

Prevention and Correction of Handball Players' Lumbar Spine Injuries

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Abstract

In performance sport, where the human limits are permanently forced, medical problems appear more often and at a higher intensity and gravity. A real problem in performance sport is interrupting sports activity for medical reasons. The most common diseases in sports games, in general and particularly in handball, are those of the lumbar spine, which have different causes. The research was done using the male players in the handball team Sports Club (CS) University Suceava, the National League, who had symptoms and pathologic signs of vertebral column which imbalanced the normal sporting activity. By using a system of stretching exercises applied in a differentiated manner, we achieved the effect of reducing lumbar pain.

Keywords: stretching, vertebral column, lumbar pain, physical exercise

Assumption - Apply an adequate system of stretching exercises can prevent lumbar pain and its causes, decreasing at the same time the manifestations of already installed diseases.

Material and method - In this paper we tried to underline the importance of stretching in lumbar pain and decreasing the pain in athletes, integrating the experimental program into the athletes' recovery program, coordinated and with the consent of the team's physiotherapist. Along the study, the students in the Physiotherapy and special motility study programme found that the athletes showed symptoms and pathologic signs of vertebral column which imbalanced the normal sporting activity. By using a system of stretching exercises applied in a differentiated manner, we achieved the effect of reducing lumbar pain.

The aim of applying the stretching exercises was to stop or to improve lumbar pain, increase joint mobility, to improve muscle tone and form a correct posture. In recovery it was taken into account the principle of working out under elongation of tense muscles (shortened) and under shortening of elongated muscles.

The used materials were: massage tables, trellis, elastic bands and electrotherapy devices, and the research took place on the premises of the "Centre for swimming and physiotherapy" of Ștefan cel Mare University of Suceava. The most important part of the practical activity took place in the gym of High School Sports Program in Suceava.

The subjects of research were 18 athletes, performance handball players of C.S. University of Suceava team.

The period of experimental research was November 2015 - June 2016, and data interpreting and conclusions were made by 15 September 2016.

Research methods: bibliographic documentation, directed observation, experiment, tests method.

Stretching is used in sport as a means of training the musculoskeletal for effort (preheating), but also at the end of the training, in order to decrease the unwanted effects of intense requests of muscles. It is used largely in all sportive games, but also in gymnastics, athletics, swimming, box, and so on.

Bibliographic documentation for the research focuses on the opinions of the best known authors in this field. So, according to Bob Anderson's opinion, "stretching keep muscle supple, prepares you for movement and helps you make the daily transition from inactivity to a vigorous activity, without an exaggerated effort" (2007, p 12). Stretching before and after work-out helps to maintain flexibility, decreases stress, has a role in elimination of toxins, activates the secretion of synovial fluid and prevents common accidents. Stretching exercises increase strength and muscular resistance, stimulate blood circulation and nutrients, leading to strengthening the bone system.

By stretching, according to several specialists (Moțet, 2010; Baci, 1981; Leuciuc, 2012), we try to achieve the following effects:

- favorable recovery after injuries;
- decrease of lumbar pain;
- improvement of joint flexibility;
- decrease of acute muscular pains after effort (muscle soreness);
- reduction of muscle spasm (convulsion spasms);

- maintaining correct posture;
- favorable the transport of oxygen and nutrients to the cell;
- maintaining normal range of movement at joints' level;
- stimulation of blood circulation and lymphatic circulation;
- breathing improvement.

A stretching session should start with performing some exercises of moderate intensity, which engages progressively the muscle and ligaments. The method involves an exercise system of maintaining a segment in a certain position, for a limited time period (10-15 seconds for beginners, 20-30 seconds for advanced), with the role of successive stretching of a muscle or a muscle group and their training for the effort to come (Ylinen, 2008; Jenkins, 2001).

Classification of stretching exercises (Leuciuc, 2012):

1. *Isometric Stretching* – in maximum position of passive stretch, individual makes an isometric contraction of the stretched muscle for maximum 6 seconds at maximum intensity, followed by relaxation and passive stretching performed at pain's limit.

2. *Dynamic Stretching* – it is performed in movement, each position is maintained for less than a second; it usually uses the centrifugal force to stretch a muscle.

3. *Active Stretching* - it is performed voluntarily, by isometric contraction of agonist muscles without external help.

4. *Passive Stretching* - it is performed through an external force: performed by a partner/therapist or passive self-stretching.

5. *Ballistic stretching* – consists in dynamic contractions of some agonist muscles, performed to achieve a short term stretching of antagonist muscles.

Stretching can be applied in a large area of diseases/trauma from tensed muscle: trunk muscles, upper and lower limb muscles.

The vertebral column is composed from 33 spinal vertebrae which act unitary in order to maintain the verticality, spinal cord protection, redistribution of pressures and facilitate the flexion-extension movements. If these vertebrae swell, move or put abnormal pressure on the inter-vertebral discs, it appears the lumbar pain. The spine is supported by ligaments and muscles, which can suffer stretching or injuries. Lumbar pain or low back represents a pain which is located at lumbar spine, especially the vertebrae between T12 and S1 (Voiculescu, 1971).

Back pains are frequently recorded both in people who practice a sport, but also in sedentary people. Pains can range from mild, nagging to severe forms.

The lumbar pain indicates the presence of irritation at muscle level, nervous or a bone injury. Most of the lumbar pains appear after a back trauma, but the pain may also be caused by degenerative disorders such as arthritis, osteoporosis or a bone disease, a viral infection, a joint irritation, a congenital affection of spine (Jenkins, 2001; Baci, 1981).

Obesity, smoking, stress, poor physical condition, inadequate posture during activity, inadequate posture during sleep may contribute to back pain.

Lumbar pain can be treated through medication (anti-inflammatory or pain relievers), physiotherapy (electrical stimulation), and kinesiology (mobilizations, stretching and massage). If the lumbar pain persists or it increases as a result of the treatment, it will resort to surgery (Moțet, 2010).

The experiment - The physiotherapy program applied during the research was adapted for each athlete, according to the disease and its stage. Movement therapy was part of the complex program of functional recovery, which included:

- stretching;
 - electrotherapy;
 - massage (relaxing, analgesic, decontracting);
 - examination of lumbar zone.
1. Standing back against the wall, feet slightly apart and flexed knees, bending the knees at 45°. It maintains the position 10-15 seconds then returns, easily, to the initial position. It maintains the back straight throughout the exercise and repeats the movement 10 times.
 2. Standing, feet parallel and apart at a distance equal to 1.5 towards shoulders width, knees are stretched. It is performed a slight flexion of the trunk, hands being positioned on the front of the leg, distal. Maintain 20 seconds. The movement is repeated 5 times, and then it relaxes a few seconds (Fig. 1).



Figure 1

3. Standing, with feet flat and knees slightly bend, it performs trunk flexion and touching feet or floor with fingers. Stretch completely one leg (the other slightly bended) and maintain 5-10 seconds, then flex again and stretch the other leg. Repeat 5-6 times.
4. On the knees, with heels under the buttocks and tips oriented towards back, body leans forward over the thighs and stretch arms forward, and the head is put between the arms, in the extension of body. Approach as much as possible the body of thighs, pushing slowly the arms forward and maintain the position 20 seconds. Repeat the movement 5 times with a few seconds *breaks* between the repeats.
5. Seated, legs stretched and apart. It leans the body towards a leg, catching with hands its toe. The toe should be directed toward the body, gamba muscle should be in maximum elongation. Keep the legs stretched, trunk bends as permitted. Maintain the stretching position for about **10-15 seconds**. Change with other leg.
6. Dorsal decubitus, arms sideways, perpendicular to the body. Bend a little one leg, bring it over the other and try to reach the ground with toe. The head is moving in the opposite direction in which the foot is lead. Through this stretching the vertebral column is forced to twist by rotating the pelvic zone and neck in opposite directions. Try to maintain arms and shoulders in contact with floor.
7. Seated, with flexed knees, legs close to the body and feet flat. Grab the feet with both hands and press the knees towards the floor with forearms. Maintain the position 20 seconds. If during the exercise the vertebral column is flexed, there will be requested the erector spinal muscles. Repeat the movement 5 times with a few seconds *breaks* between the repeats (Fig. 2).
8. Dorsal decubitus, carrying a leg to the chest with flexed knee, catching it with hands of tibia and maintaining it 10-15 seconds. Repeat with both legs.
9. Dorsal decubitus, carrying a leg up with stretched knee and catching it with hands of the portion behind the knee (popliteal zone). It pulls the leg towards the head and it maintains 10-15 seconds without forcing it.
10. Dorsal decubitus, bending the knees to chest and spread. Arms are inserted through the legs and grab the gamba though exterior. Draw the legs as much as possible toward the chest, without lifting the head and maintain position 20 seconds. Repeat the movement 5 times with a few seconds *breaks* between the repeats.
11. Dorsal decubitus with knees bent, feet on the ground and arms near the body, lifting the hips without arching the back, so as to form a straight line from shoulders to knees. Maintain the position for 10-15 seconds, then return to the initial position and repeat the movement.



Figure 2

12. Ventral decubitus, the right leg lifts 50 – 60 cm from ground, it maintains this position for 10 seconds, and then return to the start position and repeat the movement with the other leg.

These exercises of lumbar stretching were done before and at the end of each training session during the entire study. We witnessed the trainings two times a week, as well as at the athletes' recovery session (once a week).

To examine the lower back, the following tests were made:

1. **Lasegue test:** it is made in order to underline the existence of a herniated disc. It is considered that Lasegue test is approximately 90% accurate.

It is performed with patient in dorsal decubitus, with head on bed's plan. The examiner fixes patient's pelvis so to prevent its rotation, and the other hand catches patient's heel and gradually raise the leg with the extended knee. If lumbar pain appears between 30 and 70 degrees flexion of the thigh on basin, the sign is considered to be positive. A negative test excludes a high probability of herniated disc at youth. After the age of 30, a negative test may appear even if in presence of a herniated disc.

2. **Finger-ground distance:** it is assessed by measuring the distance between ground and medius tip, after performing spine's flexion.

The test is positive when pain appears in performing the movement.

Subjects:	Lasegue Test:	Finger-ground distance:
Subject 1	Positive	Positive (Finger-ground distance - 10 cm)
Subject 2	Negative	Negative
Subject 3	Negative	Negative
Subject 4	Negative	Positive (Finger-ground distance – 8 cm)
Subject 5	Negative	Positive (Finger-ground distance – 14 cm)
Subject 6	Positive	Positive (Finger-ground distance – 10 cm)
Subject 7	Negative	Negative
Subject 8	Negative	Positive (Finger-ground distance – 4 cm)

Subject 9	Negative	Positive (Finger-ground distance – 8 cm)
Subject 10	Negative	Negative
Subject 11	Positive	Positive (Finger-ground distance – 12 cm)
Subject 12	Negative	Positive (Finger-ground distance – 6 cm)
Subject 13	Negative	Positive (Finger-ground distance – 3 cm)
Subject 14	Negative	Negative
Subject 15	Negative	Negative
Subject 16	Negative	Negative
Subject 17	Negative	Positive (Finger-ground distance – 5 cm)
Subject 18	Positive	Positive (Finger-ground distance – 10 cm)

From the 18 athletes, 7 had lumbar pain with high intensity, 4 of them had moderate lumbar pain, 5 had transient pain, and 2 accused superficial pain (chart 1). In the final pain evaluation, changes of values were observed: high intensity pain – 3 athletes, moderate pain- 5, transient pain - 2, superficial pain - 4, absence of pain- 4 (Chart 2).

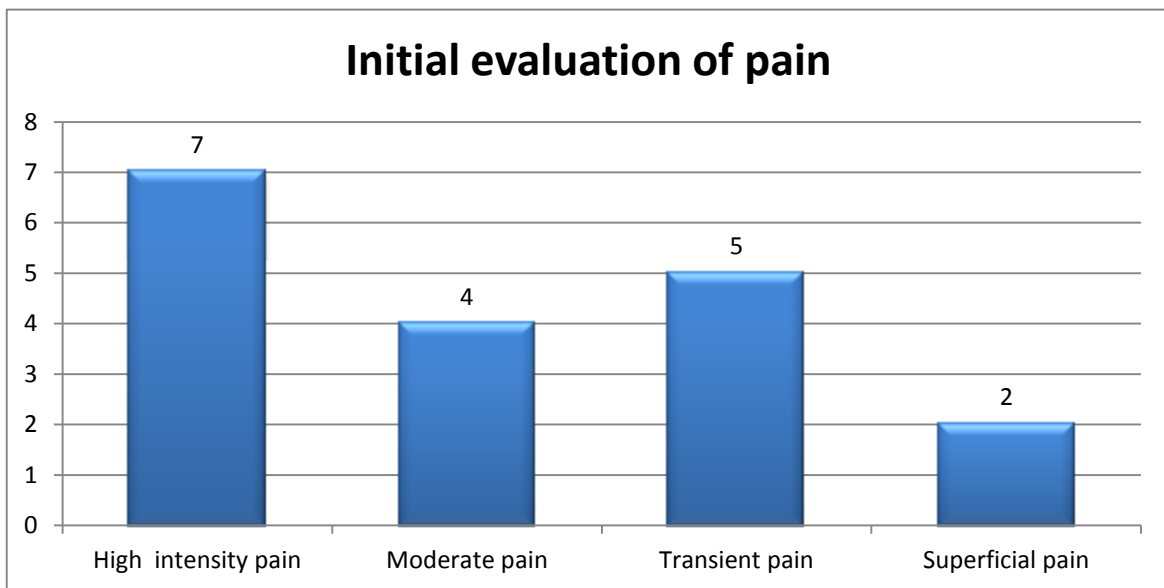


Chart 1 - Initial evaluation of pain

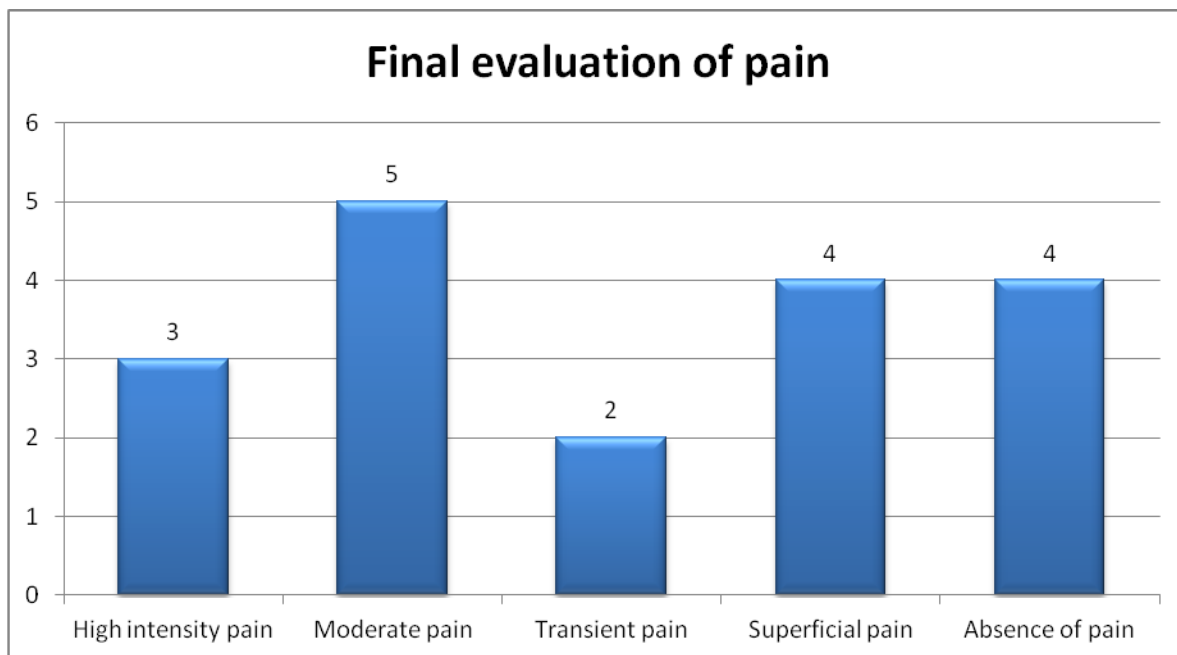


Chart 2 - Final evaluation of pain

Conclusions:

After the two evaluations, we could observe a percentage decrease of athletes' pain. These results came after compliance to the exercise program, the athletes having a better yield in training and games.

As a result of the study performed on the handball players of the CSU Suceava team, the importance of stretching in preparing the body for effort is underlined. By applying lumbar stretching, the decrease or disappearance of pain was achieved.

The paper's assumption was confirmed, the results being positive in most athletes (Charts 1 and 2). Due to the results, the team's players will continue to use the program implemented by us.

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