Article

Comparing the effect of foot reflexology with olive oil and peppermint inhalation on job stress and fatigue severity among emergency medical services workers

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Abstract

Background: Emergency medical services (EMS) workers are constantly in exposure to intense physical and mental distress secondary to their obligatory at-once attendance to emergency medical situations.
Objectives: This study's aim was to compare the effect of foot reflexology with olive oil and peppermint inhalation on job stress and fatigue severity among the workers of EMS affiliated with the Zanjan University of Medical Sciences.
Methods: This was a clinical trial conducted on 69 employees of urban and road EMS units. The subjects were randomly divided into three groups. The first intervention group received foot reflexology with olive oil in the stress- and fatigue-reduction regions of the feet for three 20-minute sessions over a 3-month period. For the second intervention group, three drops of 10% peppermint essential oil were poured on a gauze, which was held 10 cm away from the nose. The control group received no intervention. The data were collected using the Esipo and Spokane job stress questionnaire and the Fatigue Severity Scale (FSS). The data were analyzed by SPSS 21 software.
***Results*:** The results of the ANOVA test revealed no significant difference in the overall mean scores of fatigue severity and job stress between the study groups before the interventions; however, the mean scores of fatigue severity ($P<0.002$) and job stress ($P<0.001$) showed a statistically significant difference between the study groups after the intervention.
Conclusion: Considering the effectiveness of both interventions, each of the interventions can be used to reduce the job stress and fatigue of emergency medical workers.

Application of Study Results in Preventive Care in Nursing and Midwifery:
- Using reflexology massage and aromatherapy with peppermint improves job stress and burnout.
- These two interventions can be used as a preventive strategy and routine care for emergency medical workers.

Introduction

Stress is increasing in today's societies, especially in developing countries. Among the jobs that face tension and stress are health-related professions. Healthcare workers deal with stress-causing factors every day when treating patients [1]. Job stress is rooted in the interaction between the work conditions and individual characteristics of the employee in such a way that occupational demands and related pressure in the work environment exceed the tolerance threshold of the individual. According to the definition provided by the National Institute of Occupational Safety and Health, job stress encompasses exasperating physical and emotional responses resulting from the incompatibility of occupational demands and requirements with employees' talents, abilities, resources, or needs [2,3]. Occupational stress adversely affects the performance and physical and psychological health of employees, which ultimately reduces productivity and increases health-related costs [4,5]. Among various professions, the personnel of emergency medical services (EMS) are constantly dealing with enormous physical and mental stress as they need to immediately attend emergency situations, which is considered one of the root causes of occupational stress in these individuals [2,3]. The results of previous studies show that people engaged in jobs dealing with emergency situations

have a higher perceived occupational stress compared to those who have routine jobs [6]. Investigations show that prolonged and continuous stress in the work environment can be associated with adverse consequences such as a reduction in creativity, work efficiency, job satisfaction, the quality of patient care, and making correct and timely decisions, as well as fading of job values, the incidence of between-colleague conflicts, decreasing of job commitment, experiencing incompetency and depression, feeling disgust and exhaustion toward work, recurrent absenteeism from work, and finally, the occurrence of job burnout syndrome [7].

Fatigue is another factor influencing the performance of healthcare workers. Fatigue refers to a debilitating feeling of exhaustion and energy depletion due to a high workload, interrupting one's physical and psychological activities by interfering with sleep-wakefulness patterns and biological rhythms of the body [8]. In today's world, healthcare workers have been reported to experience high levels of fatigue, negatively affecting patient care outcomes and imposing high costs on the health system [9].

One way to mitigate fatigue and stress is to use non-pharmaceutical methods in addition to pharmaceutical interventions [10]. The advantages of non-pharmaceutical and complementary treatments include their lower costs, feasible use, and lack of side effects [11]. Among the complementary therapies used to reduce stress and fatigue are aromatherapy, massage therapy, muscle relaxation, and music therapy [12].

Foot reflexology is one of the common non-pharmaceutical techniques accepted as a traditional medical treatment for this purpose [13,14]. Pressuring the reflexology points of the feet and sometimes the palm restores balance releases energy channels throughout the body of energy, reducing cortisol levels in the blood, causing its propagation throughout the body, reducing cortisol levels in the blood, stimulating the parasympathetic neuronal system, causing relaxation, and finally, improving physiological parameters. Also, the massage of specific points on the hands and feet can augment blood flow toward these areas [15]. In a study by Mohammad pour et al., it was shown that reflexology massage can optimize vital signs such as the heart rate [16]. Therapeutic reflexology can also regulate the immune system, shorten the duration of infections, improve stress, anxiety, tension, and sleep quality, and alleviate depression, constipation, cutaneous problems, headache, back pain, sinusitis, asthma, eczema, and some other types of allergies [17,18]. Comprehensive studies have shown that foot reflexology can effectively improve some patient outcomes, including pain, anxiety, and lymphedema, and by increasing the plasma concentration of beta-endorphins, reduce muscle tension, heart rate, and blood pressure. In addition, this intervention was reported to increase skin temperature and blood flow, improving sleep quality and therapist-patient communication [19]. The use of oils, particularly olive oil, has always been customary when giving a massage. Olive is a rich source of antioxidants that can be effective in improving blood supply to tissues, pain, and muscle fatigue [19].

Aromatherapy is another technique used in complementary medicine as a natural method to treat people's mental, physical, and spiritual problems. Aromatherapy is the controlled utilization of aromatic oils to maintain and promote physical and psychological health. This method is used as a part of nursing practice in many countries [20]. Aromatherapy affects the hypothalamus, the autonomic nervous system, and the endocrine system, improving blood circulation and regulating respiration, heart rate, and blood pressure, which ultimately improves stress. Among the medicinal plants whose essential oils are used in aromatherapy is peppermint. In fact, the word mint, which is positioned at the end of peppermint, is derived from a Latin word meaning thought. Mint can regulate the pulse rate, blood pressure, and heart rate [21]. Menthol present in peppermint acts on kappa-opioid receptors and blocks the transmission of pain signals, thereby reducing pain perception. Moreover, aromatherapy can stimulate olfactory pathways, affecting the hypothalamus and causing a reduction in the secretion of the corticotropin-releasing hormone, reducing the release of adrenocorticotropin from the pituitary gland and cortisol from the adrenal gland, which ultimately alleviates anxiety [22]. Also, other constituents of mint, such as flavonoids, calcium, iron, and minerals, can improve cerebral function,

increasing people's attention and reducing their stress and anxiety [23].

Regarding the importance of healthcare professions, it is crucial to ensure that EMS workers are not inflicted by fatigue and stress, given the nature of their profession. Pharmaceutical therapy used to resolve fatigue and stress is considered an invasive approach. On the other hand, peppermint inhalation has been suggested in traditional medicine to relieve pain, but its effect on fatigue and stress has not been assessed. Therefore, researchers here aimed to investigate the impact of two non-pharmaceutical interventions (foot reflexology with olive oil and aromatherapy with peppermint oil) on the fatigue and stress of EMS workers. We compared the effects of these two interventions on occupational stress and fatigue among EMS workers at the Zanjan University of Medical Sciences in 2020-2021.

Methods

This three-group, single-blinded, randomized clinical trial was conducted on the EMS workers of the Zanjan University of Medical Sciences in 2020-2021.

Considering a confidence interval of 95%, the maximum study power of 80%, and according to the results of Mahdizadeh et al.'s study [24], the sample size was estimated as 59 people. Adding up a 15% likelihood of dropout, a total of 69 patients (n=23 per group) were enrolled. The subjects were recruited by the accessible sampling method among those fulfilling the inclusion criteria. The patients were randomly allocated to the study groups by lottery. Blinding was one-sided in a way that each eligible individual selected one of the three numbers 1, 2, and 3. The number 1 was assigned to the foot reflexology massage delivered to the EMS workers in station 1; the number 2 was assigned to peppermint inhalation, which was delivered to the EMS workers of station 2, and the number 3 belonged to the control group that contained the workers of EMS station 3. These individuals were unaware of the group assignments and their placement in either the intervention or control groups. Finally, the subjects were allocated to each of the three groups of intervention 1 (n=23), intervention 2 (n=23), and control (n=23) (Figure 1).

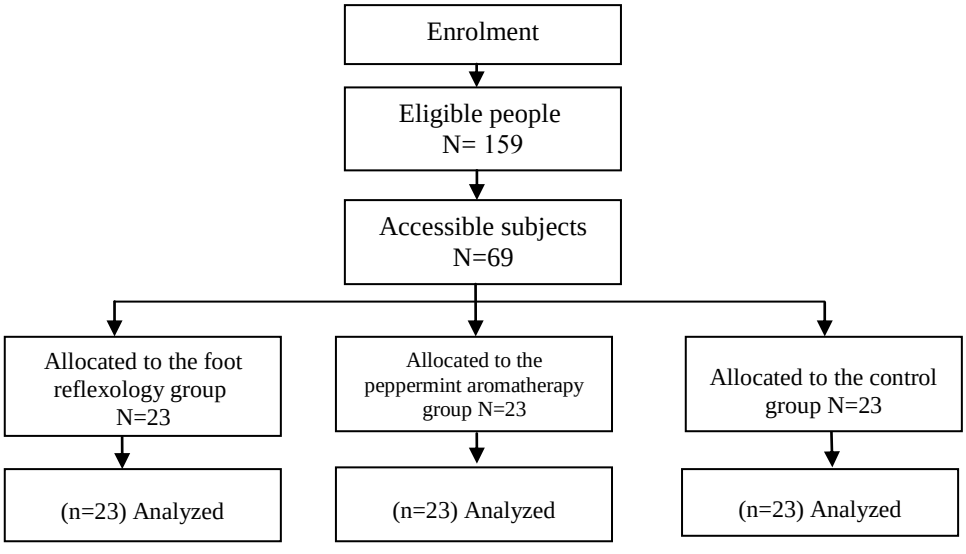

Figure 1: CONSORT diagram for randomized clinical trials

Inclusion criteria were consent to participate in the study and age between 22 and 50 years. People having olfactory problems, allergies to medicinal plants, history of respiratory problems, allergic diseases, headaches, history of asthma, known hepatic diseases, gall bladder problems, defects in their feet (especially the bottom of the feet), sensory and movement disorders, and drug addiction, as well as smokers and those using psychoactive drugs and anxiety medications were

not included in the study. Those declaring dissatisfaction with the odor of the essential oil or foot reflexology were excluded as well.

The data collection tools included a researcher-made demographic information checklist to record age, education, length of employment, and marital status, the occupational stress inventory (OSIPOW), and the Fatigue Severity Scale (FFS).

Occupational Stress Inventory: This instrument measures 6 subscales (i.e., role overload, role insufficiency, role ambiguity, role boundary, responsibility, physical environment), and each subscale includes 10 items. Each item is scored on a 5-point Likert scale from never [1] to often [5], with a score range between 60 and 300 and a higher score indicating higher stress. The degree of job stress was categorized based on the score obtained as low (score of 50-99), low to moderate (score of 100-149), moderate to severe (score of 150-199), and severe (score of >200). The validity and reliability of this questionnaire were reported to be excellent in a study by Sharifian et al. in 2005. The reliability of the tool was designated as satisfactory according to internal consistency assessment with Cronbach's alpha coefficient of 0.89 [25]. In the present study, the validity and reliability of the questionnaires were assessed before the onset of the study. For this purpose, the questionnaire was completed by the participants on two occasions two weeks apart, delivering Cronbach's alpha coefficient of 0.85.

Fatigue Severity Scale: This 9-item scale was developed by Krupp et al. in order to assess fatigue severity. This 9-item questionnaire has been derived from a 28-item tool and assesses different dimensions, including sleep quality (queries 1, 2, 3, 4, and 6), physical and mental fatigue, and their social outcomes (queries 5, 7, and 9). A single last query in this scale analyzes fatigue severity respective to existing symptoms. This scale is scored based on a 7-point Likert scale from complete disagreement [1] to complete agreement [7], with higher scores indicating more severe fatigue and vice versa. The total score of the questionnaire was generated by summing up the scores of each individual question. The score range was from 9 to 81. The reliability of this questionnaire has been approved in Iran with Cronbach's alpha coefficient of 0.96 [26].

Before implementing the interventions, the researcher received a validated certificate by participating in reflexology massage training courses held by authorized institutions.

In the first intervention group, the foot reflexology massage with olive oil was performed by one of the members of the research team. For this purpose, the participant was first asked to lie on a bed on the stomach, placing feet on a pillow with a height of about six inches. The researcher then sat adjacent to the participant's feet and, after soaking his hands and the participant's soles with olive oil (Famila Co., Iran), started massaging for 20 minutes (three sessions per week on each leg, a total of 40 minutes massage on both legs). Reflexive massage was delivered to stress- and fatigue-reducing points [27]. This technique included holding, pressuring, sliding, stretching, and rotating. In order to perform foot reflexology, the researcher first rubs his hands soaked with olive oil together to warm them, followed by moving hands on feet for five minutes to warm them. When the feet became completely warm, the researcher applied pressure on the reflexive points of soles pertaining to stress and fatigue (i.e., the inner edge and the middle part of the sole and toe joints).

In the second intervention group, before performing aromatherapy, the participants were evaluated for any allergy to the substance under study, and those who had no sensitivity were included in the study. In order to conduct the sensitivity test, one drop of the essential oil was rubbed on the inner part of the wrist; then, it was bandaged, and after 2 minutes, the area was scrutinized for any sign of allergic reactions. If there was any sign of hypersensitivity, the subject was not included in the study. In order to conduct aromatherapy, three drops of 10% peppermint essential oil manufactured by the Barij Essential Pharmaceutical Company (Iran) were poured on a gauze using a dropper, and then the gauze was held at a distance of 10 cm from the participant's nose for 5 minutes.

It should be noted that both interventions were carried out after EMS workers accomplished their missions. The stress and fatigue measurement tools were completed one hour after the last session of the interventions [28]. The participants in the control group received no intervention.

Data analysis was conducted in SPSS 21 software using descriptive statistics, as well as the chi-square test, ANOVA, and independent t-test at the

significance level of P<0.05. The normality of data distribution was assessed using the Kolmogorov-Smirnov test.

This study's protocol was reviewed and approved by the Ethics Committee of the Zanjan University of Medical Sciences (ethical approval code: IR.ZUMS.REC.1400.368). Also, this study was registered at the Iranian Registry for Clinical Trials (IRCT20211213053379N1). All the participants provided written informed consent for being included in the study, and they were assured that they had the right to withdraw from the study at any time they wished.

Results

The results showed that most of the participants belonged to the age group of 30 years and younger (56.52%). Also, most of them were married and held associate's degrees. The study groups were homogeneous in terms of demographic variables, showing no statistically significant differences (Table 1).

Table 1: Comparison of demographic features between the three study groups

Variables		Intervention group 1 (N=23)	Intervention group 2 (N=23)	Control group (N=23)	P-value*
Age groups (years)	≤30	13 (56.5)	12 (52.2)	14 (60.9)	0.864
	31-40	7 (30.4)	5 (21.7)	5 (21.7)	
	≥41	3 (13)	6 (26.1)	4 (17.4)	
Marital Status	Single	4 (17.4)	9 (39.1)	9 (39.1)	0.189
	Married	19 (82.6)	14 (60.9)	14 (60.9)	
Education	Associate's degree	11 (47.8)	13 (56.5)	15 (65.2)	0.889
	Bachelor's degree	11 (47.8)	9 (39.1)	7 (30.4)	
	Master's degree	1 (4.3)	1 (4.3)	1 (4.3)	
Work experience (years)	6	6 (26.1)	10 (43.5)	12 (52.2)	0.257
	6-11	9 (39.1)	10 (43.5)	6 (26.1)	
	≥11	8 (34.8)	3 (13)	5 (21.7)	

*Chi-square test

According to the ANOVA test, the mean of the total fatigue severity score showed no statistically significant difference between the study groups at pre-intervention (P=0.179), but there was a significant difference between the groups at post-intervention (p=0.002). According to the results of the paired t-test, a statistically significant difference was observed comparing the mean of the total fatigue severity score before and after the intervention in both experimental groups (P<0.002) (Table 2).

Table 2: Comparison of the total mean score of fatigue severity between the study groups at pre- and post-intervention

Fatigue severity (total mean score)	Intervention group 1 (foot reflexology) N=23	Intervention group 2 (peppermint aromatherapy)	Control group N=23	P-value (ANOVA)
Pre-intervention	24.96±6.22	21.22±7.34	23.61±6.89	0.179
Post-intervention	19.52±5.95	17.74±5.01	23.96±6.76	0.002
P-value (paired t-test)	0.001	0.001	0.119	-

According to the ANOVA test, the mean of the total occupational stress score showed no statistically significant difference between the study groups at pre-intervention (P=0.258), but there was a significant difference between the groups at post-intervention (p=0.001). According to the results of the paired t-test, a statistically significant difference was observed comparing the mean of the total occupational stress score before

and after the intervention in both experimental groups (P<0.001) (Table 3).

Table 3: Comparison of the total mean score of occupational stress between the study groups at Pre- and Post-intervention

Occupational stress (total mean score)	Intervention group 1 (foot reflexology) N=23	Intervention group 2 (peppermint aromatherapy)	Control group N=23	P-value (ANOVA)
Pre-intervention	174.14±83.05	168.20±70.01	176.17±91.70	0.258
Post-intervention	161.11±30.46	155.23±04.50	175.14±83.32	0.001
P-value (paired t-test)	0.001	0.001	0.481	-

The results of the independent t-test revealed no statistically significant difference between the two experimental groups (i.e., foot reflexology massage vs. aromatherapy) in terms of post-intervention total scores of occupational stress and fatigue severity (P>0.05, Table 4).

Table 4: Comparison of the effect of foot reflexology massage and peppermint aromatherapy on occupational stress and fatigue severity between the study groups post-intervention

Variables	Intervention group 1 (foot reflexology)	Intervention group 2 (peppermint aromatherapy)	P value (independent t-test)
Total mean score of fatigue severity	19.52±5.95	17.74±5.01	0.278
Total mean score of occupational stress	161.11±30.46	155.23±04.50	0.259

Discussion

The results of this research indicated that both the interventions implemented (i.e., foot reflexology massage with olive oil and peppermint inhalation) were effective on occupational stress and fatigue severity and could reduce the total mean scores of these variables among EMS workers [29]. In line with the findings of the present study, the results of a study by Nazari et al. in Isfahan (2014) demonstrated that foot reflexology massage could mitigate stress among nurses working in the intensive care unit, upgrade their psychological health, and improve their quality of work life [30]. In a study by Rafsanjan (2017), Mahdizadeh et al., who investigated the effect of reflexology massage on the stress of EMS workers, declared that this method could be employed as a non-pharmaceutical strategy to fight stress in EMS workers [31]. Also, Khazaei et al. (2018) conducted a study in Birjand and asserted that foot reflexology massage could alleviate chemotherapy-induced stress and neuropathic pain in women with breast and genitalia cancer, suggesting that this method could be regarded as a useful complementary therapeutic approach along with routine treatments [32]. Another non-pharmaceutical method used in the present study was aromatherapy by peppermint inhalation, and the results showed that this intervention, similar to foot reflexology massage, could reduce fatigue and stress in EMS workers. In a study, Parveen et al. (2012) demonstrated that mint extract possessed anti-anxiety effects [33]. In another study by Kohestani Einadini et al. (2020), it was declared that peppermint inhalation was effective in reducing obvious anxiety in coronary angiography candidates [34]. Also, Qodus et al. (2014) assessed the effect of peppermint aromatherapy on the performance of female nurses working in intensive care units and reported a significant increase in the work accuracy of these nurses [35]. Wu et al. (2020), who investigated the effect of massage therapy combined with lavender essential oil aromatherapy, showed that this method significantly reduced occupational stress and fatigue scores, encouraging researchers to recommend lavender aromatherapy plus massage therapy as a method with fast alleviating effects on occupational stress and fatigue, which could be routinely delivered during employees' rest periods to ease their distress caused in the environment [21]. Likewise, in a study by Ozgoli et al. in 20121390, it was specified that peppermint can

play a role as a complementary treatment to relieve pain and reduce anxiety [23]. The findings of Nakhai et al. (2020) revealed that peppermint essential oil could boost the accuracy of nursing students [36]. Overall, these studies suggest that the inhalation of plant essential oils can exert profound effects on the central nervous system. For example, the essential oils of rosemary and peppermint were noted to reduce the activity of the sympathetic nervous system, while the essential oils of pepper and grapefruit have been shown to intensify the activity of the sympathetic nervous system [37].

One of the limitations of this research was the dispatch of EMS workers during the interventions, forcing the research team and the participant to arrange another time to complete the procedure.

Conclusion

Our results showed that foot reflexology massage with olive oil and aromatherapy with peppermint could both exert immediate satisfactory effects on the occupational stress and fatigue of EMS workers. Because lower levels of occupational stress and fatigue can augment the quality of the services provided, as well as work efficiency, these two interventions can be recommended during rest hours or as a part of the health promotion activities of EMS workers, who often experience high levels of stress and fatigue due to their working conditions. Overall, one can affirm that the two interventions delivered in the present study could be regarded as effective, low-cost alternatives to reduce occupational stress and fatigue and, therefore, to promote the well-being of healthcare workers. The effectiveness of these interventions is suggested to be compared with that of other relaxation methods in other groups of healthcare workers, as well as among patients.

Ethical Consideration

This article was extracted from a master's thesis in the field of special care nursery, registered in the Iranian Registry for Clinical Trials under the code of IRCT20211213053379N1 and approved under the ethics code of IR.ZUMS.REC.1400.368 by the Ethics Committee of Zanjan University of Medical Sciences.

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Conflict of interest

The authors declare no conflict of interest.

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Authors' contributions:

All authors contributed equally to this study.

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