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Foot reflexology for acute occupational low back pain: a double-blind randomized clinical trial

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ABSTRACT

Aim: To compare the effects of foot reflexology in relieving acute occupational low back pain in the nursing team. **Method**: randomized, controlled, double-blind clinical trial. Participants included 36 randomly allocated, effective professionals. Data collection was performed with the Visual and Analogue Scale of pain intensity, before and after the applications of the reflexotherapy protocol and Questionnaire for Low Back Pain, applied at the beginning and end of the research. For normality of the sample the Shapiro Wilk test, Chi-square test or Fisher's exact test was used to verify the significance of the association between categorical variables; Wilcoxon test (non-parametric data) and t-test (parametric data). **Result:** reflexotherapy showed significant effect (p=0.000) in the intervention stages to alleviate the intensity of acute low back pain, both in the VAS score and in the Low Back Pain Questionnaire (p=0.0002). **Conclusions:** reflexotherapy showed statistically significant effects on the reduction of acute low back pain in Nursing professionals.

Descriptors: Cumulative Trauma Disorders; Low Back Pain; Nurse Practitioners; Reflexotherapy.

INTRODUCTION

Occupational disorders, called work-related osteomuscular diseases (WRMD), are multicausal clinical conditions associated with degenerative tissue lesions that interfere with individuals' quality of life and professional productivity. Among the most common symptoms associated with WRMD are: fatigue, feeling of heaviness and the presence of pain, which can occur in different regions of the body, such as upper and lower limbs, cervical and lumbar region[1-2].

As observed in the data provided by the Social Security Institute (INSS, acronym in Portuguese), the high WRMD rates represent one of the major causes responsible for leaving work, causing costs to the government due to the demand for sickness benefits from social security[3]. In addition to the functional impairment of the neuromuscular and tendon-articular structures, this disorder poses a risk to the individuals psychoemotional health, allowing unpleasant feelings, such as the feeling of impotence, failure and fear of losing their job[3-4].

In the world, research developed since the year 2000 has shown an increasing prevalence of WRMD in nursing professionals, when compared to the other health areas[4], reaching an average of more than 70% of cases. In Brazil, this index is even higher, reaching the margin of 80%[5].

Due to the competencies and attributions of the nurses, many are the factors that allow the appearance of WRMD. Among them, working hours combined with on-call schedules, demands on repetitive movements and weight lifting, poor posture and lack of physical conditioning, as well as the reduced number of practicing professionals[4,6-7]. It is understood that the hospital environment itself exposes professionals to varied physical, chemical, psychosocial and ergonomic risks, which favor the construction of an exhausting scenario and conducive to the occurrence of occupational accidents[1-2,5-6].

Of the most common occupational disorders among nurses, low back pain (also described as the presence of pain in the lower back) is the most hegemonic, reaching up to 80% of professionals[4-6]. Although the onset of low back pain is multifactorial and involves individual and genetic issues, the main cause related to its appearance are biomechanical factors[2-3].

Conceptually, pain (5th vital sign) is an indicator responsible for triggering a set of adaptive psychological, autonomic and motor reactions, whose systematic identification, evaluation, measurement and reassessment aims at preserving the organism, distancing it from an aggressor cause[8]. However, it is not only an intelligent defense mechanism against injury or tissue damage, but also the perception and recognition of diseases and imbalances[9]. Consequently, ignoring the pain signal in its acute phase triggers varying degrees of functional incapacity in the disorder, resulting in withdrawals from some professionals and the overload of others, constituting a vicious cycle[5].

Therefore, by incorporating preventive activities into the daily life of these professionals, one can help them avoid wear and tear resulting from work activities. Thus, it is deduced that caring for the caregivers contributes to health promotion, positively impacting work, productivity and safe care intrinsic to nursing work.

Thus, interest arose in therapeutically intervening with foot reflexology in the relief of acute low back pain caused by WRMD in nursing workers working in hospital settings. Foot reflexology is a therapy that is characterized by manipulation of the feet by pressure and movements with the thumb (and sometimes with other fingers) in areas called reflex points[7,10]. It is a treatment that favors the improvement of the bodily functions in general, helping in the transport of nutrients, oxygenation of the tissues and the elimination of toxins. It aims to promote homeostasis through the stimulation of nerve endings related to the organs, viscera and systems of the human body. Therefore it is indicated in the prevention and treatment of chronic and acute disorders, as in the case of low back pain[7,10].

In this context, the study aimed to compare the effects of foot reflexology for the relief of acute low back pain related to the work performed by the nursing team between experimental and control groups.

METHOD

The present study refers to step 2 of a master's thesis, and step 1 is found in another manuscript[7]. The first step describes the results of the participants in the groups, and the second compares the effects of reflexotherapy among the sample groups. This is a pilot, controlled, randomized, double-blind, pre- and post-clinical trial of a quantitative nature.

The research site was a University Hospital of Santa Catarina, and the population studied consisted of professionals of the nursing team in work activity. Recruitment took place through invitations made to all professionals, researchers and collaborators of the research and through the dissemination of posters and social networks.

The posters were set in the murals, sectors and nursing departments of the mentioned Hospital and contained figures, images and texts, aiming clarity in the information for the nursing team. The same information was also made available through the QR code (Quick response), for smartphone users.

As eligibility criteria, it was adopted: being an active nursing professional; presenting acute low back pain; and absence of lesions, inflammatory or infectious processes in the feet. The exclusion criteria were defined as: being treated or participating in another study for acute low back pain and presenting vascular disorders in lower limbs (varicose ulcers and/or thrombosis).

The sampling was of the probabilistic type. Sample size was calculated in the software Emory University's Open Source Epidemiologic Statistics for Public Health (OpenEpi) 3.03a of Emory University, Rollins School of Public Health, Atlanta, USA. The sample calculation was based on data obtained from a study[11] that evaluated the effects of reflexology on the intensity of chronic pain in nurses from hospital units, and observed a mean pain score in the control group of $3.8800(\pm 0.9713)$ and in the experimental group of $2.7200(\pm0.8907)$. Considering a 95% confidence interval, 80% power, 11 patients would be required in each group. With the addition of 20% of losses and refusals, the total sample would be 27 patients.

In order to collect the data, the Visual Analogue Scale of pain intensity (VAS), low back

pain questionnaire[12] (for follow-up and more information of participants) and a sociodemographic questionnaire were used. The control variables selected were: gender, age, weekly and daily working hours, length of service in the sector, work unit, commuting time, physical exercise practices, and use of analgesic medications.

The distribution of the participants in the control and experimental groups was randomized and started only after delivery and completion of the Informed Consent Form. To do this, a number whose distribution ranged from 1 to 100 was inserted into a sealed brown envelope. Each participant chose one of the available envelopes and the number drawn was recorded by the study's collaborators, in a scale previously structured for the organization of the treatments.

Those who chose odd-numbered envelopes received treatment A (specific reflexotherapy - test group), and those who chose even numbers received treatment B (non-specific reflexotherapy - control group).

Both the investigators and study participants were not aware of who was receiving the specific treatment for acute low back pain, ensuring blinding between them. Only the collaborators responsible for applying the protocols knew which treatment was being directed to each participant (procedure necessary to ensure the applicability of the correct protocol in the sample groups).

All the collaborators of the research were qualified in reflexotherapy and received a training of qualification, before the recruitment of the participants, to guarantee its technical precision in the application of the protocol.

The research intervention occurred from May to July 2016 and had a total of nine (9) days of duration for each participant. The time stipulated for each session and the interval between them were based on the methodology of a clinical study that evaluated the effects of reflexotherapy for chronic low back pain in hospital nurses[13].

Thus, the research was organized in three moments, two sessions of application of the protocol and one session only to fill the instruments of data collection, in which there was no intervention.

At the first meeting, the participants were asked to complete the questionnaire for sociodemographic characteristics and the questionnaire for low back pain. Soon after, the procedure was initiated. Participants were then accommodated on a litter covered with disposable paper and were instructed to mark their pain level on the VAS instrument. Subsequently, they were submitted to the protocol of foot reflexology[7]. At the end, the participant was again asked to mark his level of pain on the VAS scale.

The time between responding to the questionnaires and receiving the practice of reflexotherapy was 40 to 50 minutes, with 30 minutes for the protocol. In all the interventions, disposable paper sheet for total coverage of litter, cotton and 70% alcohol for foot hygiene were used.

The second session occurred three days after the first intervention and the same procedures and protocols as the previous one were repeated. In the third session, carried out three days after the second, participants were asked to fill out the questionnaire for low back pain[12] and VAS. The estimated time for

completing the questionnaires at this stage was approximately 5 minutes.

Initially, the study had the participation of 45 individuals who were randomized and allocated to the control and experimental groups, with 28 being in the control group and 17 in the experimental group. After the first session, nine professionals were excluded from the study (five chose not to participate in the study anymore and four were excluded from attendance after the first). Thus, 36 participants remained in the research, 19 of which were maintained in the control group and 17 in the experimental group, according to the diagram presented in figure 1.

The data collected was entered into a Microsoft Excel® spreadsheet database and subsequently exported to the IBM SPSS Statistics version 20.0 Software for statistical analysis. The qualitative variables were presented as simple and relative frequency and the quantitative variables as mean and standard deviation. In order to verify the significance of the association between the categorical variables, the Chi-square or Fisher's exact test was used. The Shapiro Wilk test was performed to evaluate the hypothesis of normality of the distribution of continuous variables. As the distribution of the data was parametric, the t-test was used to evaluate the differences of means of acute lumbar pain intensity between the experimental and control groups before and after the application of the foot reflexology protocol. The Wilcoxon test (non-parametric data) was used to evaluate the Visual and Analog Scale of Pain Intensity Evaluation between the experimental and control groups
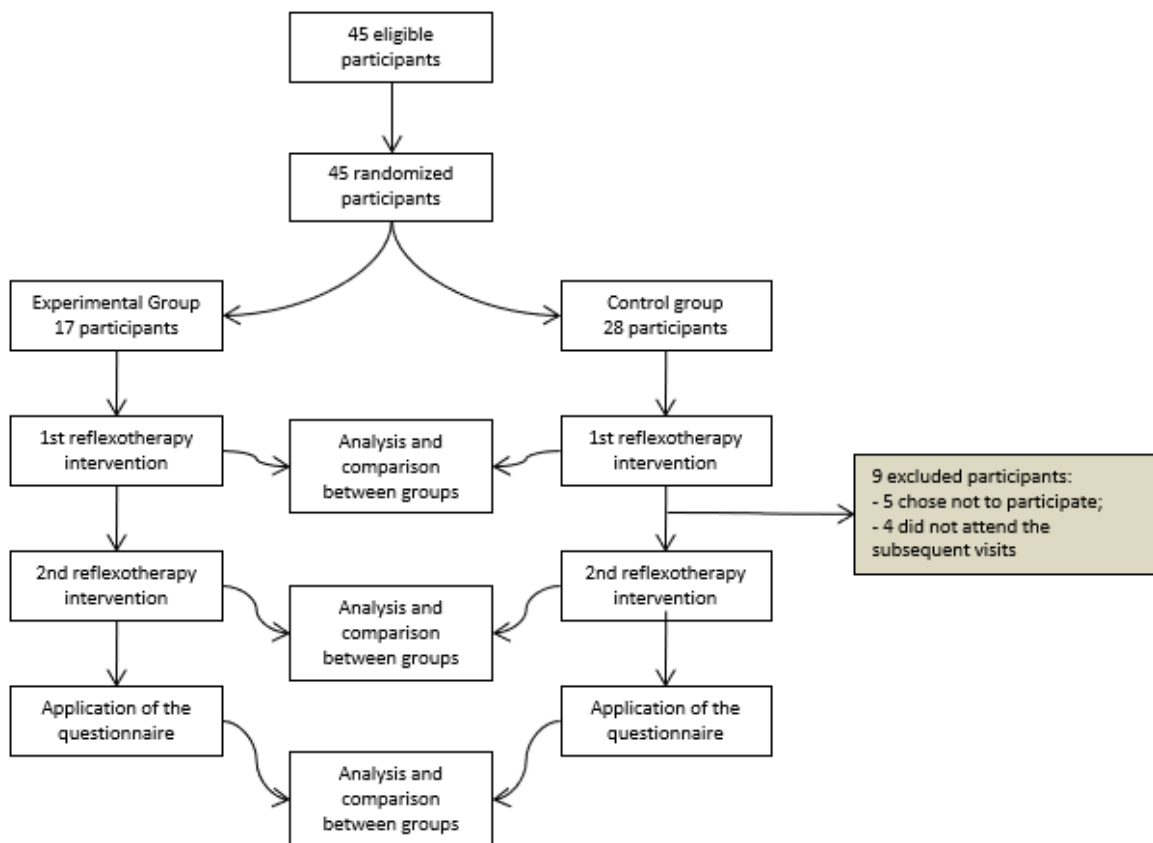

Figure 1. Participant flow diagram and data analysis for each step of the research (Florianópolis - SC - Brazil - 2016).

before and after the application of the foot reflexology protocol. The significance level of p<0.05 for a 95% confidence interval (CI) was adopted in this study.

The research was carried out in a Southern Hospital of the country, after approval of the Ethics Committee in research, in the year 2016, with the number 1,512,978 and registered in the Brazilian Registry of Clinical Trials (ReBEC) under the number RBR-5ndq22.

RESULTS

The study was completed with a total of 36 participants, including: 16 nurses, 18 nursing technicians and two assistants. The sociodemographic characteristics of the sample studied are shown in Table 1.

The sociodemographic characteristics of the study participants are shown in table 2 and the results descriptions are separated according to the numerical variables obtained between the control and experimental groups. When using the VAS instrument to obtain data on the effects achieved with the application of foot reflexology in acute occupational low back pain, the results presented in table 3 were obtained.

To compare the effects promoted in acute occupational low back pain, after two interventions with foot reflexology, the questionnaire was used for low back pain (13), and the results obtained were presented in table 4.

DISCUSSION

The effects achieved with foot reflexology for the relief of acute occupational low back pain of the nursing team presented a statistically significant result (p=0.0001) among the sample groups. The protocol applied in both groups respected the same points and maneuvers, but the intensity of the stimulus given in the reflex areas was different[7]. The experimental group received the protocol with firm and deep movements, and in the control group the stimuli were light and superficial. Thus, it is understood that the precise touch, firm and sure in the reflex points is determinant to guarantee the effectiveness of the practice, favoring the achievement of the intended results with the intervention[7,13]. Acute pain has the function of alerting and preserving life and is also one of the factors that promote the limitations of individuals, generating negative impact on routine activities[13]. For this pain, foot reflexology showed a significant difference in the very first intervention between the sample groups, with median of 0 (minimum value of 0 and maximum of 4) of pain intensity, including maintaining the effects over three (3) days after each intervention.

The results showed gradual effects on pain reduction in the experimental group, a fact that did not occur in the control group. This group maintained the same median intensity of acute low back pain throughout the intervention.

The results in other studies indicate that reflexotherapy promotes pain relief, but more chronic pain is contextualized[14], and the time of intervention with reflexotherapy extends on average from 4 to 12 sessions to observe results[15,18-19].

The relief of acute low back pain in this study allowed us to reflect on the incentive of the technique's applicability in the acute phase to avoid the progression of pain to sub-acute and chronic stages[13-16]. This type of pain

Table 1. Distribution of sample groups of foot reflexology according to categorical variables. Florianópolis – SC, 2016

Variable	Factor	Experimental group (n= 17)		Control group (n= 19)		Total (n=36)		P*
		N	%	N	%	N	%	
Sex	Female	16	94,1	16	84,2	32	88,9	0,345
	Male	1	5,9	3	15,8	4	11,1	
Workload (hours)	30	7	41,2	11	57,9	18	50	0,062
	36	0	0,0	1	5,3	1	2,8	
	40	7	41,2	1	5,3	8	22,2	
	48	1	5,9	0	0,0	1	2,8	
	50	1	5,9	0	0,0	1	2,8	
	60	1	5,9	5	26,3	6	16,7	
	70	0	0,0	1	5,3	1	2,8	
Daily hours of work	6	7	41,2		57,9	18	50	0,026
	8	8	47,1	1	5,3	9	25	
	12	2	11,8	6	31,6	8	22,2	
	14	0	0,0	1	5,3	1	2,8	
Work unit	Medical clinic	2	11,8	9	47,4	11	30,6	0,003
	Outpatient clinic	6	35,3	0	0,0	6	16,7	
	Research Center	3	17,6	0	0,0	3	8,3	
	Inpatient unit	6	35,3	8	42,1	14	38,9	
	Emergency	0	0,0	2	10,5	2	5,6	
Practice exercises	Yes	5	29,4	7	36,8	12	33,3	0,454
	No	12	70,6	12	63,2	24	66,7	
Medicine use	Yes	9	52,9	4	21,1	13	36,1	0,050
	No	8	47,1	15	78,9	23	63,9	

* Pearson's chi-square test or Fisher's exact test.

Table 2. Distribution of the sample group of the foot reflexology according to numerical variables. Florianópolis – SC, 2016

Variable	Experimental group (n= 17)	Control group (n= 19)	Total (n=36)	p*
	Média ± Desvio padrão	Média ± Desvio padrão	Média ± Desvio padrão	
Age	48,76 ± 9,82	37,05 ± 8,56	42,58 ± 10,81	0,001
Workload (weekly-hours)	38,12 ± 8,67	40,84 ± 14,92	39,56 ± 12,27	0,503
Length of service (years of occupation)	23,35 ± 12,30	13,00 ± 8,55	17,89 ± 11,59	0,006
Length of service (years in the industry)	17,67 ± 9,46	9,37 ± 6,66	13,33 ± 9,04	0,004
Travel time (home-work-minutes)	38,53 ± 24,28	40,53 ± 21,85	39,58 ± 22,72	0,798

* Independent samples T-test.

Table 3. Results presented by the application of the Visual and Analog Scale of Intensity of Pain – VAS. Florianópolis – SC, 2016

Research phase	Groups		p*
	Experimental	Control	
Início da pesquisa	5 (3-8)	4 (2-7)	
Immediately after the first intervention	O (0-4)	4 (1-7)	0,000
72 hours after the 1st application and before the 2nd application	3 (2-7)	4 (3-8)	0,362
Immediately after the 2nd application	0 (0-1)	4(2-7)	0,000
72 hours after the 2nd application	1 (0-3)	4 (2-7)	0,000

Results expressed as median (minimum value-maximum value). * Wilcoxon test.

Table 4. Results presented by the application of the questionnaire for low back pain. Florianópolis – SC, 2016

Search factor	Experimental	Control	P*
1st day (before the 1st application)	40,00 ± 4,264	38,26 ± 3,533	
9th day (after all applications)	20,76 ± 3,064	41,84 ± 3,636	0,0001

Results expressed as Mean ± Standard Deviation. * T test of independent samples.

begins with the release of algogenic substances at the affected site, which stimulate the nociceptors of myelinated fibers of small caliber or unmyelinated fibers. These structures then drive the pain stimulus generated to the dorsal horn of the spinal cord, exciting several nerve endings along the transmission path. When stimulated for a long time, these pathways may begin to develop another stage of pain, the sub-acute; if there is not adequate intervention, it can progress to chronic pain[13].

Low back pain interferes with the well-being, mood, health, and productivity of hospital workers. Collaborating factors for the maintenance of this clinical picture are defined as inadequate posture (in patient mobilization) and static, besides the ergonomic and environmental conditions, such as furniture, equipment and the structure of the workplace[3,6]. Thus, it is understood that intervention for the relief of acute pain can reduce absenteeism, improve the movements and the capacity of attention to the service provided to the patient, besides promoting the professional well-being and improvement of attention to the inducing factors of the disorders osteomuscular or occupational pain providers[16-17].

Studies have shown that the stimulus at reflex points influences not only pain reduction[15,18], but also heart rate, blood pressure and anxiety[20], inducing relaxation, which contributes to decrease the symptoms of disorders and chronic and acute diseases[15,18-19]. The efficacy presented by the study protocol can be based on the effect of modulation of the nervous system, when submitted to reflexotherapy.

Evidence-based studies indicate that the manipulation of reflex points enables modulation of the nervous system. In turn, the stimulation of these points helps to regulate the systems that are under unconscious control (respiration, heartbeat, blood pressure) and that are responsive to the physical and emotional

states of the human being[17,20]. Vagal modulation promotes relaxing, soothing changes and regulates sympathetic modulation, which responds by arousal. There are descriptions that physical, mental, and emotional effects occur through induction of somatic and sensory activity, which were observed through imaging, in which the propagation of nerve impulses showed the occurrence of nerve stimuli between the corresponding parts of the body[17-20].

Regarding the discussion of possible mechanisms of action of reflexotherapy, researchers point out that pain relief and muscle relaxation are caused by the release of opioids and endorphins, as a response to the stimuli generated in the technique. Skin-to-skin contact promotes the release of oxytocin, which acts in the autonomic and cardiovascular systems. Oxytocin has an alpha-adrenergic action and reduces the release of catecholamine (pituitary-adrenal-hypothalamic action) and results in reduction of heart rate and blood pressure, and improvement of vagal function – relaxation, well-being, and anxiety reduction[12,20].

Another physiological explanation for the effectiveness of reflexotherapy is the hemodynamic effect achieved by improving blood circulation in organs, viscera and tissues, which facilitates oxygenation and an adequate flow of blood in muscles and tendons[6-7,10,20]. Consequently, the effect achieved contributes to the occurrence of homeostasis and to the recovery of organic weaknesses, as well as to help in other symptoms involved with low back pain, such as reduction of edema, difficulty in limb movement and pain relief[7,15,18-19].

A relevant fact that the study brought, and which is in agreement with other research, was that the highest incidence of back pain occurs between 20 and 40 years of age, that is, at the apex of professional productivity. This condition can further favor the development of pain and injuries in professionals, since, besides being exposed to physical factors, they also face stressful situations, such as high demands on routine tasks, which make them susceptible to WRMD, in addition to the age issue[7,10,15].

CONCLUSION

This study provided evidence of the efficacy of foot reflexology, with a positive impact for reducing the intensity of acute low back pain caused by WRMD in nursing staff working in hospital settings.

In the comparisons between control and experimental group, there was a significant difference in the effects of the reduction of acute low back pain in all intervention sessions with the practice in the data obtained by the VAS instrument (p=0.000). There was also statistical significance for the efficacy of the protocol applied in the study, when the results were evaluated at the beginning (1st day), without previous intervention, compared to the last day (9th day), when using the Questionnaire for low back pain (p= 0,0001). It is ensured, from the results of this study, that the type of touch, intensity and precision of the stimuli exerted in the practice of reflexotherapy directly influence the efficacy of the technique. Therefore, it is understood that the stimulus generated at the reflex points needs to be firm and deep, and the location of the points must be well delimited

to achieve the desired effects. In addition, it should be noted that the technique does not require the use of instruments or any object to carry them out.

It is concluded that, despite the small sample, the study indicates effects relevant to the applicability of the practice in acute pain related to the work of the nursing team. However, it is necessary to highlight the need for the development of new clinical studies and others that contribute to the production of information about effects and applicability of foot reflexology, regarding the therapeutic possibilities in which the practice is indicated. Because it is considered a millenarian practice, it is believed that there is much content to be explored in bibliographical, systematic reviews, technological works and clinical research in favor of the construction of foundations of the benefits of the technique.

As limitations, it should be noted that similar studies were not found to broaden the discussion of the results, since the present research was characterized by the immediate and short-term evaluation of the intervention with reflexotherapy for acute low back pain. The inconstancy in the working hours of the participants was also a point that made attendance difficult at all stages of the investigation, causing loss and limitation of the sample.

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All authors participated in the phases of this publication in one or more of the following steps, in according to the recommendations of the International Committee of Medical Journal Editors (ICMJE, 2013): (a) substantial involvement in the planning or preparation of the manuscript or in the collection, analysis or interpretation of data; (b) preparation of the manuscript or conducting critical revision of intellectual content; (c) approval of the version submitted of this manuscript. All authors declare for the appropriate purposes that the responsibilities related to all aspects of the manuscript submitted to OBJN are yours. They ensure that issues related to the accuracy or integrity of any part of the article were properly investigated and resolved. Therefore, they exempt the OBJN of any participation whatsoever in any imbroglios concerning the content under consideration. All authors declare that they have no conflict of interest of financial or personal nature concerning this manuscript which may influence the writing and/or interpretation of the findings. This statement has been digitally signed by all authors as recommended by the ICMJE, whose model is available in http://www.objnursing.uff.br/normas/DUDE_eng_13-06-2013.pdf