphere.[8] Similar in several respects to Sound Therapy, LTM uses the principles of resonance, entrainment, and vibration to effect changes in tissues and organs.[9]

A recent meta-analysis concluded that music interventions significantly reduced anxiety and pain in adult surgical patients.[10] These findings support the need for further study and led this team to investigate whether LTM could lower perceived stress levels in highly stressful work environments. The purpose of this study was to examine the

possible impact that LTM may have on stress levels of HCWs working in COVID-19 Critical Care (CC) units. This study sought to answer the following questions:

1. Among HCWs working in COVID-19 CC units, can participation in a LTM session reduce current levels of stress?

2. To what degree is stress reduction associated with selected personal characteristics (specific job role, years in healthcare, general life stress, etc.) and LTM?

Study Design and Methodology:

A descriptive, correlational design was used. The study was conducted in a large, multi-campus hospital system located in the Southeastern United States. Institutional Review Board approval was obtained from the clinical site where the study took place.

A-priori power analysis, using inputs for a medium Cohen's f-square effect size of .15 and probability of .05, determined that a sample size of 55 participants was needed. All HCWs working in two COVID -19 CC units were eligible to participate in the study and participants were recruited with flyers during communication huddles and in person. Informed consent was obtained from each participant at the time of recruitment. The final sample included 60 HCWs; registered nurses (RN), patient care technicians (PCT), unit assistants (UA), and respiratory therapists (RT).

Study Measures

Participant's stress was measured using two instruments. Global stress was measured using the widely used Perceived Stress Scale (PSS), a 10-item, self-administered questionnaire that measures "the degree to which situations in one's life is stressful".[11] Possible total scores range from 0-40, with a higher score indicating a higher degree of life stress.[11] Cronbach's alpha was .82 for this study.

Current stress levels were measured using a numeric rating scale rating (NRS) immediately prior to and following each LTM session. Participants were asked to circle the number that indicated how they would rate their current level of stress, with "0" indicating "no stress" and "10" indicating "extreme stress".

Study Procedures /Data Collection

Multiple 30-minute LTM sessions were provided at different areas in two COVID-19 CC units with acoustic guitar or electronic keyboard. Sessions and surveys occurred between the 4th and 6th hour of the HCW's 12-hour shift on both day and night shifts. All LTM sessions were conducted by Certified Music Practitioners (CMPs), who played familiar, contemporary, classical, or unfamiliar music, loosely metered @ 50 – 60 beats per minute (bpm) at a volume of 50 – 60 decibels. CMPs also played interludes of improvisation, based on participant's observed responses to the music.

At the beginning of their assigned shift when sessions were scheduled to take place, participants completed a brief demographic survey and the PSS. Participants rated their pre-intervention current stress level using the NRS scale just prior to the LTM session. CMPs conducted sessions at nursing stations and in corridors where clusters of HCWs were working. Prior to each session, the CMP assessed various environmental conditions that they observed, then selected appropriate pieces of music based on those observations. CMPs modified the music throughout their sessions, based on participants' responses to the music. Key elements of the music that were modified included tempo, key, mode, and volume. At the conclusion of the session, HCWs were asked rate their current stress level again using the NRS scale.

Data Analysis & Results

All 60 HCWs completed the study. Ages ranged from 24 to 64 (M=37, SD=9.58) years. Most participants were RNs (75%) serving in non-supervisory roles, and 70% female. HCWs' years of healthcare experience ranged from 6 months to 34 years (M=10.7, SD=7.5), 29 (48%) were primarily assigned to day shift and 31 (52%) were assigned to nights. Though underrepresented in the current study, Respiratory therapists (RTs) reported the highest number of days worked in a row, and Patient Care Technicians (PCTs) reported the highest daily number of assigned patients (Table 1).

Table 1.

Healthcare Worker Characteristics (N = 60)

	n	%	M (SD)	Range
Age			37 (9.58)	24-64
Female	42	70		
Male	18	30		
RN	45	75		
RT	8	13.3		
PCT	4	6.7		
UA	3	5		
Day Shift	29	48		
Night Shift	31	52		
Supervisory Role	4	7		
# Years in Healthcare			10.7 (7.5)	6 months - 35
# Patients Assigned			3.1 (3.81)	0 - 16
RN			1.54 (.71)	0 - 2
RT			9.00 (3.74)	2 - 15
PCT			10.25	1 - 16
# Consecutive Days Worked			2.30 (1.53)	1 - 10
RN			2.09 (1.14)	1 - 6
RT			3.75 (2.82)	1 - 10
PCT			1.75 (.96)	1 - 3
UA			2.67 (1.15)	2 - 4

RN = Registered Nurse, RT = Respiratory Therapist, PCT = Patient Care Tech, UA = Unit Assistant/Secretary

HCWs' Characteristics and Stress

Average life stress (PSS) reported by HCWs ranged from 4 to 33 with an average score of 17.3 (*SD* = 6.11), significantly higher than the U.S. national average of 13.[12] (t (59) = 5.43, p = .001. Pearson's correlation was used to assess relationships between HCWs

personal characteristics, degrees of life stress, and pre-intervention stress (Table 2). HCWs reporting higher life stress were significantly more likely to serve in nursing support staff roles ($r = .26$, $p = .04$).

	Variable	1	2	3	4	5
	Table 2. **Relationships Among Participant Characteristics, Pre-Intervention Stress and Perceived Stress ($N = 60$)**					
1	PSS	--				
2	Age	-.06	--			
3	Gender	-.19	-.26*	--		
4	Role	.26*	-.19	-.03	--	
5	Years in Healthcare	-.15	.71***	-.17	-.17	--
7	Shift	-.09	-.19	.27*	-.16	-.14
6	# Days Worked	.17	-.10	.27*	.13	-.12
8	PIS-NRS	.59***	-.13	.03	.26*	-.28*
9	Stress Reduction	.28*	-.08	-.17	.27*	-.20

Note: * p =.05, **p=.01, *** p = .001; PSS = Perceived Stress Scale; PIS-NRS = Pre-intervention Stress, Numeric Rating Scale

Degree of stress (NRS) reported by HCWs just prior to LTM sessions ranged from 0 to 9, with an average score of 4.38 *(SD = 2.29)*. UAs reported the highest level of pre-intervention stress (M = 6.00, *SD* = 1.73) followed by RTs (M = 5.88, *SD* = 2.03), PCTs (M = 4.25, *SD* = 2.03), and RNs (M = 4.02, *SD* = 2.31), respectively (Table 3). Pre-intervention stress levels were most often associated with higher degrees of life stress (PSS, *r* =.59, *p*=.001), fewer years in healthcare (*r* = .28, *p* = .03), and more days worked consecutively (*r* = .26, *p* = .04).

LTM and Stress Reduction

Current stress level, recorded immediately pre and post-session, were reduced on average by 1.96 points, *(SD = 6.11)*, reflecting an average reduction of 44.74% among HCWs who participated in this study. Paired samples t-test found differences in mean

pre-intervention scores and post-intervention stress levels were significant $t(59)=12.48$, $p = .001$), indicating that LTM sessions significantly reduce stress for HCWs in this study.

			Life Stress (PSS) M(*SD*)	Pre-Session Stress (NRS) M(*SD*)	Post-Session Stress (NRS) M(*SD*)	Stress Reduction (NRS) Average M(*SD*)
Table 3. *Healthcare Worker Stress Characteristics and Stress Reduction Before and After Live Therapeutic Music Session (N = 60)*						
Measurement	*n*	%				
All HCWs			17.3 (6.11)	4.38 (2.29)	2.41 (1.75)	1.97 (1.22)
RN	45	75	16.51 (5.83)	4.02 (2.31)	2.27 (1.79)	1.76 (1.19)
RT	8	13.3	17.88 (5.51)	5.88 (2.03)	3.13 (1.73)	2.75 (1.03)
PCT	4	6.7	21.25 (9.54)	4.25 (1.70)	2.25 (1.26)	2.00 (1.41)
UA	3	5	22.00 (5.57)	6.00 (1.73)	3.00 (2.00)	3.00 (1.00)

HCWs = Healthcare Workers, RN = Registered Nurse, RT = Respiratory Therapist, PCT = Patient Care Technician, UA = Unit Assistant/Secretary, PSS = Perceived Stress Scale, NRS = Numeric Rating Scale

Pearson's correlation analysis was also used to assses which characteristics were most associated with stress reduction, post-intervention. HCWs who reported a higher current stress level just prior to the LTM session experienced the most significant reduction in stress following the LTM session ($r=.66$, $p = .001$), followed by those reporting higher life stress (PSS, $r =.28$, $p = .04$), and those serving in nursing support staff roles ($r = .27$, $p = .04$). Findings indicate that HCWs, experiencing the higher degrees of stress while working and higher general life stress, benefitted the most by participating in LTM sessions.

Discussion

For HCWs who completed this study, LTM was beneficial for reducing stress during the course of their shift. Findings from this study are consistent with previous studies that have shown music to be beneficial for reducing symptoms of emotional

distress. An important finding was that HCWs who reported higher level of current stress prior to the LTM session also reported the largest reduction in stress following the session. This finding suggests that LTM may be beneficial for relief of acute stress and warrants further study. Findings are limited due to the small size of this study, however.

HCWs in this study reported significantly higher life stress than the U.S. national average and was highest among those in nursing support roles. Higher degree of stress may have been attributable to working conditions during the pandemic which included higher incidence of patient death, increased numbers of patients requiring invasive procedures and resuscitation, and restrictive patient visitation policies that led to increased family dissatisfaction. Another stressor during this time was the practice of self-imposed isolation, where HCWs distanced themselves from family, friends, and their community. HCWs who reported higher life stress also reported the highest levels of stress while working, which may indicate reduced coping ability among those with chronic stress. Of note, some HCWs declined to participate in this study citing that their stress levels were too high at the time to participate. This suggests that some may not perceive a benefit from LTM sessions during times of extreme stress or were just too busy to stop and participate.

This study contributes to knowledge regarding the potential benefit of LTM as an intervention for stress reduction among HCWs. Findings are limited, however, due to small, convenience sample of HCWs from two areas within a single organization. Delivery of LTM sessions during a normal work shift where interruptions were common may also limit findings. Finally, HCWs were not asked how they personally felt about music or whether they find music in the work environment to be a distraction. Addition of this question would be helpful in the next study.

This study highlights that HCWs may be at increased risk for chronic and work-related stress. Those at greatest risk may include those with less experience, who are working in nursing support roles, and/or who have shorter periods of time off between workdays. Developing strategies for HCW stress reduction and management may positively impact overall health, job satisfaction, productivity, and workforce retention. A healthier, stable, and more satisfied healthcare workforce may lead to better patient outcomes and increase patient satisfaction. Future studies that included larger, more diverse samples in a variety of healthcare settings are needed to determine the

prevalence of stress among HCWs and to further explore the effectiveness of LTM as a strategy for reduction of life and workplace stress.

Acknowledgements

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