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www.elsevier.com/locate/issn/20954964

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● Research Article

Effects of self-administered exercises based on Tuina techniques on musculoskeletal disorders of professional orchestra musicians: a randomized controlled trial

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ABSTRACT

BACKGROUND: Musicians are frequently affected by playing-related musculoskeletal disorders (PRMD). Common solutions used by Western medicine to treat musculoskeletal pain include rehabilitation programs and drugs, but their results are sometimes disappointing.

OBJECTIVE: To study the effects of self-administered exercises based on Tuina techniques on the pain intensity caused by PRMD of professional orchestra musicians, using numeric visual scale (NVS).

DESIGN, SETTING, PARTICIPANTS AND INTERVENTIONS: We performed a prospective, controlled, single-blinded, randomized study with musicians suffering from PRMD. Participating musicians were randomly distributed into the experimental ($n = 39$) and the control ($n = 30$) groups. After an individual diagnostic assessment, specific Tuina self-administered exercises were developed and taught to the participants. Musicians were instructed to repeat the exercises every day for 3 weeks.

MAIN OUTCOME MEASURES: Pain intensity was measured by NVS before the intervention and after 1, 3, 5, 10, 15 and 20 d of treatment. The procedure was the same for the control group, however the Tuina exercises were executed in points away from the commonly-used acupuncture points.

RESULTS: In the treatment group, but not the control group, pain intensity was significantly reduced on days 1, 3, 5, 10, 15 and 20.

CONCLUSION: The results obtained are consistent with the hypothesis that self-administered exercises based on Tuina techniques could help professional musicians controlling the pain caused by PRMD. Although our results are very promising, further studies are needed employing a larger sample size and double blinding designs.

Keywords: Tuina; musculoskeletal disorders; professional orchestra musicians; randomized controlled trial

Citation: Sousa CM, Coimbra D, Machado J, Greten HJ. Effects of self-administered exercises based on Tuina techniques on musculoskeletal disorders of professional orchestra musicians: a randomized controlled trial. *J Integr Med*. 2015; 13(5): 314–318.

[http://dx.doi.org/10.1016/S2095-4964\(15\)60194-7](http://dx.doi.org/10.1016/S2095-4964(15)60194-7)

Received March 30, 2015; accepted May 28, 2015.

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1 Introduction

It is an established fact that musicians are frequently affected by specific work-related musculoskeletal disorders^[1]. According to Zaza^[2], the prevalence of playing-related musculoskeletal disorders (PRMD) in musicians ranged from 39% to 87% in adult musicians and from 34% to 62% in high school music students. More recent data suggest that the percentage of affected musicians ranged between 64% and 94%^[3-7].

Common PRMD include overuse complaints, entrapment neuropathies and occupational hand cramp^[8]; areas of frequent complaints include the neck, shoulder, arm and wrist^[9-11]. Those injuries can cause symptoms ranging from slight to severe pain^[12]. The combination of a variety of stressors, including unrelieved muscular tension, repetitive movements, lack of ergonomic precautions and preventive wellness behaviors, self-imposed pressures and psychological stressors, musicians' individual characteristics, previous trauma, environmental conditions could individually or in concert contribute to the development of PRMD^[13-16].

Common solutions used by Western medicine to treat PRMD include rehabilitation programs and drugs, such as local injection of steroids, non-steroidal anti-inflammatory drugs, opioids, local anesthetics and drug combinations^[17,18]. Almost half (49%) of orchestra musicians admit to use paracetamol to control their symptoms^[19]; however, many drugs are ineffective at reducing pain, and only offer modest and brief improvements to the musicians' quality of life^[18]. More than half (64%) of orchestra musicians also report they had been examined or treated by a health care professional, like a physiotherapist^[19]. In many rehabilitation programs, it is recommended that the musicians refrain from playing^[20] for 2 to 7 d, depending on the complaints^[21].

Frequently, as the disease develops, musicians tend to underestimate their symptoms. This fact could possibly be explained by the fear of losing their job, or professional setbacks resulting from reduced practice schedule required by rehabilitation programs^[22].

Traditional Chinese medicine (TCM) is defined by the Heidelberg model as a system of sensations and findings designed to establish the functional state of the body^[23]. This state could be treated using acupuncture, Chinese pharmacotherapy, Qigong, dietetics or Tuina^[24].

Tuina is the abbreviated name of the Chinese manual therapy “*tui na an mo*”. There are more than 50 classic techniques, however there are four components that could be mixed within these techniques: pressure, vibration, moving and warming. The proper component must be chosen in accordance with the TCM diagnosis^[25].

Despite the absence of strong methodological research into the effects of Tuina therapy in pain conditions, studies suggest that Tuina can diminish musculoskeletal pain. A

literature review done by Kong *et al*^[26] indicates that Tuina can provide effective treatment for patients with low back pain. According to Cen *et al*^[27], Tuina techniques and a home-based self-administered exercise program can significantly reduce neck pain. Tuina techniques also have been effective in pain conditions such as cervical spondylosis^[28], lumbar intervertebral disc herniation^[29] and labor^[30].

The aim of the present research is to study the effects of a self-management program, based on Tuina exercises, on pain intensity caused by PRMD in professional orchestra musicians.

2 Methods

2.1 Design and study group

The study was a prospective, controlled, single-blinded, randomized experiment approved by the Ethical Commission of Institute of Biomedical Sciences Abel Salazar, University of Porto.

One hundred and sixty-two professional orchestra musicians from the three professional orchestras from the North of Portugal (*Orquestra Nacional do Porto Casa da Música, Orquestra Filarmónica das Beiras and Orquestra do Norte – Portugal*) were invited to participate in the research. Of those, 112 agreed to be screened and were randomly distributed into experimental or control group (randomization by coin flip).

Of those, 69 cooperated and fulfilled the inclusion criteria of exhibiting playing-related musculoskeletal disorders, as diagnosed by a physiotherapist. The musculoskeletal pain also must be present during at least three weeks. Thirty-nine musicians were included into the experimental group and 30 musicians into the control group. The recruitment process is exposed into the following flow chart (Figure 1).

2.2 Intervention

Specific complaints and their respective pain intensity were assessed through Numeric Verbal Scale (NVS), and by semi-structured baseline interviews. After a practitioner with more than 30 years of experience performed tongue and pulse diagnoses, treatment points were selected.

Tuina exercises were based mainly on Tui techniques (consisting of high-frequency pressure and vibration) on the selected points.

Point location and the Tui technique were individually taught to all participants for self-management of PRMD. Musicians were recommended to repeat the exercises twice a day or more often, according to their requirements.

Pain intensity (measured by NVS) and the frequency of practice were appraised by telephone after 1, 3, 5, 10, 15 and 20 d. If the participant communicated any doubt regarding performance of the prescribed exercises, an appointment was arranged immediately. The control group procedure was the same, but the Tuina exercises were done

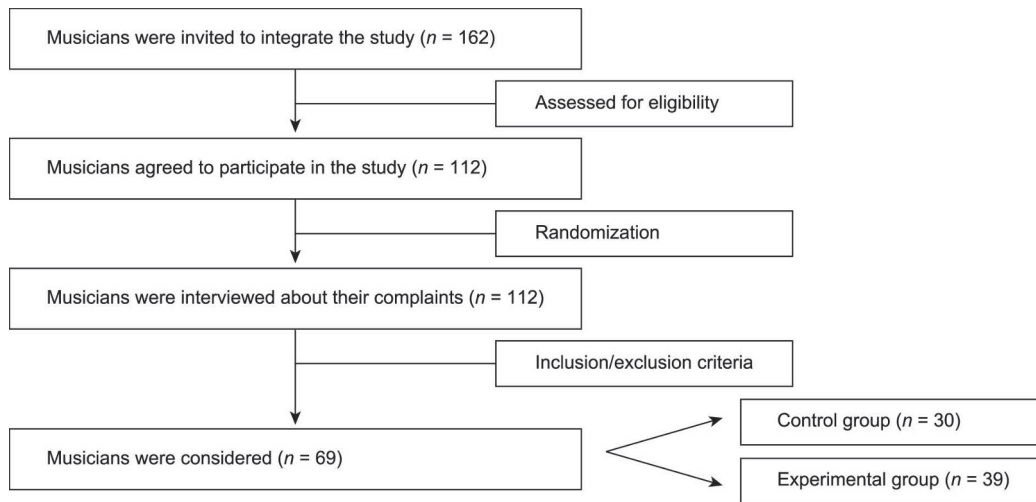


Figure 1 Recruitment flow chart

in points away from the commonly used acupuncture points. As this was a single-blinded study, the participants did not know which treatment they received.

2.3 Statistical analyses

The Mann-Whitney test was used to analyze data between groups during the different days of the follow-up evaluations^[31]. The analysis was done using SPSS 21 (version 21.0, SPSS Inc., Chicago, Illinois, USA).

3 Results

3.1 Sample characteristics

The study population included 69 musicians distributed into experimental ($n = 39$) and control groups ($n = 30$). As showed in Table 1, groups were equivalent in terms of demographic data and played instruments.

Of the complaints reported during the patient intakes, 56.8% affected the spine, mainly the cervical (26.6%) and the lumbar regions (24.3%), and 27% affected the shoulder joint (16.2% left shoulder and 10.8% right shoulder).

Complains affecting the arm, forearm, wrist, hand, fingers and face were less common, together comprising 16.2% of complaints.

3.2 Pain intensity

Baseline pain was measured using NVS. The experimental group presented an average of 5.03 (standard deviation = 1.87) NVS value while the control group presented an average of 3.8 (standard deviation = 1.8) (Figure 2). The values at baseline were not statistically different ($P = 0.51$).

As Table 2 shows, pain was significantly lower in the experimental group compared to the control group on day 1 ($P < 0.0001$), day 3 ($P < 0.000$) and day 5 ($P = 0.002$). The difference between groups is significant on day 10 ($P < 0.000$), on day 15 ($P < 0.000$) and on day 20 ($P = 0.004$).

Results showed that NVS value of patients in the experimental group was variable, but dropped 70% on day 1 and remained low throughout the 20-day experimental period (Tables 2 and 3). Within the control group, pain remained fairly constant throughout the experimental period (Tables 2 and 3).

Table 1 Sample characteristics

Group	n	Male	Female	Age (mean ± standard deviation, years)	String	Wind	Percussion
Experimental	39	26 (67%)	13 (33%)	38.9±9.4	27 (69%)	11 (28%)	1 (3%)
Control	30	18 (60%)	12 (40%)	36.0±9.5	22 (73%)	7 (23%)	1 (4%)

Table 2 NVS values

Group	n	NVS value					
		Day 1	Day 3	Day 5	Day 10	Day 15	Day 20
Experimental	39	1.5±2.0**	1.8±1.8**	2.3±1.9**	1.9±1.7**	2.0±1.8**	2.4±2.0**
Control	30	4.0±2.0	3.6±1.9	3.9±2.1	3.8±2.1	3.9±2.2	4.0±2.3

Data are presented as mean ± standard deviation. ** $P < 0.01$, vs control group. NVS: numeric visual scale.

Table 3 Pain variation within groups

Group	n	NVS value variation compared to baseline					
		Day 1	Day 3	Day 5	Day 10	Day 15	Day 20
Experimental	39	-70%	-64%	-44%	-62%	-60%	-52%
Control	30	+5%	-5%	+2%	0%	+2%	+5%

NVS: numeric visual scale.

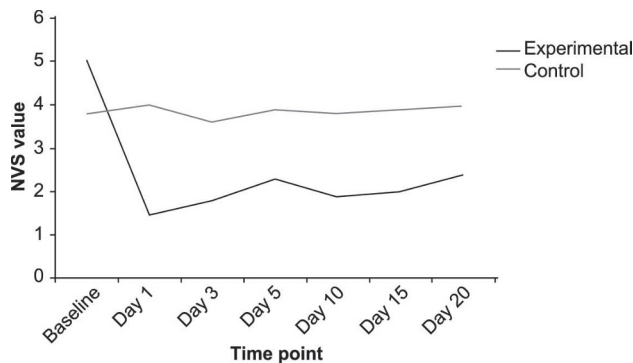


Figure 2 NVS value variation across time
NVS: numeric visual scale.

4 Discussion

According to our results, self-administered exercises based on Tuina techniques effectively reduced pain caused by PRMD in professional orchestra musicians.

At baseline the control and experimental groups presented similar pain intensity. On days 1, 3, 5, 10, 15 and 20 the treatment group had significantly lower NVS values than the control group (Tables 2 and 3).

Within the experimental group, pain reduction was always greater than 44%. Within the control group, pain was reduced by a maximum of 5% but also increased by 5% on days 1 and 20.

We consider that all the exercises were done with acceptable Tui techniques on the correct points.

Our results may have several explanations. In our sample 56.8% of the complaints were related to pain in the spine. According to the literature, Tuina techniques are especially effective at reducing lumbar and cervical pain^[26-29].

Into this research we rejected the usage of treatment protocols. According to the Heidelberg model of Chinese medicine, the application of protocol treatments highly reduces the success of the treatment^[23-25]. The treatment points were chosen according to the individual Chinese diagnosis. We can speculate that the rejection of a treatment protocol could highly contribute to our results.

The prescribed exercises were mainly based on Tui techniques. According to the literature, the pressure vibrating components of those techniques help to loosen spasms of muscles and tendons. From a Western medical view, these

symptoms may be caused by mast cell substance P^[24,25].

We advised the musicians to repeat the exercises twice a day or as required, according to their needs. During the first week most of the participants repeated the exercises twice a day. After one week most of the musicians of the experimental group felt much better and repeated the exercises just once a day. Musicians of the control group were slightly demotivated and often did not perform the exercises on a daily basis. We always encouraged both groups to repeat the exercises daily but the compliance of the control group was inferior to the experimental group.

5 Conclusion

According to our results, self-administered exercises based on Tuina techniques effectively reduced musculoskeletal pain caused by PRMD in professional orchestra musicians from the North of Portugal.

In this study only the musicians were blinded, thus we cannot exclude the intention to treat of the TCM doctor as a confounding factor. In future investigations, double-blinding techniques must be used.

As pain is a subjective parameter, the use of only one scale is not ideal; future investigations will be needed to have more robust response variables.

Clearly further studies of the efficacy of Tuina techniques for treatment of professional groups exposed to repetitive movements, such as supermarket cashiers and factory workers, would help to promote this treatment modality as a safe and effective replacement or complement to drug-based therapy.

6 Acknowledgements

The authors would like to thank the participations of all involved orchestras and musicians and to Catarina Gomes for reviewing the paper.

7 Competing interests

The authors declare that they have no competing interests.

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