Original Article

Bull Emerg Trauma 2026;14(3):2-9.

Bulletin of Emergency And Trauma



Participant-Selected Favorite Music versus Instrumental Targeted-Theme Music for Short-Term Occupational Stress in Emergency Responders: A Multicenter Randomized Controlled Trial

***Keivan Babaei*[1], *Nader Salari*[2], *Vahid Ghanbari*[3], *Amir Hossein Nowzari*[4], *Afshin Goodarzi*[3*]**

[1]*School of Nursing and Midwifery, Kermanshah University of Medical Sciences, Kermanshah, Iran*
[2]*Department of Biostatistics, School of Public Health, Kermanshah University of Medical Sciences, Kermanshah, Iran*
[3]*Department of Medical Emergencies, School of Allied Medical Sciences, Kermanshah University of Medical Sciences, Kermanshah, Iran*
[4]*Student Research Committee, Kermanshah University of Medical Sciences, Kermanshah, Iran*

***Corresponding author:** *Afshin Goodarzi*
Address: Department of Medical Emergencies, School of Allied Medical Sciences, Kermanshah University of Medical Sciences, Kermanshah, Iran. **Tel:** +98 9183881754; **e-mail:** afshingoodarzy@yahoo.com

Received: June 03, 2026
Revised: July 20, 2026
Accepted: July 29, 2026

ABSTRACT

Objective: This study examined the effects of participant-selected favorite music versus instrumental targeted-theme music on daily short-term job stress among emergency responders (ERs).
Methods: This multicenter randomized controlled trial was conducted in Kermanshah from December 2024 to March 2025. Ninety ERs were randomly assigned to three groups using block randomization. Group 1 received instrumental targeted-theme music, Group 2 received participant-selected favorite music, and Group 3 served as the control. The intervention was administered twice per work shift. All participants completed a job stress questionnaire before and after the intervention.
Results: Job stress scores improved following the intervention in all groups. However, a statistically significant reduction was observed only in the targeted-theme music group ($p<0.05$). Bonferroni-adjusted post-intervention pairwise comparisons revealed a significant improvement in the colleague support domain in the targeted-theme group compared with the control group ($p<0.05$). Although colleague support scores indicated greater descriptive improvement in the targeted-theme group than in the favorite music group, the difference between the two interventions was not statistically significant.
Conclusion: Brief music-based interventions, particularly instrumental targeted-theme music, might reduce occupational stress and enhance colleague support among ERs, serving as a feasible, low-burden adjunctive strategy for occupational mental health support.

Keywords: Music therapy; Stress; Psychological; Emergency medical services

Please cite this paper as:
Babaei K, Salari N, Ghanbari V, Nowzari AH, Goodarzi A. Participant-Selected Favorite Music versus Instrumental Targeted-Theme Music for Short-Term Occupational Stress in Emergency Responders: A Multicenter Randomized Controlled Trial. *Bull Emerg Trauma*. 2026;14(3):2-9. doi: 10.30476/beat.2026.111637.1680.

Copyright: ©Bulletin of Emergency And Trauma (BEAT).This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License.

Introduction

Emergency medical services (EMS) are an integral component of the healthcare system, and their personnel play a vital role in both clinical and emergency response settings [1]. As prehospital care providers, emergency responders (ERs) are frequently exposed to high-pressure, critical, and life-saving scenarios [2]. This continuous exposure to high levels of stress can significantly impact their mental and physical health, as well as their overall well-being [3], often leading to premature occupational burnout [4]. Due to the inherent demands of their profession, ERs are highly susceptible to occupational stress. Consequently, mitigating workplace stress is crucial not only for preserving responder well-being but also for maintaining the quality of patient care [5].

Stress is defined as the nonspecific physical and psychological response to any demand for adaptation [6], and is widely recognized as the body's reaction to perceived threatening conditions [4]. Both acute and chronic physiological or environmental stressors are associated with an increased risk of physical and mental health disorders [6]. Such stress can exert various adverse effects on the body, including disrupting homeostasis, triggering or exacerbating pathological conditions, and, in severe conditions, posing life-threatening risks [7]. Furthermore, chronic stress is linked to detrimental behavioral and psychological outcomes, substance abuse, irritability, anxiety, insomnia, poor performance, emotional numbness, and depression [8].

The management and treatment of stress-related disorders are generally categorized into pharmacological and non-pharmacological (psychological) approaches [9]. Although pharmacological interventions can be effective, they are frequently associated with side effects and substantial costs [10]. Consequently, there is a growing preference for non-pharmacological methods and complementary medicine. Numerous studies have demonstrated the efficacy of these approaches, which not only aid in symptom management but also significantly contribute to long-term health maintenance. Common complementary medicine interventions include yoga, massage therapy, energy healing, acupuncture, and music therapy [11-13].

Evidence indicated that among these modalities, music therapy modulates emotional and physiological responses, promoting relaxation, normalization of vital signs, pain relief, and alleviation of anger, anxiety, and depression [14]. The scientific literature further confirmed the efficacy of music in enhancing occupational performance and reducing stress and cortisol levels [15]. Some studies suggested that even a single session of music therapy can have a positive effect on psychological parameters, such as reducing perceived stress [16]. Besides, music listening is a cost-effective, brief intervention that can serve as a practical tool for emergency medical personnel to manage anxiety and stress [17].

Although several studies have explored music interventions in healthcare settings, an evidence-based protocol tailored to the specific demands of operational shifts, particularly one that distinguishes between self-selected motivational music and structured calming music, remains limited. An ideal protocol must be able to successfully balance the dual demands of performance (at shift start) and facilitating complete recovery (at shift end), while also accounting for the moderating role of personal preference. Based on these considerations, this study was designed to investigate the effects of participant-selected favorite music versus instrumental targeted-theme music on short-term occupational stress among ERs.

Materials and Methods

This study was designed as a randomized, controlled, parallel-group, multicenter clinical trial using pre- and post-intervention assessments. The research was conducted across prehospital emergency service stations in Kermanshah, Iran, over 4 months from December 2024 to March 2025. Data collection occurred during day shifts (8:00 a.m. to 8:00 p.m.), 7 days a week. The study setting comprised 16 pre-hospital emergency stations that provide medical services at the scene of incidents and during transport to medical centers to a population exceeding one million.

The target population consisted of all ERs employed at these stations. Based on recent statistics, the total workforce comprises approximately 160 personnel (averaging 11 per station) responsible for providing pre-hospital emergency services to the community. The inclusion criteria were as follows: Holding an associate, bachelor's, or master's degree; willingness to participate in the study; self-reported interest in music; no self-reported history of thyroid disorders (hyperthyroidism or hypothyroidism); no history of active psychiatric illness or current use of psychiatric medications; and no hearing impairment. The exclusion criteria included unwillingness to continue participation during the research or being dispatched on an emergency mission during the scheduled intervention period.

Upon obtaining the necessary ethical and administrative permissions, the researcher visited the emergency stations to initiate the sampling process. After explaining the study's objectives, willing participants were randomly assigned to either an intervention or a control group. Before the intervention, each participant completed the Health and Safety Executive (HSE) Job Stress Questionnaire. Group 1 (Targeted Instrumental Music): Participants listened to a 25-minute session of an uplifting instrumental piece (Albéniz's Asturias- Op. 47, No. 5, tempo: ≈120 BPM, major mode) via noise-canceling headphones (≈60 dB) at the beginning of their work

shift. A second 25-minute session featuring a calming piece (Schubert's Serenade - D. 957, No. 4, tempo: ≈70 BPM, minor mode) was administered after their final mission. As each piece is approximately 4 to 7 minutes in length, the selected track was looped to fulfill the 25-minute duration. The selection of these specific pieces was based on a previous study that introduced and validated empowering and calming instrumental themes for similar occupational settings [18, 19]. Based on that framework, the pieces were selected as the most suitable options for the study's time constraints and goals. Furthermore, these selections were reviewed and validated by a music expert with extensive experience in selecting pieces for psychological and situational contexts, who confirmed their suitability regarding tempo, mode, rhythmic consistency, and instrumental structure.

For the second intervention group, instead of using predefined pieces, each participant freely selected any musical piece of their choice (instrumental, vocal, or any genre). The requested track was immediately downloaded and played through the same headphones for an equivalent 25-minute duration. All selected pieces were recorded for potential genre-based subgroup analysis.

The control group engaged in their routine break activities (e.g., resting, watching TV, playing video games, or reading) during the equivalent time frames without any music intervention. Following the post-shift session, all participants across the three groups completed the job stress questionnaire a second time.

Block randomization was used to ensure a balanced number of participants in each group. This method, also known as "restricted randomization", was implemented to ensure balanced group allocation. Using a permuted block design with a block size of three and a 1:1:1 allocation ratio, participants were assigned to Group A (targeted instrumental music), Group B (participant-selected music), or Group C (control). All possible random permutations of these three letters (e.g., ABC, ACB, CAB) were generated within the blocks. To achieve the minimum required sample size for each group, 30 blocks (totaling 90 participants) were generated to ensure an equal distribution of participants across the three arms.

Given the nature of this intervention, blinding of participants or the administering researcher was not feasible. However, to mitigate bias, data collection and questionnaire distribution were performed by a separate, blinded assessor who was unaware of group assignments. As the primary outcome was measured using self-administered questionnaires, the assessor's knowledge of group assignment did not directly influence the measurements. Furthermore, all groups received equal attention and standardized instructions to minimize performance bias.

In this study, ERs' demographic and occupational data, including workplace base, age, marital status, number of children, education level, work experience, mission outcomes, and average monthly working hours, were recorded using a standardized data collection form.

To assess the outcome variable, which was the level of job stress, the HSE Job Stress Questionnaire was used. This questionnaire consists of 35 questions with a five-point Likert scale. A higher score on this questionnaire indicated lower job stress and pressure, while a lower score signified higher job stress and pressure. The instrument had seven sub-scales: Demands (8 items: 3, 6, 9, 12, 16, 18, 20, 22), assessing workload, work patterns, and environmental changes; Control (6 items: 2, 10, 15, 19, 25, 30), measuring the degree of an individual's autonomy in performing their duties; Colleague Support (4 items: 7, 24, 27, 31), evaluating encouragement and resources from peers; Managerial Support (5 items: 8, 23, 29, 33, 35), addressing addressing support from supervisors; Relationships (4 items: 5, 14, 21, 34), assessing interpersonal traits for group communication and conflict reduction; Role (5 items: 1, 4, 11, 13, 17), examining clarity of work responsibilities; and Change (3 items: 26, 28, 32), evaluating the management of organizational change.

The HSE job stress questionnaire is considered a valid and reliable instrument for research on occupational stress. In Iran, Azad and Gholami validated the questionnaire, reporting a correlation coefficient of 0.48 ($P<0.0001$) with the General Health Questionnaire (GHQ), alongside strong inter-factor correlations. The overall reliability was reported as 0.78 using Cronbach's alpha and 0.65 using the split-half method [20]. These findings were consistent with the findings of other studies; for instance, MacKay *et al.,* reported Cronbach's alpha coefficient ranging from 0.63 to 0.83 for this instrument [21]. Furthermore, Mirzaei *et al.,* demonstrated a Cronbach's alpha of 0.76 for the HSE questionnaire specifically within the Iranian medical emergency community [22], confirming its validity and reliability in high-pressure occupational environments.

The primary outcome of this study was the level of daily short-term occupational stress among ERs, measured at two time points: at the beginning of the work shift (before the first intervention and initial mission dispatch) and at the end of the work shift (following the second intervention session and return from the final mission).

Sample size was calculated using G*Power (version 3.1.9.7), referencing a study by Kacem *et al.*, that reported a mean Perceived Stress Scale (PSS-10) score of 22±8.9 [23]. Assuming a Cohen's d of 0.70, with $\alpha=0.10$ and a power of 0.90, the minimum required sample size was 26 participants per group. To account for a potential 10% dropout rate, the target was increased to 30 participants per group, yielding a total of 90 participants. A *post hoc* power analysis at $\alpha=0.05$ confirmed an achieved power of 0.82, indicating an adequate sample size

even under the conventional alpha level. During the study, seven participants were replaced due to work-related missions, resulting in no loss to follow-up. Consequently, the analysis was conducted on the full sample using a modified intention-to-treat (ITT) approach.

Statistical analysis was performed using SPSS software (version 25). Descriptive statistics (mean, standard deviation, and frequencies) were used to summarize the data. The Shapiro-Wilk test confirmed the normal distribution of all quantitative variables, allowing the use of parametric tests, while the Chi square test was used for categorical variables. Paired t-tests were used to compare pre- and post-intervention stress scores within each group. One-way analysis of variance (ANOVA) was used to compare stress scores across the three groups at each time point, and one-way analysis of covariance (ANCOVA) was used to compare mean changes in stress scores among the three groups while controlling for potential confounders. Pairwise comparisons were conducted using the Bonferroni post hoc test. All analyses were performed on an ITT basis, with statistical significance defined as $p<0.05$.

Results

Table 1 presents the baseline demographic and occupational characteristics of the three study groups: control, instrumental targeted-theme music, and favorite music. The groups were generally well-matched regarding education ($p=0.953$), marital status ($p=0.956$), age ($p=0.789$), and work experience ($p=0.658$). However, significant baseline differences were observed in the outcome of the last mission ($p=0.010$) and monthly working hours ($p=0.016$), with the favorite music group reporting the highest average monthly working hours (186.5±36.5 hours). Consequently, these variables were controlled for in subsequent analyses to adjust for potential confounding. An examination of baseline stress scores, standardized by the number of items across the entire sample, revealed that the Control (2.26 per item) and the Demands (2.37 per item) subscales reflected the highest levels of perceived stress, whereas the Role (4.79 per item) and Relationships (4.23 per item) subscales reflected the lowest.

The results of the paired t-test showed changes before and after the intervention in each of the intervention and control groups. Results indicated an improvement in total stress scores across all groups after the intervention. However, this reduction reached statistical significance only in the targeted-theme music group ($p<0.05$).

Unadjusted between-group analyses revealed significant between-group differences in specific stress domains (Table 2). Specifically, a significant difference was observed in the Demands subscale, which measures workload, work patterns, and environmental changes ($p=0.037$). Furthermore, a significant between-group difference was found in the Colleague Support subscale, which assesses the encouragement and resources provided by peers ($p=0.029$). Detailed comparisons and specific values are presented in Table 2.

To account for baseline imbalances, the effects of "monthly working hours" and "outcome of the last mission" were controlled using analysis of covariance (ANCOVA; Tables 3 and 4). After adjustment, the group effect for the Demands subscale was attenuated to a borderline level of significance ($p=0.057$, partial $\eta^2=0.07$; Table 3). The R^2 value for this model was 0.087, indicating that approximately 9% of the variance was explained. The covariates did not demonstrate significant independent effects on Demands scores ($p=0.386$ and $p=0.539$, respectively), suggesting that this attenuation was primarily attributable to a reduction in statistical power from the inclusion of additional variables, rather than the removal of substantial confounding. Conversely, the ANCOVA results demonstrated that the intervention had a significant effect on the

Table 1. Sociodemographic characteristics of the participants.

Variable		Control group (n=30)	Instrumental targeted-theme music group (n=30)	Favorite music group (n=30)	*p*-value [a]
		n (%)	n (%)	n (%)	
Education	Postgraduate degree	11 (36.7)	11 (36.7)	10 (33.3)	0.953
	Bachelor's degree and Master degree	19 (63.3)	19 (63.3)	20 (66.7)	
Marital status	Single	16 (53.3)	16 (53.3)	15 (50)	0.956
	Married	14 (46.7)	14 (46.7)	15 (50)	
Number of children	No	19 (63.3)	17 (56.7)	20 (66.7)	0.718
	1-5	11 (36.7)	13 (43.3)	10 (33.3)	
The outcome of the last mission n (%)	Patient death	8 (26.7)	4 (13.3)	0 (0)	0.010
	Patient survival	22 (73.3)	26 (86.7)	30 (100)	
Age (mean±SD)		33.9±7.9	33.3±5.5	32.7±5.8	0.789
Work experiences (mean±SD)		10.2±8.9	8.7±5.5	8.7±6.4	0.658
Monthly working hours (mean±SD)		165.6±14.6	173.4±27.4	186.5±36.5	0.016

[a] $p<0.05$

Colleague Support subscale, and this between-group difference remained statistically significant after adjustment (p=0.024, partial η^2=0.085; Table 4), with an R^2 of 0.088. Although the explained variance was modest, the partial eta squared values indicated small-to-moderate clinical effect sizes. The results of the Bonferroni-adjusted pairwise comparisons are illustrated in Figure 1.

Table 2. Stress and subscale scores before/after intervention.

Subscale	Time	Control group (mean±SD)	Instrumental music group (mean±SD)	Favorite Music Group (mean±SD)	Betweengroup *p*value [a]	Withingroup *p*-value [b]
Demands	Before	18.1±2.4	19.7 3.2	19.0±3.7	0.143	C: 0.194/ I: 0.467/ F: 0.423
	After	17.5±3.0	19.5±3.3	19.4±3.8	0.037	
Control	Before	12.8±3.6	13.6±2.5	14.3±3.0	0.168	C: 0.378/ I: 0.373 / F: 0.876
	After	13.1±3.8	14.0±2.4	14.2±3.7	0.407	
Managerial Support	Before	14.5±2.5	12.9±3.2	13.5±3.2	0.118	C: 0.376/ I: 0.001/ F: 0.001
	After	14.9±2.4	14.3±3.7	15.2±3.7	0.569	
Colleague Support	Before	13.3±1.5	15.0±5.6	12.9±3.3	0.089	C: 0.129/ I: 0.750/ F: 0.004
	After	12.7±1.7	14.7±2.9	14.1±3.4	0.029	
Relationships	Before	16.2±2.7	17.0±3.5	17.6±4.0	0.320	C: 0.020 / I: 0.002/ F: 0.466
	After	17.2±2.4	18.4±3.8	18.0±3.8	0.408	
Role	Before	23.5±3.5	23.8±4.4	24.5±5.1	0.656	C: 0.009 / I: 0.029/ F: 0.575
	After	24.9±3.9	25.3±3.4	24.2±5.6	0.612	
Change	Before	8.8±1.7	7.6±2.5	8.5±2.3	0.111	C: 0.698 / I: 0.027 / F: 0.023
	After	8.7±1.9	8.2±3.0	9.2±2.8	0.348	
Total Stress	Before	107.4±10.8	109.8±14.5	110.5±14.5	0.647	C: 0.189 / I: 0.044 / F: 0.058
	After	109.2±13.7	114.5±15.8	114.4±18.1	0.341	

[a] Paired t-test; [b] one-way ANOVA

Table 3. Covariance analysis for the demands subscale: intervention and control group comparison

Tests of between-subjects effects						
Dependent variable: Demands						
Source	**Type III Sum of Squares**	**df**	**Mean Square**	**F**	***p*-value**	**Partial Eta Squared (η^2)**
Corrected model	93.857[a]	4	23.464	1.996	0.102	0.087
Intercept	463.435	1	463.435	39.431	0.001	0.319
The outcome of the last mission	8.934	1	8.934	0.760	0.386	0.005
Monthly working hours	4.477	1	4.477	0.381	0.539	0.009
Group	74.532	2	37.266	3.171	0.057	0.07
Error	987.267	84	11.753	-	-	-
Total	32605.000	89	-	-	-	-
Corrected total	1081.124	88	-	-	-	-

[a] R Squared=0.087 (Adjusted R Squared=0.043)

Table 4. Covariance analysis for the Colleague Support Subscale: intervention and control group comparison

Tests of between-subjects effects						
Dependent variable: Colleague Support						
Source	**Type III Sum of Squares**	**df**	**Mean Square**	**F**	***p*-value [a]**	**Eta coefficient**
Corrected Model	64.9[b]	4	16.2	2.0	0.099	0.088
Intercept	315.3	1	315.3	39.1	0.001	0.318
The outcome of the last mission	10.04	1	10.04	1.2	0.267	0.015
Monthly working hours	1.2	1	1.2	0.157	0.693	0.002
Group	62.9	2	31.4	3.9	0.024*	0.085
Error	676.1	84	8.05			
Total	17740	89				
Corrected Total	741.1	88				

[a] $p<0.05$; [b] R Squared=0.088 (Adjusted R Squared=0.044)

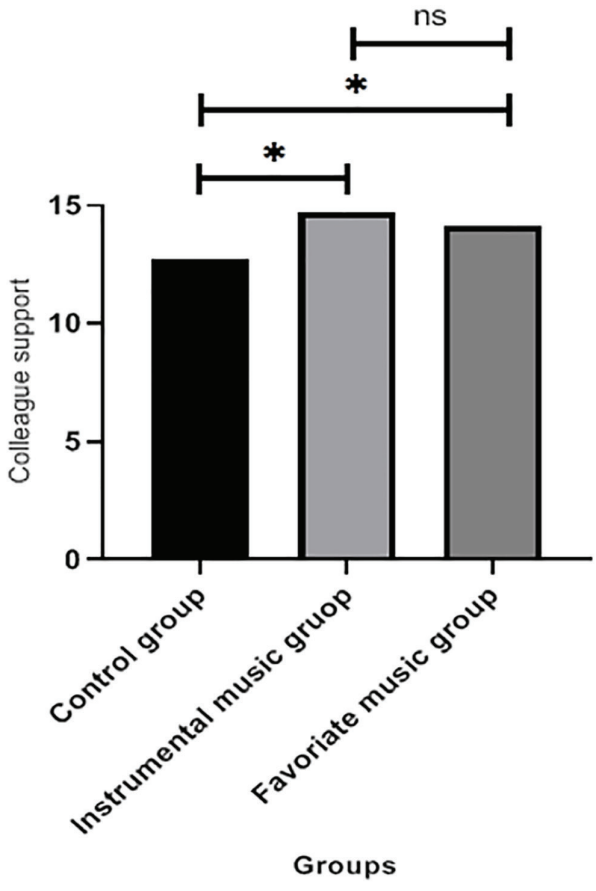


Fig 1. Pairwise comparisons (Bonferroni post hoc test) for Colleague Support

Discussion

In line with the demanding nature of emergency medical services, baseline findings revealed moderate job stress levels among ERs, ranging from 107.4±10.5 to 110.5±14.5 (out of a maximum of 175). These findings were consistent with previous studies reporting high stress levels in this population [5]. Similarly, Charzyńska *et al.,* found that 41.9% of ERs experienced job stress, particularly during crises [24], and Asadi Aghajari *et al.,* reported that one-third of emergency medical technicians in Iran suffer from post-traumatic stress disorder (PTSD), with occupational stress domains such as "demand" being a strong predictor of this condition [25]. Hence, identifying relevant sociodemographic and work-related predictors might help develop more targeted interventions for this population.

Examination of overall stress scores across the three groups revealed that a significant reduction was observed exclusively in the targeted-theme music group. This finding highlighted the unique effectiveness of the targeted music intervention, uplifting at the start and calming at the end of the shift, distinguishing it from the preferred music and control groups. Although some studies supported preference-based music therapy for stress reduction in healthcare providers [26], recent meta-analyses have confirmed that structured music therapy had a moderate to large effect on stress reduction (d=0.72, 95% CI=0.51-0.94) [27]. While therapist-guided and individualized music interventions might offer additional benefits over passive listening, the evidence does not conclusively establish superiority. Our findings aligned with the broader evidence base, as the targeted music intervention significantly reduced stress, whereas the preferred music group did not. This discrepancy might be partly due to contextual factors. Although baseline stress levels were similar across groups, the favorite music group had no patient deaths in their last mission (compared to 26.7% in the control group), which might have reduced their responsiveness due to a potential floor effect.

Supporting this, Calamassi *et al.,* reported that music tuned to 432 Hz improved vital parameters and reduced anxiety in emergency nurses [17]. Similarly, Gudi *et al.,* found that improvisational music followed by guided imagery effectively reduced perceived stress in nurses [16]. These findings, together with the results of the present study, suggested that the benefits of music were not limited to personal preference but might depend on specific musical structures and parameters [28]. Our findings further supported this notion, as the targeted music intervention, designed with specific uplifting and calming themes, significantly reduced stress, whereas the preferred music group did not. Overall, careful and deliberate music selection could have significant physiological and psychological impacts on stress, making it a practical and low-cost strategy for supporting staff well-being.

After standardizing the baseline stress scores by the number of items, the Control and Demands subscales emerged as the primary sources of stress among ERs. The Demands subscale addressed workload, work patterns, and environmental changes, while the Control subscale measured the degree of an individual's autonomy in performing their duties. This finding indicated that perceived lack of control over work processes and excessive workload demands were the most significant stressors at the start of the work shift. This finding contrasted with findings from Yazdi *et al.,* who reported organizational change as the most stressful domain [5]. However, other studies reported that effective management of task changes and a healthy work environment could ease organizational transitions, whereas previous literature often identified role ambiguity or excessive demands as the primary stressor [29-31]. Stress from organizational change might still arise from factors such as inadequate consultation, role changes, restructuring, the introduction of new technologies, or personnel shifts. However, our findings suggested that control and demands were more pressing concerns in this population. Accurately identifying the core sources of stress allows for targeted interventions to support staff well-being and productivity.

Both instrumental targeted-theme music and participant-selected favorite music significantly improved perceptions of Colleague support and reduced overall stress among ERs. Although no previous study has specifically examined the effects of music on occupational stress subdomains in this population, the overall stress-reducing effect of music is well established. Raglio *et al.,* found that daily music listening reduced work-related stress, as measured by the Maugeri Stress Index-reduced form (MASI-R) questionnaire [28], and other studies confirmed similar effects in emergency healthcare workers [17, 32]. Furthermore, the findings confirmed that the intervention's effect remained significant for the Colleague Support subscale after controlling for potential confounders, whereas the effect on the Demands subscale was not statistically significant. *Post hoc* comparisons using the Bonferroni correction revealed that both intervention groups experienced a significant reduction in stress within the Colleague Support Domain compared to the control group. However, this reduction was more pronounced in the instrumental targeted-theme music group. While our findings suggested that music might positively influence perceptions of Colleague support, the underlying mechanism, whether through improved interpersonal relationships or shared emotional experience, remains unclear and warrants further investigation.

In conclusion, this multicenter randomized trial demonstrated that a targeted-theme instrumental music protocol, featuring uplifting music at the start of shifts and calming music at the end, significantly reduced occupational stress and improved colleague support among prehospital emergency technicians. These findings suggested that structured music interventions could serve as a simple, low-cost, and effective strategy for enhancing psychological resilience in high-pressure emergency settings. However, these findings should be interpreted cautiously due to the absence of blinding, the short-term nature of the intervention, the relatively moderate sample size, and the possibility of residual confounding despite statistical control for baseline differences. The long-term sustainability of the effects remains unknown. Future studies with larger, blinded, and longitudinal designs are required to confirm and expand upon these results.

Declaration

Ethics Approval and Consent to Participate: This study was approved by the Vice-Chancellor for Research and Technology at Kermanshah University of Medical Sciences and the Iranian Center for Clinical Trials (Project ID: 4030364, Ethics ID: IR.KUMS.REC.1403.205, Clinical Trial ID: IRCT20240724062537N1). Before the study began, written informed consent was obtained from all participants. The confidentiality of all participant information was strictly maintained. Participants were informed of their right to withdraw from the study at any time, including before or during the intervention, without any consequences. All study procedures were conducted in accordance with relevant guidelines and regulations, including the principles of the Declaration of Helsinki.

Consent for Publication: Not applicable, as this manuscript does not contain any personally identifiable information (e.g., names, ID numbers, or addresses). All data are reported in aggregated form.

Funding: This study was not financially supported.

Conflict of Interest: The authors declare that they have no competing interests, financial or otherwise, that are relevant to the content of this article.

Data Availability: The data and materials are available by contacting the corresponding author.

Declaration of Generative AI in Scientific Writing: Regarding the use of AI, ChatGPT (GPT-5.5 Lite) and Google Gemini were used solely as linguistic tools to assist in translating the manuscript from Persian to English and to refine the grammar and clarity of the text, including the Discussion and Conclusion sections. We emphasize that these tools were used only to improve the linguistic presentation; they were not involved in data analysis or the formulation of scientific findings. The authors have meticulously reviewed and verified all AI-assisted edits to ensure the accuracy and integrity of the final manuscript.

Authors' Contributions: All authors designed the study. A.G., and A.H.N. participated in the coordination and data collection. N.S. and A.G. analyzed the data. K.B. and V.G. wrote the report and the final article. All authors have read and approved the final manuscript.

Acknowledgment: The research team acknowledges the Research Committee of Kermanshah Paramedical Faculty, the management team of pre-hospital emergency medical centers, and all participants for their valuable contributions.

References

1. Williams B, Beovich B, Olaussen A. The definition of paramedicine: an international delphi study. *J Multidiscip Healthc*. 2021;**14**:3561-70.
2. Kosydar-Bochenek J, Ozga D, Woźniak K, Migut M, Lewandowski B, Burdzy D. Traumatic stress in the work of paramedics. *Przegl Epidemiol*. 2017;**71**(4):639-45.
3. Herttuainen A, Nordquist H. Recent Paramedic Graduates' Chronic Stress Adds Intentions to Leave the Profession: A Pilot Study Utilizing a Web-Based Survey. *Inquiry*. 2023;**60**:469580231210706.
4. Anghelescu IG, Edwards D, Seifritz E, Kasper S. Stress management and the role of Rhodiola rosea: a review. *Int J Psychiatry Clin Pract*. 2018;**22**(4):242-52.
5. Yazdi F, Chaboksavar F, Malekzadeh R, Ziapour A, Lebni JY, Janjani P, et al. Role of demographic variables in investigating occupational stress of disaster and emergency medical management center. J *Educ Health Promot*. 2023;**12**:289.
6. Lopresti AL. The Effects of Psychological and Environmental Stress on Micronutrient Concentrations in the Body: A Review of the Evidence. *Adv Nutr*. 2020;**11**(1):103-12.
7. Yaribeygi H, Panahi Y, Sahraei H, Johnston TP, Sahebkar A. The impact of stress on body function: A review. *EXCLI J*. 2017;**16**:1057-72.
8. Sun L, Sun Z, Wu L, Zhu Z, Zhang F, Shang Z, et al. Prevalence and risk factors for acute posttraumatic stress disorder during the COVID-19 outbreak. *J Affect Disord*. 2021;**283**:123-9.
9. Hoge EA, Bui E, Mete M, Dutton MA, Baker AW, Simon NM. Mindfulness-Based Stress Reduction vs Escitalopram for the Treatment of Adults With Anxiety Disorders: A Randomized Clinical Trial. *JAMA Psychiatry*. 2023;**80**(1):13-21.
10. Vanderah TW. Katzung's basic & clinical pharmacology: McGraw Hill New York; 2024.
11. Jang A, Kang D-H, Kim DU. Complementary and alternative medicine use and its association with emotional status and quality of life in patients with a solid tumor: a cross-sectional study. *J Altern Complement Med*. 2017;**23**(5):362-9.
12. Mortada EM. Evidence-based complementary and alternative medicine in current medical practice. *Cureus*. 2024;**16**(1):e52041.
13. Burton MS. Complementary and alternative medicine in rehabilitation. *Curr Sports Med Rep*. 2019;**18**(8):283-4.
14. Sarıtaş SÇ, Araç B. The effect of music therapy on the vital signs of patients in a surgical intensive care unit. *International Journal of Medical Investigation*. 2016;**5**(2):54-9.
15. Saleem S, Saleem T. Efficacy of music and quranic verses in reducing cortisol level: A stress biomarker in medical undergraduates. *Current Psychology*. 2023;**42**(8):6229-34.
16. Gudi H, Gowribhatla Y, Sharma V. Role of music intervention on professional quality of life and work stress: an experimental investigations. *Indian Journal of Health Studies*. 2023;**5**(01):106-20.
17. Calamassi D, Vigni MLL, Fumagalli C, Gheri F, Pomponi GP, Bambi S. Listening to music tuned to 440 hz versus 432 hz to reduce anxiety and stress in emergency nurses during the Covid-19 pandemic: a double-blind, randomized controlled pilot study. *Acta Biomed*. 2022;**93**(S 2):e2022149.
18. Jamali Firoozabadi K, Javadi Vasigh H. A study on the effect of playing music on staff's efficiency during the working hours. *Journal of industrial management*. 2009;**4**(8):55-66.
19. Liebman E, Saar-Tsechansky M, Stone P. The Right Music at the Right Time. *MIS quarterly*. 2019;**43**(3):765-86.
20. Azad ME, Gholami FM. Reliability and validity assessment for the HSE job stress questionnaire. *Journal OF Behavioral Sciences*. 2011;**4**(4):291-7.
21. MacKay CJ, Cousins R, Kelly PJ, Lee S, McCAIG RH. Management Standards' and work-related stress in the UK: policy background and science. *Work & stress*. 2004;**18**(2):91-112.
22. Mirzaei A, Mozaffari N, Soola AH. Occupational stress and its relationship with spiritual coping among emergency department nurses and emergency medical services staff. *Int Emerg Nurs*. 2022;**62**:101170.
23. Kacem I, Kahloul M, El Arem S, Ayachi S, Hafsia M, Maoua M, et al. Effects of music therapy on occupational stress and burn-out risk of operating room staff. *Libyan J Med*. 2020;**15**(1):1768024.
24. Charzyńska E, Habibi Soola A, Mozaffari N, Mirzaei A. Patterns of work-related stress and their predictors among emergency department nurses and emergency medical services staff in a time of crisis: a latent profile analysis. *BMC Nurs*. 2023;**22**(1):98.
25. Aghajari MA, Hashemzadeh E, Fazlizade S, Ojaghloo M, Ghanbari-Afra L, Ghahremani Z, et al. Post-traumatic stress disorder among Emergency Medical Technicians and its relationship with Occupational Stress and Depression: Post-corona Screening, Zanjan, 2022. *Bull Emerg Trauma*. 2023;**11**(3):138-45.
26. Tang H-YJ, Vezeau T. The use of music intervention in healthcare research: a narrative review of the literature. *J Nurs Res*. 2010;**18**(3):174-90.
27. De Witte M, Pinho AdS, Stams G-J, Moonen X, Bos AE, Van Hooren S. Music therapy for stress reduction: a systematic review and meta-analysis. *Health Psychol Rev*. 2022;**16**(1):134-59.
28. Raglio A, Bellandi D, Gianotti M, Zanacchi E, Gnesi M, Monti M, et al. Daily music listening to reduce work-related stress: A randomized controlled pilot trial. *J Public Health (Oxf)*. 2020;**42**(1):e81-e7.
29. Moradi F, Toghroli R, Abbas J, Ziapour A, Lebni JY, Aghili A, et al. Hospital managers' skills required and onward challenges: A qualitative study. *J Educ Health Promot*. 2020;**9**(1):228.
30. Hosseinzadeh M, Hosseinzadeh H, Razeghi N, Barzegar Z. The relationship between job satisfaction and job stress and its related factors among emergency medical services personnel of Mazandaran University of Medical Sciences in 2013. *J Neyshabur Univ Med Sci*. 2015;**3**(3):55-63.
31. Sharifi T, Namdari M, Hasheminejad N. The effect of job stress on the intention to stay as emergency personnel. *Journal of Sabzevar University of Medical Sciences*. 2016;**23**(1):133-42.
32. Ozgundondu B, Metin ZG. Effects of progressive muscle relaxation combined with music on stress, fatigue, and coping styles among intensive care nurses. *Intensive Crit Care Nurs*. 2019;**54**:54-63.

Open Access License
All articles published by Bulletin of Emergency And Trauma are fully open access: immediately freely available to read, download and share. Bulletin of Emergency And Trauma articles are published under a Creative Commons license (CC-BY-NC).