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The effect of soft tissue therapy for recreational runners with non-specific low back pain

Piotr Gawda[1], Magdalena Dmoszyńska-Graniczka[2], Robert Rojewski[3], Magdalena Zawadka[4], Michał Ginszt[5]

[1,3,5]Chair and Department of Rehabilitation, Physiotherapy and Balneotherapy, the Medical University of Lublin, Poland
[2]Chair and Department of Biochemistry and Molecular Biology, Medical University of Lublin, Poland
[4]PhD student, Faculty of Health Sciences, Medical University of Lublin, Poland

Corresponding author:
Michał Ginszt
Address:
Magnoliowa 2
20-143 Lublin, Poland
+48602533723
michal.ginszt@umlub.pl

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Key words: Physiotherapy, Musculoskeletal Disorders, Manual Therapy

Abstract
Background: Many of recreational runners have not practiced running before and for years have lived sedentary lives. Non-specific low back pain may occur in this group of runners during movements of the lumbar spine while running.

Aim: Reporting of efficacy and effectiveness of manual therapy in this target group of runners was the aim of this study.
Material and methods: The study comprised of 40 recreational runners (29 males, 11 females; mean age: 42±12) training three times a week. In order to check how the training duration affected the results of treatment tree groups were compared: runners training for no longer than one month (A: 8 runners), runners training from 1 to 3 months (B: 12 runners) and runners training for more than 3 months (C: 20 runners). The pain intensity numerical scale (NRS) and finger-floor test were determined before and after therapy, which consists of myofascial release and compression technique.
Results: The significant differences in the fingers-floor test and intensity of pain before and after therapy were observed. The results of fingers-floor test decreased from 11.27 to 6.14 after therapy, and pain intensity measured by NRS decreased from 3.75 to 0.94 after therapy. The best treatment effect measured by numerical scale was achieved by runners from group B and the lowest effects in group A.
Conclusions: Non-specific low back pain physiotherapy based on soft tissue techniques is statistically highly effective for improve finger-toe flexibility and decrease the intensity of pain.

INTRODUCTION

Chronic low back pain (LBP) is one of the most important health problems worldwide. Most people will experience back pain at least once in their life. Low back pain without inflammatory or radicular symptoms, fracture, osteoporosis or infection or any other clear cause is defined as a non-specific low back pain (NSLBP) (1).

The most common cause of back pain in athletes results from a soft tissue insult. Soft tissues are muscles, ligaments or fascia (2). Muscles imbalance such as tightness of hamstrings muscles or atrophy of multifidus and quadratus lumbar muscles, as well thoracolumbar fascia dysfunctions were documented in LBP subjects (3-7). The increase of lumbar lordosis and anterior pelvic tilt during running have been previously observed (8,9). Those changes can generate stress in the lumbar-pelvic area, which can lead to low back pain.

The number of recreational runners is growing. Many of them have not practiced running before and for years have lived sedentary lives. That sudden change in activity generates higher effort on spinal muscles than a sedentary lifestyle. It is quite clear that incorrect mechanisms occurred in the musculoskeletal system appear to be responsible for the pain in recreational runners. The management of LBP comprises a range of different intervention strategies including exercise therapy, manual therapy, massage, behavioral therapy, education and others (10). A search for the most effective forms of treatment for lower back pain, a very frequent complaint reported by athletes in who overload is particularly common, is still underway (11). Restoration of the correct muscular balance as well as pelvis stability requires a specialist diagnosis followed by targeted, posture correcting therapy. The effectiveness of soft tissue therapy is not well known in the group of recreational runners suffering from LBP.

This is an uncontrolled prospective trial to determine whether applied soft tissue therapy decreases pain and increases finger-to-toe flexibility. In clinical practice, manual therapy is often combined with exercises to treat musculoskeletal disorders. In this study have been used only soft tissue techniques without exercise. It was hypothesized that after applied therapy the pain will decrease and the spinal mobility measured by the fingertip-to-floor test will increase.

MATERIALS AND METHODS

Participants

The study comprised of 40 recreational runners (29 males, 11 females; mean age: 42±12) training three times a week. The distance was dependent on the level of advancement in running training. The diagnostic investigation consisted of physical examination and case history. The diagnostic examination was performed by a physician. Informed consent was obtained from all the study subjects.

Inclusion criteria: nonspecific low back pain, which occurred only while running.

Exclusion criteria: specific spinal pathology and radicular symptoms, sacroiliac joints disorders.

In order to check how the training duration affected the results of treatment tree groups were compared: runners training for no longer than one month (A: 8 runners), runners training from 1 to 3 months (B: 12 runners) and runners training for more than 3 months (C: 20 runners). The characteristics of groups analysis did not show a significant difference ($p>0.05$) in age.

Evaluated parameters

In order to assess the pain, the Numerical Rating Scale (NRS) containing 11 degrees of pain intensity was used (12,13). The scale was from 0 to 10, 0 for the absence of pain and 10 for a maximum of pain. The pain was assessed twice, i.e. before and after the applied treatment. General spinal mobility was assessed by the fingertip-to-floor test. The distance in centimeters between the fingers and the floor was measured while the patient was in the maximum possible forward bend position while standing on the 5 cm step elevation. The fingertip-to-floor test is routinely performed in order to determine the maximum flexibility of the trunk and hamstrings as well as the fascial structures localized in the trunk and lower extremities. This is a sensitive test and thus useful for diagnostic results of spine therapy (14-17). The examined patient was asked to bend forward with the knee joints straightened up. With adequate spinal mobility, proper functioning of the sacroiliac joint, and appropriate length of the sciatic-tibial muscles, the person is able to touch the floor with his/her fingertips easily. If mobility is restricted, the distance between the pulp of the middle finger and the floor is measured. In this study, the measurement was performed twice: after the first and the last day of the therapy session. In order to check how the training duration affected the results of treatment tree groups (A, B, C) were compared.

Therapy

There is no consensus on the optimal approach to the treatment of LBP. Inflammatory drugs, behavior therapy, education, therapeutic exercises and other methods are postulated. Garvey et al. indicate that trigger points therapy seems to by useful in LBP treatment (18). Therapy was consist of myofascial release and trigger points therapy.

A single therapeutic session lasted 45 minutes. The treatment consisted of five therapeutic sessions provided in 3-day intervals. Full therapy took 17 days (5 therapeutic days and 12 days between them). Sessions based on soft tissue techniques consists of trigger points therapy (pressure held for 2 minutes) and myofascial release applied on the spine-pelvic area of multifidus and quadratus lumbar muscles.

Participants had less intensive training in this period. The conducted study allowed calculation of the dynamics of changes in the pain intensity range of motion following the applied treatment.

Data analysis

The IBM SPSS Statistics 19 was the tool of the study. We assumed statistically significant differences for $p<0.05$, while statistically highly significant differences for $p<0.01$. T-student test for dependent samples was performed to evaluate the effectiveness of manual therapy. Pearson's correlation test was performed to analyze the correlation between the intensity of pain on the NRS scale and the range of motion in the fingers-floor test. In order to check how the training duration affected the results of treatment measured by NRS and the fingers-floor test, a single factor (one-way) analysis of variance (ANOVA) was used. A statistically significant result ($p<0.05$) in ANOVA was obtained at least two of the three compared groups significantly differed from each other.

RESULTS

As presented in Table 1, the average score in the fingers-floor test was 11.27 cm at the start and 6.14 cm after treatment. The difference is remarkable, which is confirmed in the t-student test giving a highly statistically significant result. Similar results were obtained when assessing the intensity of pain on a numerical scale NRS. The mean pre-treatment result was 3.45, while only 0.94 after treatment. In addition, the difference is highly statistically significant. This confirms the high efficacy of physiotherapy in this study. In eight subjects, the pain completely disappeared (the value 0 on NRS).

Table 1. Results of the fingers-floor test and pain intensity on NRS scale before and after therapy (T-test for dependent samples)

Measurement	n	Before therapy	After therapy	T	p
The fingers-floor test	40	11.27 ±9.26	6.14 ±4.89	7.41	<0.01
NRS scale	40	3.45 ±1.23	0.94 ±0.75	18.61	<0.01

A statistical significance of correlation was found between the intensity of pain on the NRS and the fingers-floor test at the beginning of treatment (Tab. 2). The greater pain the patient experienced at the beginning of the treatment, the smaller the range of movement he or she scored in the fingers-floor test. It was also observed that a higher intensity of pain on the NRS before treatment was associated with better treatment effect measured by the fingers-floor test. The greater effect of treatment assessed by NRS scale was also associated with better results on the finger-floor test after therapy. However, there is no statistically significant correlation between the treatment effect measured by NRS, and the result of the fingers-floor test performed prior to treatment (Tab. 2).

Table 2. Correlation between the intensity of pain on the NRS and the effect of treatment measured as the range of motion in the fingers-floor test (Pearson's correlation test)

		NRS scale before treatment	Effects of treatment NRS
The fingers-floor test first day of therapy	Pearson's r	0.711	0.399
	p	<0.05	0.112
Effects of fingers-floor test last day of therapy	Pearson's r	0.792	0.888
	p	<0.05	<0.05

To see how gender affects treatment outcomes measured by NRS and fingers-floor test, t-student test for independent samples was used. Two groups were compared:

11 females and 29 males (Tab.3). It turned out the effects of treatment measured by the fingers-floor test were higher for men (5.71) than females (4.54), but this difference was not statistically significant. The effect of treatment measured by NRS was only slightly higher in men (2.74) than in women (2.39).

Table 3. The influence of gender on the effects of treatment (T- test for independent samples)

Gender	Female	Males	T	p
NRS	2.39 ±1.48	2.74 ±1.41	-0.471	0.642
Finger-floor test	4.54 ±3.53	5.71 ±4.01	-1.37	0.181

As presented in Table 4, the best treatment effect measured by NRS was achieved by runners from group B (2.77) and the lowest effect in group A (2.37). The best treatment effect measured by the fingers-floor test was observed among group B (5.35) and the lowest among trainees from group A (5.05). However, none of the differences are statistically significant (Tab. 4).

Table 4. The influence of training practice on the effects of treatment (one-way analysis of variance ANOVA)

Group	A (n=8)	B (n=12)	C (n=20)	F	p
NRS	2.37±1.47	2.77±1.89	2.64±1.78	0.421	0.661
Finger-floor test	5.05±4.38	5.35±5.10	5.20±4.88	1.938	0.163

DISCUSSION

Key findings of this study were the decrease of pain and increase of mobility of spine after applied soft tissue therapy. Recent biomechanical and ergonomic studies of the human body have given grounds for proposing appropriate forms of therapeutic rehabilitation based on selected physiotherapeutic techniques (19-21). Previous studies have investigated the effectiveness of manual therapy and trigger points therapy (22-27). Any dysfunction, such as a contracture, weakness or atrophy of a stagnant muscle, exerts an effect on the positioning of the pelvis (28), as well as on the range of motion of the locomotors apparatus. All this is bound to result in producing an incorrect running mechanism that will generate an overload in the pelvic area (29). Some movement restriction may occur between the pelvis and the trunk causing reduced coordination in the runners complaining of non-specific low back pain (30). Altered biomechanics may be connected with the runner`s age (31), whereas the running economy is dependent on the mechanical work while running (32).

Many of recreational runners have not practiced running before and for years have lived sedentary lives. Prolonged sitting position restrains the gravity load, which results in the loss of antigravity muscular activity (33). In consequence, the role of the weakened muscles, ensuring straightening up and movement control within the low back, has to be taken over by the passive structures of the spine (6,34).The spine is bound to get overloaded and, as a result, the motor control will be disturbed (35). All of this accounts for the occurrence of back pain and balance disorders that will be typically observed in those runners who decide to do long runs after many years of physical inactivity (36). The network of myofascial connections is a functional system where the vertebral column has a rudimentary role to play because all the attachments of the fascial connections responsible for maintaining the body balance are found here (37). Due to the cooperation between the agonistic and antagonistic muscles, while one side of the body is hypertonic, the other can relax. In order to function properly, the muscular system requires stable support (38). Among other things, this demand is fulfilled by other muscles and thus muscle chains are formed. Since the stability of the body relies on the feet as well, their position while standing affects the bodily resting state to a large extent (39). Incorrect feet positioning during running, which may be a result of a foot defect or improper footwear may predispose runners to foot injuries (40-

42). Although injuries to the whole muscle chain are rare, local injuries tend to spread to the total myofascial structure (43). Daily living activities e.g. prolonged sitting position, produce disproportions between the agonistic and antagonistic groups of muscles. That imbalance can generate an overload of tissue and occurrence of pain. Al of that initiates the adapted movement strategies (44). On one hand, low back pain in recreational runners can by related with the change of physical activity level and starting running training, on the other hand, it can be results of sedentary lifestyle before training. Manual therapy can restore muscle imbalance and prepare for new activity.

Forward bending flexibility seems to by related with pain intensity in runners with LBP. A possible explanation is inhibiting the influence of pain on flexion range or deficits in proprioception (45). Nociceptive information can involve some protective muscle spasm to reduce the range of motion. This is not clear if flexibility deficits are causes of pain or pain is a result of reduced mobility and muscle imbalance. These findings need to investigate in further.

There were no statistically significant differences in sex and training practice correlation with therapeutic effects in this study. That suggests that therapy result does not depend on gender and training practice.

CONCLUSIONS

Physiotherapy based on soft tissue techniques is statistically highly effective in the treatment of low back pain when the pain was caused by increased physical activity. The current study shows that soft tissue therapy alone is beneficial in treating NSLBP. These findings support the main hypothesis that soft tissue techniques displayed significant improvements in pain and spine mobility. These findings could be applied in the clinic, for the treatment of low back pain disorders. Further studies are needed for examination long-term effects of applied therapy in recreational runners.

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