



## DIAGNOSTIC OF SPINAL COLUMN MOBILITY USING SCHOBER'S TEST FOR LUMBAL SYNDROME BY APPLICATION OF PHYSICAL THERAPY AND SPORT RECREATION

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### **Abstract:**

The research was conducted on the sample of 90 male and female subjects with chronic lumbar syndrome, aged between 20 and 50, of which 45 men and 45 women who were divided in three groups, 30 subjects per each group, formed on the basis of exercises done by the subjects during and upon the rehabilitation (III groups). The longitudinal and time bound research was executed (8 months). The research was conducted in the Department V "Banja Slatina", in the Institute for Physical Medicine and Rehabilitation "Dr Miroslav Zotović" in Banja Luka, including three Fitness centres in Banja Luka. The goal of the research was to compare results of testing of subjects who continued to engage in sport recreation after termination of a rehabilitation process in the Institution for Physical Medicine and Rehabilitation - IPMR "Dr Miroslav Zotović" in Banja Luka (by means of usual physical procedures) and the results of those subjects who did not continue kinesitherapy, nor sport-recreational activities. For the statistical analysis in the SPSS program ANOVA was used, especially Post Hoc Test – Tukey HSD. The results showed that during the eight-month research there was a statistically significant improvement of the observed parameters (Schober index), but with the application of programmed physiotherapy with recreation (gr. II) the best results were achieved, as well as more stable remission, which could be explained by biological effects of the programmed physiotherapy together with sport recreation.

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## 1. Introduction

In combination with overeating and stress, hypokinesia causes the greatest number of civilization's contemporary diseases: diseases of the musculoskeletal system, diseases of the heart and blood vessels, respiratory organs, digestive organs and different neuro-emotional diseases<sup>2,18,20</sup>.

The ailment named in the academic literature as lumbar syndrome (Lat. *Syndroma lumbale*, Eng. Low back pain, Ger. *Kreuzschmerz*), represents a pain in the lumbar region and a real enigma for the contemporary medicine, i.e. for rehabilitation. Lumbosacral pain syndrome, as the most common pain manifestation of a contemporary man, attracts attention of numerous researchers<sup>1,18</sup>. Usual subjects of research are prevention, diagnostics, treatment, and rehabilitation of this pain manifestation<sup>1,13,14,17,20</sup>.

A particular importance in the biomechanic interpretation of etiopathogenic factors for occurrence of lumbar syndrome is given to mechanical load of that segment of spinal column<sup>4,5,18</sup>.

Motion, an optimal physical activity, is the prerequisite for preservation of man's health and normal functioning of organs, the system and organism as a whole. Any excessive limitation of motor activities is in opposition to man's nature. It causes various violations and disarrangement of the functions of the most vital organs and systems of the organism, which are initially only functional, but later organic in character. Lack of optimal physical activity can be compensated in the best and easiest manner through adequate and expertly guided sport recreations<sup>2,4,14,18,19,20</sup>.

In their work Huang, Palmer & Forbes (2000) suggest that persons from village are less susceptible to lumbar syndrome than persons from cities. The cause of this ailment lies in weak abdominal muscles, which persons from urban areas have in higher percent, as a consequence of a hypokinetic lifestyle. On the basis of their results, the reasons for lumbar syndrome can be: muscle disbalance between lumbar and abdominal muscles, which is related to hypokinesia, lethargy, spare time spent sitting in wrong position, stress, discontent, etc.<sup>1,18</sup>.

Due to insufficient motion, the musculature responsible for maintenance of right posture weakens by time and is subject to different influences coming from internal and external environment. Surface muscles weaken in the first place, then muscles of the middle layer and then deep muscles.<sup>2,18</sup> After that, the whole load is transferred to

ligament and bone structure, which results in structural changes in bone mass, as well as in reduction of locomotor functions. In general, in most cases postural disorders and deformities occur as a result of reduction of tonic muscles' isometric endurance<sup>1,5,10,14,18</sup>.

Mikkelsen, Salminen, Sourander et al. (1998) attempted to determine the effect of postural status disorder on lumbar ailments. However, the results they obtained did not completely meet their expectations. It was acknowledged that scoliosis in the initial stage did not have any influence, as well as kyphosis, while lordoses had impact on a smaller scale.

Nonetheless, the research Brooks, (2001) showed that postural deformities have a great effect on lumbar syndrome occurrence, especially scoliosis and kyphotic bad posture. Today postural status of a child and its lumbar-abdominal part is more endangered than ever. This is confirmed by the latest research conducted during two previous years.<sup>4,7,9,11,14,17,18,19,20,22,23,24,25</sup>.

It happens often that a person with long lasting pain in the lower part of the back, in the repeated rehabilitation episode, when they come to kinesitherapy again, forget the exercises, their order or does not know to do them adequately. Exactly this was one of the reasons that directed me towards research on possibility to increase the motivation for a long-term kinesitherapeutic process, through connecting classical kinesitherapy and interesting recreational activities, as well as promotion of physical activity and healthy life in general. (Radulović, 2017)

The basic goal of this paper is to use comparative methods to inspect and determine separate and joint effect of classic physiotherapy and sport recreation on the final result of rehabilitation of persons with a chronic lumbar syndrome. In that regard, the intention of the research is to introduce us not only to chronic lumbar syndrome, but also to methods of proper sport recreation, and importance of continuous evaluation of effects of programmed physical therapy and sport recreation on the result of increase in mobility of spinal column's lumbosacral part of persons with chronic lumbar pain, measured by the Schober's Test or Index method (Shober Test/ Index).

## **2. Methods and Materials**

The research has been conducted in the Department V "Banja Slatina", in the Institute for Physical Medicine and Rehabilitation "Dr Miroslav Zotović" in Banja Luka, including three Fitness centres in Banja Luka. The research has been defined as the experimental longitudinal research with time dynamics of 8 months. The sample includes 90 persons, subjects (45 females and 45 males) aged from 20 to 50. They all have or had a problem with chronic lumbar pain (during previous two years they all

had episodes of different etiology pain in the lower part of back, with the confirmed diagnosis of chronic lumbar syndrome). The whole sample is divided into three groups with thirty (30) subjects in each group with equal criteria when it comes to health condition, social status, and age.

All the subjects signed the consent for research, and also the Institute of Physical Medicine and Rehabilitation "Dr Miroslav Zotović" and all of the three fitness centres in Banja Luka provided the written approval. Each subject, as well, had a separate - unique form wherein each measurement was individually recorded, and mutual group test forms were updated subsequently.

Of general parameters, age and gender of subjects were recorded, and of anthropometric parameters, mobility of lumbosacral part of spinal column was measured, which was common for all the Institutions for physical medicine and rehabilitation, as well as for researchers in the domain of sport medicine and diagnosis in sport - a specific measuring of spinal column's mobility according to Schober (Shober index-test)<sup>1,5,29,30</sup>.

**Schober's test – Schober's index** is used in physical and sport medicine, and research in the field of sport and physical education for evaluation of lumbar flexion capability, i.e. possibility of flexion of the lower part of back.<sup>29,30</sup>

**Spine mobility** helps in evaluation of functional ability, course, i.e. monitoring of therapy results, although it is insufficiently reliable for differentiation of certain causes of lumbar syndrome. The scope of active or passive motions in sagittal, frontal, and horizontal plane is examined. Symmetry, quality of motion, and pain are observed, as well. In general, pain in motion points to a mechanical cause of lumbar syndrome, while painless, free moves exclude uncomplicated mechanical pain in the back. Limited inclination of the trunk due to stiffness and pain, usually accompanied by reduction of proper flexion kyphosis points to paravertebral muscle tension. Pain during erecting from a position of inclination points to osteoarthritis of zigoapophyseal joints, while pain during reclination points primarily to mechanic pain in the lumbar region. Lateral flexion and rotation sometimes increase pain with discoradicular conflict, whereas with paramedial herniation pain is more frequently increased when leaning to the opposite side and with lateral herniation to the same side where hernia of intervertebral disc is located.

There is no gold standard or recommendations for measuring the scope of motion of lumbar spine. The scope of motion is possible to be determined in indirect and direct way. One of the most frequent methods of indirect determination of mobility of lumbar spine is measuring of distance between the top of 3rd finger and the floor

using measuring tape during inclination of trunk from standing position (Thomayer's measure), although hip moves have a great role here<sup>1,5,29</sup>.

### 2.1 Experimental procedure

Schober's test is done in the manner that points are marked on the spine 10 cm above and 5 cm below lumbosacral joint (the mark is placed at the level of spinae illiacae posterior on the spine, i.e. approximately at the level of L5 vertebra). The researcher then puts one finger 5 cm below that mark and other finger 10 cm above the mark. The subject is then asked to touch their toes (without bending of knees), then during inclination (flexion) and reclination (extension) the distance between them is measured. This provides the inclination and reclination indices whose sum gives the index of sagittal flexibility, which is usually 6cm. If the Schober's index is lower than 5cm, there is an indication of limitation of lumbar flexion<sup>29,30</sup>.

It is important to note that persons included in this research (except the group III) have been engaged in sport recreation in the form of various types of fitness for the last five years, and they had episodes of lumbar pain in the last three to five years and they were treated in some of the rehabilitation institutions or Health centres in the Republic of Srpska and Serbia, in ambulance or stationary.

After usual rehabilitation procedures, patients are provided with advice on activities of everyday life, as well as on kinesitherapy program of exercises which can be done at home.

This time patients (hereinafter: subjects) in group II, in addition to usual advice, were provided with advice on recreational sport activities, as well as recommendations regarding the selection of sport activities and the way of exercising them. The type of sport recreation is determined together with the subjects, and one of the classical fitness programs is selected, which contains elements of warm up, shaping, euthonia of almost all muscle groups, where exercises are done with or without gadgets and additional load. Thus, these are mostly partner exercises which contain elements of gymnastics, aerobics, pilates and the like. They gradually include exercises done on gadgets (Gym).

**Table 1:** Groups of interviewees

Groups	I	II	III
<b>Activities conducted and controlled by</b>	physiotherapist without individual trainer	individual trainer and physiotherapist	without individual trainer and without physiotherapist
<b>Content of activities</b>	only physiotherapy	physiotherapy and sport recreation	nothing, except ASŽ

**In the Group I** patients do classic kinesytherapeutic exercises, which consist of warm up, stretching, elasticity, strength exercises with the special emphasis on stabilizers of spinal column (muscle corset), then quadricepsipelvitrohantern muscles. Exercises of relaxation and breathing are done within these exercises. They are done on everyday basis, lasting from 45 to 60 minutes. Rehabilitation lasts 21 day, when after application of all the physical procedures, the subject learns how to do the exercises properly, gets a brochure and does them at home. Physiotherapist (researcher) monitors performance of exercises, but only if invited by the subject, without imposition, and if the subject does not want that, the physiotherapist does not visit them.

**In the group II** the subjects conduct a classic kinesitherapy program they have already learned with the physiotherapist (researcher), but now they do it in slightly shortened variant, with the help of the obtained brochure. Since kinesitherapy with lumbar syndrome is designed on periodic relaxation, stretching, stabilization and strengthening of certain muscle groups, they are sublimed in a whole which permeates both home program of kinesitherapy and group recreational activity. In this way faster memorizing of exercises is enabled (continuous repetition), as well as more correct performance (visual factor of group exercising), but also the faster progression of extensity and intensity of exercises (competition factor). Subjects do kinesytherapeutic exercises on an everyday basis, in the duration of 30 minutes. These subjects have recreational sport activities (additional 3 times a week), lasting from 60 to 90 minutes. Recreational activities are lead by a professional individual trainer, and they include exercises in the community, i.e. Fitness - centres, and they can be determined as biological-medical, socio-psychological and sport recreation. Sport (kinesiologic) recreation in this case refers to doing light to moderate fitness programs designed by accredited fitness instructors. Exercises are done with or without gadgets, mostly in parterre, in every initial position or with the help of gadgets. These are standard exercises which are done every day in fitness centres or at home (*low impact aerobic*), *step aerobics*, *workout program*, dance aerobic, and various exercises for shaping and strength with music, of course, following subject's affinities and physiology abilities, respecting protective positions, which the subject gradually acquires and automates.

**In the Group III** after conducted treatment the subjects (either in some stationed institution or in ambulance) do not have any additional physical activities, except usual activities of everyday life.

All the three groups of subjects were tested at the beginning and at the end of an eight-month research. For evaluation of rehabilitation results they used revised, most

frequently utilized test in the world for this type of problematics, i.e. monitoring of mobility augmentation in lumbosacral part of spinal column by Schober, i.e. measuring Schober's index or test. All the measuring was realized at the beginning and at the end of the eight-month research. Measure instruments (centimetre tapes-ribbon) were properly calibrated by international SI system, and their accuracy was checked regularly.

### 3. Results and Discussion

There are 90 persons with chronic lumbar syndrome recorded in medical documentation. Of total number of subjects, 45 males and 45 females were registered, and the total number of subjects was systematized by age groups (table 2).

**Table 2:** The number of subjects by age groups and gender

Gender	Age 20-30	Age 31-40	Age 41-50	Total
Men	15 (16.66%)	15 (16.66%)	15 (16.66 %)	45 (50.00 %)
Women	15 (16.66%)	15 (16.66%)	15 (16.66%)	45 (50%)
TOTAL	30 (33.33%)	30 (33.33%)	30 (33.33%)	90 (100%)

On the basis of processing statistics, results of research are displayed through differences in average values of parameters measuring (Schober index) between the first and second measuring. All the data are gathered during the eight-month research, and they were processed in programs SSPS. Of multivariate methods, analysis of variance (ANOVA) is used.

For the statistical analysis in the SPSS program ANOVA was used, especially Post Hoc Test – Tukey HSD.

The first column (Table 3) represents differences in average values of parameters in basic measure units, by the order of their measuring during the research (Paired Samples Statistics). “+” marks increase, “-” marks reduction, and “O” unchanged condition of the parameter in the given measure unit.

The second column represents a descriptive analysis based on the base of author's data, i.e. “Mean” - importance of difference and standard deviation (SD), deviation from average values of results (Table 3). The following column represents statistical analysis of the variance ANOVA, where “F” marks difference, and “Sig.” statistical importance of parameters value difference by groups. We presented all the three groups of subjects in the same way.

**Table 3:** Results and statistical importance of differences in parameter values Schober's test

Groups	I		II		III	
	Difference in measure units	Mean±SD	Difference in measure units	Mean±SD	Difference in measure units	Mean±SD
Schober test (90)	+ 0.79	- 2.6500±0.54	+ 2.65	- 9.8333±1.53	+ 0.33	.3333±0.03

**Table 4:** Multiple comparison of parameters (between groups) with their statistical importance

Groups	I - II		II - III	
	Mean dif.	Sig.	Mean dif.	Sig.
Schober test (90)	-7.18333*	.000	-10.16667*	.000

The Table 4 presents the results of research expressed by difference in average results of measuring, but this time those are intergroup differences. due to importance of this research, i.e. the very applicative values of the programmed physical therapy, the emphasis is on differences between groups I and II, and groups II and III. Here is used ANOVA, particularly Post Hoc Test – Tukey HSD.

On the basis of research, a significant statistical difference between the groups was discerned, comparing differences of results within each group individually. Obtained values show very important statistical difference in the group II between initial and final measuring. The most significant difference is between groups II and III, but the difference between groups II and I is also significant (still, slightly smaller).

Obtained values show very important statistical difference in the **group II** between the first and second measuring.

Gr. I		Gr. II		Gr. III	
+ 0.79	-2.6500	+ 2.65	-9.8333	+ 0.33	.3333

Also, the important difference occurred between groups, comparing differences in results within the group:

Initial measuring		Final measuring	
-7.18333*	.000	-10.16667*	.000

On the basis of obtained research results, it is clear that the program of professional medical rehabilitation and physiotherapy is irreplaceable, and together with



professionally organized and managed sport recreation it significantly improves the final result of rehabilitation for persons with chronic lumbar syndrome, both in functional, and subjective domain.

Different clinic conditions cause pain in the back, and in the most of cases they cause pain due to degenerative change<sup>1,3,24,29</sup>. Estimate of treatment result in medical rehabilitation is important for creation of rehabilitation program and evaluation of treatment results<sup>1,3,11,12,13,24,31</sup>. Doing sports exposes the spine, especially its lumbar part, to increased load, due to which the sportsmen often have injuries of ligament-muscle apparatus and spine joints. Their damage is most frequently caused by sudden and strong moves - stretching and rotation, which they are exposed to in sport. The main symptom is pain in low back, followed by spasm of paravertebral muscles. Treatment is most frequently conservative, thus if adequate therapy does not begin timely, it can become chronic condition and permanently prevent patients from active practising of sport<sup>9,24,28</sup>.

Data from literature show that approximately 25% of all the persons who practise sport without professional supervision, complain about lumbosacral pain syndrome, or every fourth person<sup>1,2,4,5,6,10,11,14,18,28,30,31,32</sup>.

In recent years we witness expansion of different diseases, whose main cause is unnatural lifestyle of the contemporary men, time spent in the sitting position. This increased the importance of recreation, as compensation for less and less mobility (hypokinesia) in everyday activities. In order that the recreation can be more meaningful and interesting, people mostly opt for recreational sports, whether individual or group. People today are imposed by not only physical condition as such, but dependency on gym gadgets, various gyms and programs, so called healthy nutrition and suspicious supplements, burdens of aesthetic and many half-known things. A great number of contemporary sport gadgets and machines is more and more present, introducing us into a new dimension of recreational training. Recreation is in the new light, there is more and more intense and affective muscle stimulation, thus making recreation more interesting (marketing), shorter (time superficiality) and explosive (inadequate dosing). However, the situation with group recreation in some of team sports is not better. Directed and targeted activities that repeat in cycles, instead of having a goal to maintain and improve health condition, more and more frequently become competitive (against someone other and/or against ourselves), thus losing their purpose (Radulović, 2017).

In any case, the possibility of injuring or aggravating of an already existing problem is greater. It is mostly familiar that the period of biggest growth and development of spinal column is from the age of 8 to the age of 13, spinal ligaments and

deep muscles rapidly lose durability and tonic. Their ability to save stability of spinal unit (vertebra body - intervertebra disc - vertebra body) is reduced, as well as the possibility of adequate resistance against bigger loads which affect spinal column, regardless of the observed part of the spine. This information helps us know which program entities we are allowed to create, as well as the way of their realization. If this process of growth is slow and constant, changes in ligaments and deep layers of muscles are small and their elasticity will not be impeded. Otherwise, this structure suffers plastic deformities of temporary or permanent type, which depends on many factors. These architectural changes in function and structure cause instability of certain spinal units and the spine as a whole. In these conditions it is possible to diagnose instability of spinal units (body-disc-body). The biological process itself and men's development nature do not harm spinal system, but the men themselves (by their reckless behaviour) are that factor of endangerment (Radulović, 2017).

A specified period is marked by rapid changes, longitudinal, transversal, as well as volume dimensions of children. One research acknowledged that in the period from 3 to six months, some children grow up to 10 cm (Berlin, Colditz, 2003). These big changes in the short period disable muscle-ligament-tendon structure of the back to timely adapt and establish their functionality, so that in that period postural status is functionally and structurally endangered. It often happens that highly educated professional training of trainers of sport recreation strongly competes with alternative methods of regrutation of trainers, where sport experience is emphasized as a basic or only factor. However, in a world with sport education, the need for academic education of trainers is more and more emphasized. It is estimated that experience, as much important, is not sufficient for successful trainer's work: a contemporary trainer should have quality education, as well, based on sport science<sup>31</sup>.

Proponents of quality formal education of trainers, which means scientific foundation of trainer's work, do not only accept the importance of experience, but they scientifically prove their positive attitude towards experience. In the absence of concrete research on trainer's work, indirect evidence can serve, those that are concerned with related professions. Regarding teacher profession, 5 to 7 years of post-academic experience is necessary for complete forming of teachers, depending on criteria of successfulness. Until the Coaching science arrives at its own knowledge, these figures serve us as orientation for evaluation of time necessary for reaching the coaching maturity. One more psychological finding on importance of experience is also relevant. Scholars of mastery in various fields of human activities came to a conclusion that for reaching the top professional range 10 years of training is required, on average. The rule of 10 years is probably valid for trainers, too. But the conclusion of those scientists does

not refer to mere passage of time, nor to any experience. The rule refers to 10 years of thoughtful practice. Such practice is, among other, conscious practice. (Radulović, 2016) Given the high incidence, all combinations of treatment are significant, depending on the assessment of a delicate status of the patient, and our character is to show the possibilities of the postulates of physiotherapy with all its resources, as well as the ways in which sport activities can affect the problem of low back pain, in several respects, i.e. therapeutically and prophylactically (Radulović, 2017).

#### **4. Conclusion and Recommendations**

Procedures that we have performed in the eight-month long research led to a statistically significant improvement of the observed parameter (Schober Index), but by applying the programmed physiotherapy recreation (group II) the best results were achieved, as well as more stable remission, which can be explained as the biological effects of programmed physiotherapy together with sport recreation i.e. permanent training of subjects.

Current research confirmed that low back pain is not common only in the "privileged" group of people, but it appears where least expected. Also, it was confirmed that a modern man devotes a very small amount of time to the moving, which is the basic function of the locomotor apparatus, i.e. a modern man lives more and more in contradiction with nature, thanks not only to the rapid technological advances of modern civilization that human being is not able to follow, but to the man's voluntary agreement to just enjoy all the benefits that this progress offers, without weighing the consequences that follow, primarily in the form of health problems. Thus, there is a disproportion in the development of certain anatomical structures that are related not only to the spinal cord, but the motor apparatus in general.

By analysing the results of the research, we find that they generally correspond to data from the literature and analysis of previous research in the world, i.e. covers the general population, both in terms of age groups and occupations.<sup>1,4,5,7,9,14,16,17,18,20,26,29.</sup>

When comparing differences in average results, large differences in Schober's test are visible, especially due to the increase of gross motor strength of individual muscle groups, primarily the trunk flexors (especially the lateral ones), the gluteal muscles and the trunk extensors, as well as the stretching of the hamstring, the triceps surae and the gluteal muscles. Therefore, we conclude that it is necessary to pay special attention to stretching and strengthening those muscle groups. We also came to the conclusion that the programmed physiotherapy, professionally performed and combined with sports and recreational activities, is to this problem.

Aware of the fact that the hypokinesia is a modern age disease, affecting primarily young people not only in terms of preserving their health of the spine, but their health in general. When it comes to prophylaxis, we emphasized muscle corset and other muscles trophic that are extremely important for posture and movement. Here we opted for the kinesitherapy being the most important form of physiotherapy as a basis of sport science and physical education.

Based on our observations during the study, we may suggest recommendations for the lumbar syndrome:

1. Each person with low back pain needs an individual approach, i.e. physiotherapy and recreational activities need to be programmed for each individual separately;
2. In addition to the classical physiotherapy some forms of activities need to be included, whether it is a sport or some other form of recreational activity;
3. Subjects in group II achieved the best results, both in terms of rehabilitation and in terms of efficiency- reducing the number of days on sick leave and general health;
4. Dealing with some form of recreation, especially in the community (group exercise) helps the patient to overcome the crisis, pain, feeling of helplessness, and to gain the necessary confidence that he/she needs in further treatment and life in general. In this way the patient gets a feeling of responsibility towards his/her health. Also, sharing of experiences with people who have similar problems, expands one's knowledge in the field in which he/she is interested, which we must not ignore, given that there is an increasing amount of available information in the media. This information may be accurate, but can be false also and thus cause unwanted effects.
5. Increasingly present literature in the field of pain in the back can be applied in practice (particularly in the active working population).

Here's even more important to note that we must fight against the misconceptions that slightly increased physical activity (such as walking) replaces prescribed and programmed kinesitherapy for some period. Each person, including those performing sport activities for recreational purposes, needs to know that the kinesitherapy is a set of purposeful and targeted movement in order to improve the function of locomotor apparatus and it represents an irreplaceable therapeutic method. It should be carried out continuously and proportionally, just as it is the given in the program prescribed by the physiotherapist. Special care should be taken when the program is made in cooperation with sports medicine professional, in which a slight deviation may result in adverse effects (Radulovic, 2017).

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