● **Research Article**

Immediate effects of Tuina techniques on working-related musculoskeletal disorder of professional orchestra musicians

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ABSTRACT

BACKGROUND: Musicians are a prone group to suffer from working-related musculoskeletal disorder (WRMD). Conventional solutions to control musculoskeletal pain include pharmacological treatment and rehabilitation programs but their efficiency is sometimes disappointing.

OBJECTIVE: The aim of this research is to study the immediate effects of Tuina techniques on WRMD of professional orchestra musicians from the north of Portugal.

DESIGN, SETTING, PARTICIPANTS AND INTERVENTIONS: We performed a prospective, controlled, single-blinded, randomized study. Professional orchestra musicians with a diagnosis of WRMD were randomly distributed into the experimental group (n=39) and the control group (n=30). During an individual interview, Chinese diagnosis took place and treatment points were chosen. Real acupoints were treated by Tuina techniques into the experimental group and non-specific skin points were treated into the control group. Pain was measured by verbal numerical scale before and immediately after intervention.

RESULTS: After one treatment session, pain was reduced in 91.8% of the cases for the experimental group and 7.9% for the control group.

CONCLUSION: Although results showed that Tuina techniques are effectively reducing WRMD in professional orchestra musicians of the north of Portugal, further investigations with stronger measurements, double-blinding designs and bigger simple sizes are needed.

Keywords: diagnosis (TCM); stress; Tuina; musicians; musculoskeletal disorders

1 Introduction

Working-related musculoskeletal disorder (WRMD) is a complex syndrome involving multiple joints and muscles. They are believed to be caused by repetitive movement patterns and as a result of psychosocial factors such as stress, anxiety and others[1–4]. Musicians are known as a group of patients suffering from repetitive movements and psychological stress to an extreme level, and therefore an ideal professional group at risk of developing WRMD[5,6].

The prevalence of playing-related musculoskeletal disorder (PRMD) in musicians has been studied for several years, with studies demonstrating that almost half of musicians experience PRMD that could highly damage their careers[6]. Studies show that the prevalence of PRMD in musicians ranges from 39% to 87%[5]. Recent data from the British symphonic orchestra reported that 86% of elite professional musicians assumed to have musculoskeletal pain during the last year[7].

Conventional medicine solutions to control musculoskeletal pain include rehabilitation programs or pharmacological treatment such as paracetamol[8] but the efficiency of those medicines is sometimes disappointing[9]. Approximately one-third of the affected musicians receive recommendations to stop playing during a period of time[10]. The fear of being replaced and losing their workplace may be responsible for adopting the dangerous attitude of ignoring the pain and continuing to play without asking for advisement from colleagues, teachers or health professionals[11,12]. Often the WRMD becomes chronic and painful in such a way that will affect the performance and the musician's quality of life[6,11].

Traditional Chinese medicine (TCM) in a modern understanding is known as a model system biology based on a logically accessible theoretical background[13]. It may be understood as a systemic vegetative medicine and the usage of acupoints as a part of the same may be regarded as a model of a vegetative reflex therapy. TCM diagnosis may be understood as the evaluation of a functional vegetative state of the body leading to a proper selection of clinically successful acupoints[14,15]. Acupoints have specific clinical functions and effects[16,17] and they are connected to deeper layers of the body influencing "qi" flow[18]. Acupoints could be stimulated using acupuncture needling or using Tuina techniques[19].

Tuina is the abbreviated name of the Chinese manual therapy. In fact, the original name is "*tui na an mo*", the Chinese names for the different techniques. There are more than 50 classic forms of manipulation and four components that could be mixed within these techniques: pressure, vibration, moving and warming component[20].

Several studies show the effectiveness of Tuina in different conditions like, stress and anxiety[21], stiff neck[22], low back pain[23,24], pain caused by lumbar intervertebral disc protrusion[25] and others.

The purpose of this research is to study the immediate effects of Tuina treatment of WRMD on professional orchestra musicians from the north of Portugal.

2 Methods

2.1 Design and study group

The study was performed as a prospective, controlled, single-blinded, randomized experiment. All the participants signed and gave their informed consent according to the *Helsinki Declaration* and this research was approved by the Ethical Commission of Institute of Biomedical Sciences Abel Salazar, University of Porto.

Musicians of the three professional orchestras from the north of Portugal (*Orquestra Nacional do Porto Casa da Música, Orquestra Filarmónica das Beiras* and *Orquestra do Norte*) were invited to integrate the research (*n*=162). Of those, 112 agreed to participate and were randomly distributed into the experimental or the control group (randomization by flow a coin) as Figure 1 shows.

In this investigation only WRMD present during the moment of the evaluation was included. According to the Portuguese Ministry of Health, a professional disease is a condition directly caused by working conditions that can originate incapacity or death during the professional exercise[26]. Diseases caused by repetitive movement such as tendinitis, tenosynovitis, bursitis or problems of the spine, among others, are included. The inclusion of the complaint into the present research and the diagnostic of WRMD were done according to these criteria. After the first interview, 69 out of 112 fulfilled the inclusion criteria; 39 were assigned to the experimental group and 30 to the control group.

2.2 Measurements

The verbal numeric rating scale (VNRS) for pain intensity is one of the most frequently used scales to evaluate pain intensity[27]. The patients estimate their pain in a scale from 0 to 10, considering that 0 represents no pain, from 1 to 3 represents mild pain (nagging, annoying, interfering minimally with activities of daily living), from 4 to 6 represents moderate pain (interfering significantly with activities of daily living) and from 7 to 10 represents severe pain (disabling, unable to perform activities of daily life). This scale can be used with adults and children (> 9 years old) and in all patients able to use numbers to rate the intensity of their pain[27]. The significance of VNRS was studied by Holdgate *et al* in 2003[28]. The authors studied the agreement between the visual analog scale (VAS) and the VNRS in measuring acute pain, and measure the minimum clinically significant change in VNRS. From a total of 309 observations, the results showed that VAS and VNRS were highly correlated
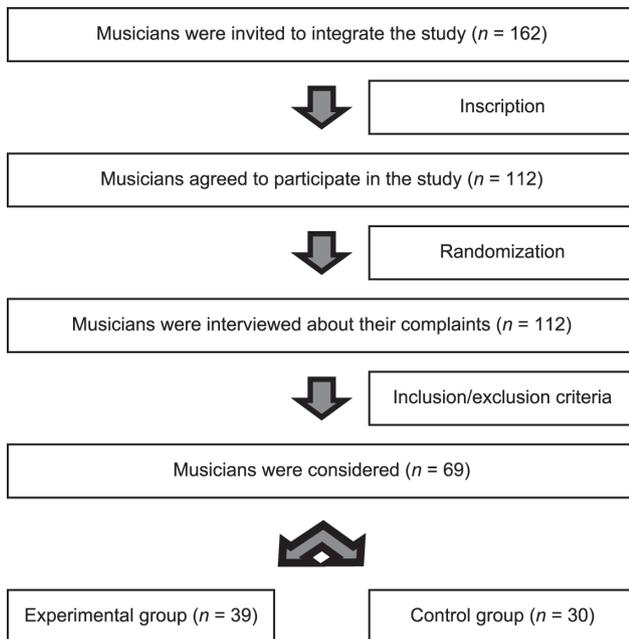
Figure 1 Recruitment flow chart

(r=0.95), however the VNRS was significantly higher than the VAS for the paired observations. The authors concluded that VNRS is a valid instrument to assess changes in pain intensity.

2.3 Intervention

Data of the personal information, the clinical history and the musicians' complaints were obtained by semistructured interviews. Complains and the respective pain intensity of the worst movement were evaluated by VNRS at the baseline. After tongue and pulse diagnoses performed by a practitioner with more than 30 years of experience, treatment points were selected. Tuina treatment was performed by a master of TCM with 3 years of experience, who received an intensive and specific training on Tuina techniques. Pain was mainly treated by Tuina techniques (consisting of pressure and vibration in a high frequency) of real acupoints in the experimental group and of non-

specific skin points on the thigh in the control group in the same manner and intensity. The amount of treated acupoints depends on the Chinese diagnosis and varies from 3 to 6 treated during approximately 5 min per point. Just one treatment session was performed. Pain intensity was measured by VNRS immediately after the treatment, to assess immediate effects. As this was a single blinded study the participants did not know in which group they were included.

2.4 Statistical analyses

Data were analyzed using IBM SPSS Statistics v.22. The Wilcoxon test was performed to analyze data within groups and Mann-Whitney test was used to analyze data between groups[29]. $P < 0.05$ was considered significant.

3 Results

3.1 Sample characteristics

Our sample was composed by 69 musicians randomly divided into the experimental (n=39) and the control group (n=30). Both groups were equivalent in terms of demographic data and played instruments (Table 1).

From the complaints present during the interview 56.8% affected the spine, mainly the cervical (26.6%) and the lumbar regions (24.3%). The shoulder joint represents 27% of the self-reported PRMD (16.2% left shoulder and 10.8% right shoulder).

3.2 Pain intensity scores

The mean of pain intensity measured by VNRS at baseline was 5.03 ± 1.87, with a maximum of 8 and a minimum of 2 for the experimental group and 3.80 ± 1.80, with a maximum of 7.5 and a minimum of 1 for the control group (Table 2). According to Mann-Whitney test the two groups are equal at the baseline ($P = 0.510$).

After treatment VNRS values decreased to 0.41 ± 1.03 with a maximum of 5 and a minimum of 0 into the experimental group and to 3.50 ± 1.78, with a maximum of 7 and a minimum of 1 into the controls (Table 2).

According to Mann-Whitney test after the first treatment there was a statistical significant difference between

**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 VNRS mean before and after treatment

(Mean ± standard deviation)

Group	n	VNRS before treatment	VNRS after treatment
Experimental	39	5.03±1.87	0.41±1.03
Control	30	3.80±1.80	3.50±1.78

VNRS: verbal numeric rating scale.

groups ($P \leq 0.001$). Within the experimental group, pain was reduced by an average of 91.8% ($P \leq 0.001$) whereas within the control group pain was reduced 7.9% ($P=0.008$) (Figure 2).
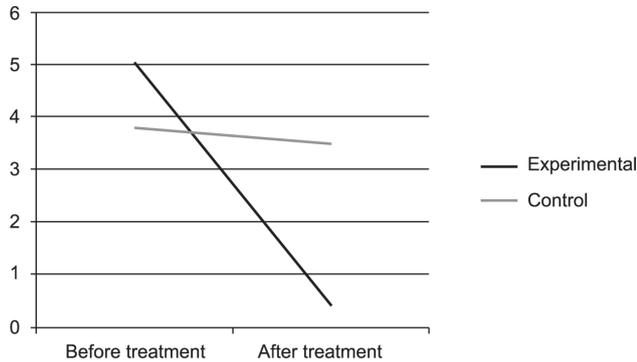
Figure 2 Score variation in verbal numeric rating scale before and after treatment

4 Discussion

According to our results, Tuina techniques demonstrated to be effective in reducing musculoskeletal pain in professional orchestra musicians. By analyzing data between groups, results show a statistically significant difference between the experimental group and the control group immediately after the first treatment ($P \leq 0.001$).

Several investigations demonstrate the effectiveness of Tuina in reducing musculoskeletal pain[22–25]. In this research we used Tuina techniques to control musculoskeletal pain. Tuina consists of pressure and vibration in a high frequency. It is expected that the vibrating component loosens spasms of the conduits muscles and tendons caused by agent ventus, decreasing musculoskeletal pain as the results showed[19]. Ventus is defined as signs and symptoms as if we had been exposed to a draught of air, such as spastic muscle, warm skin and tense muscles. From a Western medical view, these symptoms may originate from mast cell substance P reflexes and old reflexes of motor control as known from fish and other species[20,21]. According to our data, musculoskeletal pain was reduced by an average of 91.8% in the experimental group.

We can speculate that the Chinese diagnosis performed at the baseline could highly contribute to those expressive results. According to the Heidelberg model of Chinese medicine, diagnosis is the most important aspect of Chinese medicine. If the diagnosis is correct, the success of therapy is highly increased. Chinese diagnosis must be individual and the use of treatment protocols must be rejected[18–20]. Within this research we excluded the usage of protocols, and treatment points were chosen according to the actual functional vegetative state of the musicians.

We are aware that this option does not allow a complete standardized investigation, nevertheless we believe that the use of protocols could diminish the success rate of results.

Despite musculoskeletal pain was reduced almost 92% in the experimental group, and only almost 8% in the control group, results showed a significant difference within the experimental ($P \leq 0.001$) group and the control group ($P = 0.008$). We consider that the statistical difference within the control group are not clinically expressive or relevant to the daily practice comparing with the enormous difference expressed by the experimental group. We can also speculate that musicians are expected to get better with Tuina treatment and this result could be the expression of minimum placebo effects.

The lack of follow-up data is an assumed limitation of our study, although the aim of this research was to study only the immediate effects of Tuina techniques in WRMD of professional orchestra musicians.

5 Conclusion

According to our results Tuina techniques demonstrated to be effective in reducing WRMD in professional orchestra musicians of the north of Portugal.

As this is only a single-blinded study, we cannot exclude the intention-to-treat of the TCM doctor. In future investigations, double blinding techniques must be used.

Despite pain is a subjective parameter to measure, we are aware that we used one scale only. In future research stronger pain measurements could be added.

We speculate that, these results could be reproduced in other professional groups exposed to repetitive movements such as supermarket cashiers, industry employments, and others. Further randomized controlled trials based on this methodology could be performed in different conditions and professional groups allowing bigger sample sizes.

6 Acknowledgements

7 Competing interests

The authors declare that they have no competing interests.

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