PHYSIOTHERAPY OF PLAYING-RELATED NECK PAIN IN PIANISTS

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ABSTRACT
Introduction: Professional musial performance requires static postures and repetitive movements that may cause musculoskeletal problems in performers. Pianists are especially at risk for these disorders. Scarce studies have looked at the usefulness of physiotherapy in pianists suffering from neck pain.
Methodology: The aim of this study was to compare the effectiveness of two physiotherapy interventions in the treatment of playing-related neck pain in pianists: 1) a home exercise program, 2) supervised exercise with manual therapy techniques. Twenty-six pianists diagnosed with neck pain were randomly assigned to one of these two groups. The physiotherapy protocol involved 12 treatment sessions over a 6-week period. Participants in the first group performed exercises focusing on normalizing neck range of motion, strengthening the neck musculature, stretching to decrease tightness, and patient education. Participants in the second group received the same exercise protocol with the addition of spine joint mobilization and manual muscle techniques. Main outcome measures included 24-hour pain (Visual Analogue Scale – VAS), neck active range of motion (AROM), and function Neck Disability Index (NDI).
Results: The statistical analyses were carried out using an SPSS package. Repeated-measures analyses indicated significant decreases in pain, improved function, and increases in AROM. Univariate analyses on the change from pre- to post-treatment for each dependent variable found statistically significant differences ($\alpha \leq .05$) between the two groups. The second group had a higher level of change from pre- to post-treatment on pain measures (VAS), NDI, and in AROM, in comparison with the first group.
Conclusions: This study suggests that performing manual therapy techniques in combination with a supervised exercise program may result in a greater decrease in pain and improved function, although studies with larger samples are needed.

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INTRODUCTION

To play a musical instrument at a highly professional level is an extremely complex motor skill. The regular daily training loads resulting from practice, rehearsals, and performances place great demands on the body's neuromuscular system. As a result, performance-related musculoskeletal dysfunctions are recognized in the international literature as common among professional orchestral musicians (Chan & Ackermann, 2014).

Myofascial pain is a common cause (20%) of back pain. It is caused by chronic microtraumatization of the muscles due to incorrect working posture, stress, anxiety, and others. The pain is local and is associated with increased tone of the painful muscle. Local trigger zones are characteristic, which generate pain and can be palpated as a seal in the muscle. Repetitive back movements involving hyperflexion and extension increase pain and paravertebral muscle tone (Milanov, 2018).

A study of the Global Burden of Disease found that neck pain ranks 21st in terms of total burden and fourth in terms of total disability; therefore, neck pain is a more serious public health problem among the population (Hoy et al., 2014).

The cervical spine is the most mobile segment of the spine, and its functional load when performing 213 basic daily activities is mainly dynamic. These are the prerequisites that make it the most vulnerable part of the spine (Gechev, 2002).

Overall, the literature has identified several factors that are likely to be associated with a worse prognosis: previous episodes of neck pain, concomitant low back pain, concomitant headaches, poor health, psychological factors (such as anxiety, worry, frustration, and depression), and work-related symptoms (such as low job satisfaction, high physical demands of the job, and little influence on the work situation) (Verwoerd et al., 2019).

The therapeutic approach to this pathology is complex. Behavioral approaches, medication, and physiotherapy are combined. The goals of physical treatment are to reduce the pain syndrome by influencing the pathogenetic factors that cause it, preserve functional fitness, maintain general activity, improve the quality of life of patients, and prevent relapses (Costello et al., 2008). In 2016, Wong et al. published a study based on 8,551 literature citations and found that therapeutic massage, mobilizations, and manipulations in the neck lead to a reduction in pain symptoms. The Research work of Albornoz-Cabello reports a significant reduction in neck pain, extension of motion range, and neck function through kinesitherapy of modified physical factors (Albornoz-Cabello et al., 2021). Application of various physiotherapeutic agents on neck pain is highly recommended by many authors, but there are limited publications on their use and effectiveness in playing-related neck pain in pianists so far.

Aim and Objectives

This research work has aimed at comparing the effectiveness of two physiotherapy interventions in the treatment of playing-related neck pain in pianists as follows:
1) home exercise program and 2) supervised exercises with manual therapy techniques until the patient's return to their normal lifestyle and work.

METHODOLOGY

This was a prospective, randomized controlled trial. After conducting an internet-based survey among pianists regarding the presence of musculoskeletal complaints and conducting a consultation with a neurologist, 32 pianists with playing-related neck pain were referred to our practice for physiotherapy.

The inclusion criteria for the study were as follows: pianists

- with playing-related neck pain, with or without unilateral UE symptoms;
- young and middle-aged – between 15 and 59 years old.

Patients were excluded with: a whiplash injury within the past 6 weeks; history of spinal tumors, spinal infection, cervical spine fracture, or previous neck surgery; diagnosis of central cervical spinal stenosis; bilateral UE symptoms; or 2 positive neurologic findings at the same nerve root level.

26 of the pianists met the inclusion criteria and signed informed consent in accordance with the requirements for patient protection (according to the Declaration of Helsinki). We used block randomization to ensure that an equal number of patients would be allocated to each treatment group. We randomly assigned these pianists scheduled for treatment to two groups (13 per study group) as follows: for example, subject №1 had an equal chance of drawing an envelope that assigned him/her to group "1" or group "2." If he/she drew "1," the card was removed. Subject №2 then had a chance to draw an envelope with group 1 or 2 from the remaining envelopes. Blocked randomization offers a simple way to achieve balance between study groups. Each subject was informed of their treatment protocol, but remained blinded to allocation to other groups to avoid subject bias. A physiotherapist with 10 years of clinical experience performed the pre- and post-treatment measurements. This assessor was blinded to the group allocation and intervention protocols. To minimize medication effects, patients were asked to continue taking medications for their neck pain as prescribed and not to start any new medications during the treatment.

The physiotherapy protocol consisted of twelve therapy sessions over a 6-week period.

The therapist trained participants in Group 1 to perform a home exercise program twice a week for 6 weeks, which included:

- *Active cervical range of motion exercises* (flexion, extension, lateral inclination - left and right, rotation - left and right) - 2 sets of 10 repetitions each exercise.
- *Isometric exercises against manual resistance* (flexion, extension, lateral inclination - left and right, rotation - left and right) - 2 sets of 10 repetitions each exercise.
- Self-post-isometric relaxation (Lewit and Simons, 1984) for the following muscles: upper trapezius; levator scapulae; pectoralis major; wrist and finger flexors. The technique is repeated 3-4 times for each muscle.
- Mulligan auto mobilization for the cervical spine (Mulligan, 2003).

Participants in *Group 2* received twice a week for 6 weeks *supervised exercise program with manual therapy techniques*, which included:

- Neck collar massage – 2 times a week for 15 minutes.
- The same exercise program under the supervision of a physiotherapist.
- Post-isometric relaxation (Lewit and Simons,

1984) or stretching for the following muscles: anterior, medial, and posterior scalenes; upper trapezius; levator scapulae; pectoralis minor and pectoralis major; wrist and finger flexors. The technique is repeated 3-4 times for each muscle.

- Spinal joint mobilization – Mulligan's Sustained Natural Apophyseal Glides (SNAG) for the cervical spine (Mulligan, 2003, 2004): SNAG technique for flexion with anterior-cranial mobilization by procesus spinosus; SNAG technique for extension and rotation with anterior-cranial mobilization by procesus spinosus; Traction; Thoracic extension mobilization seat with towel roll; Thoracic extension mobilization on chair, each technique having 2 sets of 10 repetitions.

Both groups of patients were trained in proper postural control in everyday life and while playing the piano.

Main outcome measures included 24-hour pain (Visual Analogue Scale – VAS), neck active range of motion (AROM), and function (Neck Disability Index (NDI).

RESULTS

The statistical analyses were conducted using the SPSS package. The baseline demographic and professional characteristics of the pianists are presented in Table 1.

Table 1. *Baseline demographic and professional characteristics of the pianists.*

Characteristic	Group 1 (n = 13)	Group 2 (n = 13)	Total (n = 26)
Gender, *n* (%)			
Male	10 (76.92%)	11 (84.62%)	21 (80.77%)
Female	3 (23.08%)	2 (15.38%)	5 (19.23%)
Age (years)			
Mean (SD)	34.84 (9.09)	35.76 (10.15)	35.30 (9.45)
Median (min., max.)	35 (20, 52)	35 (19, 55)	35 (19, 55)
The average duration of musical practice (years) (*SD*)	30.38 (7.29)	30.30 (8.08)	30.34 (7.54)

According to gender, a larger percentage of pianists in both groups (80.77%) are men. The average age of the studied patients is 35.30 (SD = 9.45) years, considering people between the ages of 19 and 55. The average duration of musical practice for pianists in both groups is 30.34 (SD 7.54) years. There is no statistically significant difference between the groups in terms of baseline characteristics. Univariate analyses on the change from pre- to post-treatment for each dependent variable found statistically significant differences ($\alpha \leq .05$) between the two groups. The second group had a higher level of change from pre- to post-treatment on pain measures (VAS), NDI in comparison with the first group.

Before treatment, *neck pain* over the preceding 24-hour period was rated at a median of 4.46 points (Table 2).

Table 2. *Mean values and standard deviation (SD) of the 10-point Visual Analogue Scale (VAS) of neck pain at baseline and post-treatment in both groups.*

	Baseline	Post treatment	*p*-Value	*p*-Value
	Mean (SD)	*Mean (SD)*	(within group)	(between group)
Group 1 (n = 13)	4.15 (1.28)	2.84 (1.21)	< .05	Post treatment
Group 2 (n = 13)	4.77 (1.48)	1.92 (0.95)	< .001	< .05

Comparing the data from the visual analog pain scale (VAS) at baseline and post-treatment indicates a statistically significant reduction in pain in both groups, more pronounced in the Supervised exercise with manual therapy Group 2 (p-Value within group < .001). Comparison of the scores between the two groups post-treatment showed that the group receiving manual therapy with supervised exercise had a higher level of change in pain intensity compared to the group with a home exercise program (p < .05). The difference between the groups was clinically significant.

Active range of motion (AROM) was limited in both groups at baseline. While none of the participants reported neck pain at rest, the majority (92.3%) reported pain in their neck movements, particularly in lateral flexion ipsilateral to the symptomatic cervical rotation. There were no significant differences between the groups at baseline ($p > .05$) in outcome measures (Table 3).

Table 3. *Median (interquartile range) of participants' baseline AROM (degrees) data.*

Variables	Group 1 (*n* = 13)	Group 2 (*n* = 13)	*p*-Value
Active cervical rotation ROM (degrees)			
– Ipsilateral side of pain	51.0 (48.5, 61.4)	59.5 (51.5, 62.2)	0.466
– Contralateral side of pain	51.5 (50.0, 60.9)	54.5 (49.8, 61.7)	0.803
Active cervical lateral flexion ROM (degrees)			
– Ipsilateral side of pain	27.8 (23.4, 32.1)	29.6 (25.2, 34.7)	0.374
– Contralateral side of pain	33.7 (29.9, 37.8)	34.9 (30.5, 38.6)	0.588
Active cervical flexion ROM (degrees)	38.2 (34.6, 41.9)	39.5 (36.1, 43.7)	0.427
Active cervical extension ROM (degrees)	35.4 (30.7, 39.8)	36.6 (31.9, 40.9)	0.541

Table 4. *Median (interquartile range) of participants' post-treatment AROM (degrees) data.*

Variables	Group 1 (*n* = 13)	Group 2 (*n* = 13)	*p*-Value
Active cervical rotation ROM (Normal 70-90°)			
– Ipsilateral side of pain	53.4 (49.7, 61.8)	60.7 (52.9, 74.2)	0.418
– Contralateral side of pain	54.3 (51.1, 62.5)	56.5 (50.7, 82.9)	0.646
Active cervical lateral flexion ROM (N 20-45°)			
– Ipsilateral side of pain	29.6 (25.1, 34.2)	31.4 (26.9, 36.1)	0.372
– Contralateral side of pain	35.5 (31.2, 39.0)	36.3 (32.1, 40.2)	0.591
Active cervical flexion ROM (Normal 40-60°)	40.3 (36.7, 44.1)	41.7 (37.9, 55.5)	0.429
Active cervical extension ROM (N 50-60°)	37.1 (32.4, 41.2)	38.5 (33.3, 52.6)	0.544

Changes from baseline to post-treatment within each group revealed a significant improvement in active range of motion (AROM) outcome measures in both groups (p < 0.01). However, post-treatment comparisons between the two groups (Table 4) showed no statistically significant differences (*p* > .05).

After completing the *Neck Disability Index* (NDI) questionnaire, patients in both groups reported varying degrees of pain/discomfort during various activities of daily living (Table 5). At the baseline, there was no significant difference between the two groups in the data on this indicator. Post-treatment patients in Supervised exercises with manual therapy, Group 2, showed better results in improving cervical spine function compared to patients in *Group 1.*

Table 5. *Mean values and standard deviation (SD) of the Neck Disability Index (NDI).*

	Group 1 (*n* = 13)	Group 2 (*n* = 13)	
	Mean (SD)	***Mean (SD)***	***p*-Value**
Baseline	30.3 (14.87)	26.3 (14.5)	> 0.05
Post treatment	18.46 (9.9)	10.23 (5.12)	< 0.05

At the end of treatment, we found an average of 18.46 points on the NDI or 36.92% functional limitation in G1. In G2 (Supervised exercise with manual therapy techniques), we reported 10.23 points on the NDI or 20.46% functional limitation, which is a statistically significant better recovery of functions (*p*<.05).

DISCUSSION

The analysis of the results showed that both groups had apparent efficacy in pianists with neck pain, confirming the positive effect of physiotherapy in reducing pain, improving function, and increasing cervical active range of motion better in Group 2 (Supervised exercise with manual therapy). The above data shows that in both groups the pianists studied by us have been professionally engaged in their work for many years and are significantly burdened with hours of musical activity, which creates prerequisites for work-related musculoskeletal dysfunctions, with complaints being mainly pain and discomfort in the neck area.

Our results align well with prior research: Wong et al. (2016) and Albornoz-Cabello et al. (2021) found that manual therapy combined with exercise leads to superior outcomes in neck pain management; Chan & Ackermann (2014) emphasized the high prevalence of musculoskeletal disorders in musicians, especially due to repetitive strain and poor posture; Corp et al. (2020) recommended a multimodal approach—manual therapy, exercise, and education—as best practice for neck pain treatment. Most authors' guidelines on neck pain diagnosis and treatment recommend a combination of

manual therapy, exercises, and patient education (Corp et al., 2020). As a main part of the complex treatment, physiotherapy is crucial in neck pain treatment. The main goal is posture and movement optimization, as well as strengthening the muscles in general. An important role is also played by passive physiotherapy - classical massage, connective tissue and periosteal massage, manual techniques such as PIR (post isometric relaxation) and mobilizations, stretch techniques, which act by activating the available reflex connections: cutaneous-visceral, subcutaneous-connective-tissue-visceral, proprio-visceral, periosteal-visceral, and motor-visceral and have a very good analgesic effect (Carragee et al., 2008). This study reinforces the consensus that manual therapy enhances the effectiveness of exercise-based rehabilitation, particularly in populations with repetitive strain injuries like musicians.
In the study that was done, there were visible results in both groups after the physical therapy, despite the small number of pianists studied. In our opinion, the following factors contribute to a better result in the second group: *enhanced neuromuscular feedback* – manual techniques stimulate proprioceptors and reduce muscle tone, improving movement quality; *pain modulation* – techniques like SNAGs and PIR activate reflex pathways that inhibit pain (e.g., cutaneous-visceral and motor-visceral reflexes); *improved compliance and motivation* – supervised sessions foster accountability and allow therapists to personalize care; *massage and mobilization* – these reduce muscle stiffness and improve circulation, accelerating recovery. In essence, manual therapy adds a layer of precision, personalization, and physiological benefit that amplifies the effects of exercise alone.
Clinical Implications: Manual therapy should be considered a standard adjunct to exercise programs for musicians with neck pain. Supervised sessions ensure correct technique, adherence, and allow for real-time adjustments, which may not be possible in home programs. The findings support early intervention with hands-on therapy to prevent chronicity and functional decline. Given the high prevalence of neck pain among pianists, specialized physiotherapy protocols tailored to musicians could be developed and standardized.
Strengths and limitations of this study: This study has some strengths and limitations. Strengths of the present study include a prospective study design, random assignment of patients, and one evaluator. Various limitations of the present study include a small sample size, a short treatment period, and no long-term follow-up. A significant limitation was the lack of a no-treatment or placebo control group. The importance of many factors (comorbidities, individual characteristics, etc.) cannot be fully evaluated. This can be a potential source of bias. Further research is needed to find out the pain relief and functional outcomes after physical therapy interventions with a larger sample size and longer follow-up.

CONCLUSION
This study suggests that performing manual therapy techniques in combination with a supervised exercise program may result in a greater decrease in pain and improved function, although studies with larger samples are needed.

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