

## Yoga exercises for lower back pain

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**Abstract:** Lower back pain (LBP) as one of the most common painful conditions affects the modern man and is related to insufficient physical activity i.e. contemporary sedentary lifestyle. LBP is almost evenly distributed among the sexes (58 % of women and 45 % of men suffer from it), while about 75% of the population have suffered an episode of lower back pain syndrome. (according to Jadrić i Antić, 2006). The majority of people with LBP syndrome recover completely as a result of suitable medical treatment and body exercise; however, in a certain percentage of people, the acute phase turns into the chronic condition. Chronic lower back pain (CLBP) is a limiting condition which impacts individual efficacy but is also correlated with social and economical effects (Meucci et al., 2013). In the treatment of alleviating the pain, physical movement and different types of body exercises play an important role. The goal of this paper is to select certain yoga postures/asanas on the basis of research done so far, as a possible mode of kinesiological operator in the treatment of LBP/CLBP. Yoga exercises can lead to the increase in muscle strength, muscular and cardio-respiratory endurance, range of movement and general flexibility. (Tran et al., 2007; Bhowmik et al., 2012). However, it is very important to make the correct choice and the sequence of yoga asanas (exercises) which can be applied as an adequate kinesiological treatment of LBP/CLBP, taking into account the health status and physical shape of the patient/person. Based on the biomechanical laws and kinesiological knowledge, yoga instructors can position themselves in all programs aiming to prevent and treat LBP/CLBP.

**Key words:** yoga exercises, asanas, treatment, lower back pain syndrome

### Introduction

Incomplete functioning of the locomotive system is frequently caused by limited movement and locomotion, resulting in pain in acute and chronic conditions (arthrosis of the knee or hip joint, lower-back pain syndrome). Lower back pain (LBP), as one of the most common painful conditions, arises as a consequence of muscular inactivity. In population, it is almost equally distributed among the sexes, with 58% of women and 45 % of men suffering from it, while even 75 % of the population has experienced an episode of lower back pain syndrome. (according to: Jadrić i Antić, 2006). Lower back pain is defined as pain or discomfort located below the 12th rib and above the gluteal crease, with or without the presence of leg pain. (Freburger et al., 2009). In people over 50 years of age, the symptoms of lower back pain syndrome are significantly more intense than in younger population. Speaking of younger population, a rise in lower back pain has been identified in school population, 20-51%. (according to Lafond et al., 2007). The same authors attribute the pain to prolonged sitting, poor posture, weak abdominal muscles, etc. The pain which appears sporadically or recurring pain, and can be of very strong intensity, has been identified in the population between the ages of 20-40. Evidently, the pain appears during the most productive period of a person's life and it is accompanied by reduced work capacity. The appearance of

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acute lower back pain is subject to physical therapy treatments and physical exercises which aim to eliminate the symptoms (pain, limited movement); however, in a certain percentage of the population, the pain turns into the chronic condition.

Chronic lower back pain (CLBP) as a limiting condition, impacts personal efficacy but it also correlates with social and economic effects. (Meucci et al., 2013). This correlation has been determined by other studies which point to the limited work capacity caused by the chronic lower back pain. Majority of authors agree that lower back pain can be considered as chronic if the pain persists for at least three or more months. (Carey et al., 2000; Picavet and Schouten, 2000). Anderson (1999) defines chronic lower back pain as lasting from 7 to 12 weeks, while the other authors believe that this pain must last even six months or longer. (Silva et al., 2004; Walker et al., 2004; Almeida et al., 2008). Therapeutic approach to LBP is multidimensional. This model of treatment and rehabilitation is coordinated with the goal of meeting the needs of the patient/person, and is combined according to the structure. What is meant under the term 'structure' is the application of pharmacotherapy, education, behavioral therapy and body exercise. (National Disease Management Guideline, 2011). Therefore, one of the components of treating and alleviating the pain is the application of kinesiological operator (body exercise).

Generally, the implementation of kinesiological operator is a significant part of the LBP treatment, especially in therapy using physical exercises which offer certain benefits in battling the chronic LBP. (Hayden et al., 2005; van Tulder et al., 2006; Chou et al., 2007). The exercises can prevent the pain from recurring, decrease the pain intensity, improve the functioning of the locomotive system, and decrease the possibility of physical disability. (Sherman et al., 2005; Mailloux et al., 2006; van Middelkoop et al., 2011). In order for the results of the kinesiological operators to be efficient, the person undergoing the treatment must be ready to perform the recommended exercises in an adequate manner (the adequate quantity, duration and continuity). Therefore, the subject of this research paper is the application of kinesiological operators in the condition called chronic lower back pain syndrome. The paper presents a specific kinesiological operator, yoga exercises, which can be practised with the aim of preventing the recurring pain (the acute phase), pain reduction, the improvement in the functioning of the locomotive system, and eliminating or decreasing the limitations in the range of body movement. The aim of this paper is to select the postures/asanas based on the research performed until now, as a possible mode of kinesiological operator in the treatment of LBP/CLBP.

### **Yoga as a method of physical exercise**

A multidisciplinary team of experts participates in the treatment of LBP/CLBP (physiologist, neurologist, neurosurgeon, psychologist, physical therapist, physical therapy technician, occupational therapist, social worker), however, in addition to medication therapy, surgical treatment and physical therapy, the central place is occupied by the method of kinesiotherapy which contributes to pain reduction and the improvement of the overall condition. (Mačak-Hadžiomerović i sar., 2009). The basic instrument of kinesiotherapy is the movement which presents the integrated action of the locomotive and the neurological system. (Protić-Gava, 2012). It is recommended that the patients diagnosed with LBP/CLBP use the other types of physical activity which would contribute to the improvement of the condition of their locomotive system, especially the lower back segment. One of the alternative therapeutic methods which can be applied in the treatment of LBP/CLBP is yoga practise. Connection and similarity between body exercises (movement and locomotion) in kinesiotherapy and yoga has been identified. Kinesiological operator for therapeutic purposes, Hatha yoga is characterised by postures or asanas, which (Sherman et al., 2004; Williams et al., 2009; Cox et al., 2010) are practised in order to reduce pain, increase the range of movement and flexibility, strengthen muscles and improve the overall physical condition, improve equilibrium and develop mental focus (Kilpatrik, 2012). It has been proven that practising certain asanas - Swastikasana, Mayurasana, Matsyendranasana, Pashimotanasana, and Gomukasana - leads to significant increase in the range of movement and flexibility (Bal & Kaur, 2009).

Tran and his associates (2007) state that yoga exercises have significant impact on increased flexibility, muscular strength and cardio-respiratory endurance, which is important for maintaining good physical condition. Franka (2012) and associates state that the exercises of segmentary stabilization (SS) and stretching exercises have significant effect on reduction of pain and physical disability, while the same authors give advantage to the SS exercises.

The SS exercises, just like the yoga asanas, are performed in precisely determined positions and postures. Kaminoff (2010) points out the significance of their basic starting positions. Koturović i Jeričević (1993) point out the connectedness of the starting position in the sense of its application during the treatment, where the position is conditioned by the morphological characteristics of the patient/person, the disorder to be treated, and the goal to be achieved. The starting positions can be basic, derived and supplemental. The positions used in kinesiotherapeutic procedures where some other operators are applied are the same as the yoga asanas. Four of the six basic starting positions are the same: standing, kneeling, sitting and lying, while the hanging and leaning positions are excluded. Derived positions are derived from the basic positions, and their basic goal is to make it easier or harder to apply the kinesiological operator, without deviating from the elementary principles of the basic position and biomechanical laws. Supplemental positions and postures are applied with the intention to reduce or increase the load along the skeletal levers (Protić-Gava, 2012). In applying kinesiological operators it is important to consider the type or kind, in order to prevent possible contraindications, in this case, the treatment of LBP/CLBP. In the application of yoga kinesiological operator in the treatment of LBP/CLBP, it is necessary to select the asanas as well as their sequence. The asanas from the Hatha yoga system (Vini yoga, Iyengar yoga etc.) are generally used for stabilization and strengthening of the spinal column. Additional precautions (contraindications) refer to the asanas which are to be avoided during the acute phases of LBP. The examples of conditionally contraindicated postures from the angle of kinesiological science are shown in the picture number 1, and they are: Urdhva Mukha Svanasana (1a), Bhujangasana (1b), Marjari asana (1c) as well as in the picture 2: Urdhva Dhanurasana (2a), Ustrasana (2b), Danurasana (2c) and Matsyasana (2d). In all of the mentioned asanas there is a pronounced hyperextension of the trunk and a pronounced lordosis in the given position. Deviation from the lordotic curvature (the normal curvature is between 15 and 30 degrees) is one of the causes of LBP/CLBP, as well as insufficiently developed abdominal musculature, shortening of the back muscles (m. erector spinae, m. quadratus lumborum and m. multifidus), and the retroflexion of the mentioned positions (pictures 1 and 2) worsens the condition and causes pain, especially in the acute phase of the LBP/CLBP.

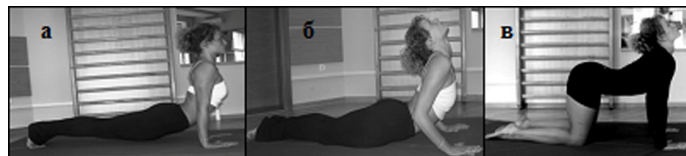


Figure 1.

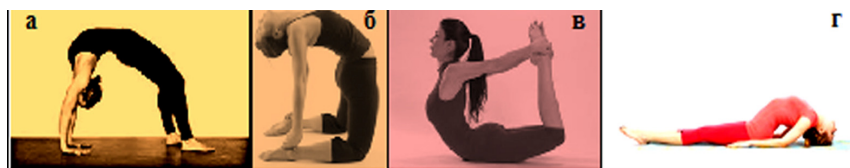


Figure 2.

Asana, Chatus pada pitham (picture 3), should also be classified among the contraindicated postures, especially when the pain appears in the acute phase. This asana, because of the weak hamstring muscles, (m. semitendinosus, m. semimembranosus and m. biceps femoris), the shortening of the m. iliopsoas muscle group, and action of the strong hip adductors, makes it impossible for the person to bring the body into the neutral position with adequate extension and external hip rotation. (Kaminoff, 2010).



Figure 3.

Precaution in using the asanas identified as contraindicated is justified by the identified condition of lordosis in the lower back, considered to be the leading cause of the LBP.

### Work Method

The references of the used studies and relevant scientific papers are adequate for the subject of this research. The choice is made according to the personal preferences of the author, on the basis of titles, keywords (yoga, Iyengar, lower back pain (LBP), chronic lower back pain (CLBP), specific exercises, therapeutic procedure, exercise therapy, asanas, flexibility, movability) and the abstracts, reports on studies and recommendations of the national associations which contained the keywords. The authors of this study have excluded the papers in which lower back pain had been caused by surgical interventions in the back region, diagnosed spinal stenosis, discus hernia, as well as conditions caused by pregnancy, bone fractures or dislocations of the vertebrae. All the data from the quoted studies which are related to the problem and the goal of this research and the results obtained have been taken out and summarized. The general impression is that the studies and papers on the mentioned topics are heterogenous.

### Results

Table 1 summarizes the results of the studies treating LBP/CLBP whose aim was the application of yoga exercises. Author Podel (Podel, 2012) quotes the studies which are also part of this research. (Galantino et al., 2004; Sherman et al., 2005 i Williams et al., 2005) This work also shows the method, the battery of tests based on which the initial/final condition of the respondents was determined, the age of the sample, kinesiological operator applied and the duration of the program.

**Table 1.** Yoga – kinesiological operator in LBP/CLBP therapy

Author	Battery of tests	Respondents' age	kinesiological treatment /program (the duration of one treatment)			program duration
Galantino et al., 2004	Oswestry Disability Index (ODI), Beck Depression Inventory (BDI), functional flexibility test (Sit and Reach, SR) and balance (Functional Reach, FR).	30-65	Hatha yoga 60 min 2 times per week with the instructor <b>asanas have not been named*</b>	Control		6 weeks
Sherman et al., 2005.	Roland Disability Scale, Short Form-36, Health Survey, Questionnaire: 'Do	20-64	Viniyoga /75 min <b>17 postures**</b>	Exercises /75 min 7 aerobic exercises – 10	Written instructions (according to Moree et al., 1999)	26 weeks (midterm mesurement after 6, 12 weeks)

	you exercise at home''.			stretching exercises	
Williams et al., 2005.	Short Form-McGill Pain Questionnaire (SF-MPQ), Tampa Scale of Kinesiophobia(TSK), Survey of Pain Attitudes (SOPA), Strategies Questionnaire-Revised (CSQ-R), Self-Efficacy Scale (BPSES), range of movement test (ROM).	23-67	Iyengar once a week, 90 min with the instructors and 5 times 30 min at home / individually <b>29 asanas</b>	Control	16 weeks
Williams et al., 2009.	Oswestry Disability Index	18-70	Iyengar <b>31 asanas</b>	(SMB)	24 weeks
Cox et al., 2010.	Roland-Morris Disability Questionnaire (RMDQ)	18-65	Vinijoga 75 min <b>17 postures***</b>	(SMB)	12 weeks
Tilbrook et al., 2011.	Roland-Morris Disability Questionnaire (RMDQ).	18-65	Iyengar / 75 min <b>does not state the asanas</b>	(SMB)	12 weeks

\*the authors do not use the original names but give the names close to the ones used in kinesiological science, such as forward bending; \*\* the authors name the asanas based on the arbitrary translation from the Sanskrit; \*\*\* they have applied the program based on the suggestion by Sherman et al. 2005

In their pilot study Galantino and associates (Galantino et al., 2004) have applied postures from the Hatha yoga system in accordance with biomechanical principles and having consulted the specialists from the field of kinesiology therapy. The authors do not state the original names of the applied asanas; instead they give the names such as: the tree, the triangle, the position with the head towards the feet; sitting: plain knee, anteflexion of the trunk /head towards the knee while twisting the spine/ partial torsion of the spinal column. Also, the authors cite the complex of exercises called The Sun Salutation, which could be considered as a sequence of asanas, under the name Surya Namaskar. Sherman and associates (Sherman et al., 2005) have selected 17 characteristic positions (they do not cite the names of the asanas) some of which have been adapted, and the sequence is in accordance with the recommendations by the Vini yoga instructors who had been working after Kraftow (''Yoga for Wellness''). In the appendix, the authors give a pictorial and textual representation of the used yoga postures. Since the adapted postures are mentioned next to the names of the asanas, the descriptions of the postures using kinesiological terminology are given in the parentheses: the Cobra (lying on the stomach, arms flexed with the hands pressing the floor, lifting the body off the floor), knees into the chest (lying on the back with the knees bent and pulled towards the chest), the wheel (from the kneeling position sit on the feet with hands extended above the head), the Bridge pose (leaning on the back of the head, shoulders, hands and feet), the Lying Butterfly pose (the starting position: lying on the back, the knees flexed, the feet on the floor, arms alongside the body, from the starting position separate the knees and drop them to the sides), leg stretch, the Warrior pose (from the standing position extend the arms up with palms together, lunge with one leg forward while bringing the arms to the sides), the standing forward bend (from the standing

position bend forward), the kneeling bend (starting from the kneeling position with the arms stretched to the sides, bend forward sitting on the feet, with arms behind the back, supporting the back), the Chair pose (starting from the standing position with the heels together lower the body into the half-squat), the false twist (starting from the lying position, knees bent, feet on the floor hip width apart, hands stretched to the sides shoulder high, bring the knees towards the floor), the Swimmer pose (lying on the stomach, arms flexed, hands on the floor chest high, bring the trunk up, push the legs backwards and to the sides), extended lateral stretch (starting from the standing position with the heels together, lunge with the right leg with the hands on the right thigh, bend the body forward), sudden movement (lunge) (the right leg kneeling, the left leg forward, flexed, hands leaning on the flexed knee, to the same position lifting the right arm up), lying position on the side, hip extension (lying on the side, the leg closer to the floor flexed at the 90 degree angle, lifting up with the opposite, extended leg), kneeling side position (kneeling on the left knee, the left leg to the side, flexed, with the feet on the floor, lift the trunk towards the flexed leg, left arm up and the right arm next to the body to the foot of the flexed leg), standing side position (legs apart, arms stretched to the sides, bend the trunk to the right with the left hand towards the right foot, and the right arm up).

Viliams and associates (Williams et al., 2005) applied Iyengar yoga exercises in their study, selecting 29 positions i.e. asanas during the intervention. Certain positions required the use of props such as belts, sandbags, benches, chairs and yoga block. In the similar study, Williams and associates (Williams et al., 2009) set the goal to estimate the efficiency of the applied system of Iyengar yoga exercises compared to the standard medical care. They show 31 basic asanas using props in certain variations of the positions (e.g. Pavanmuktasana, using two chairs as support; Adho mukha svanasana using a rope). Cox and associates. (Cox et al., 2010) compare a group of examinees who had undergone the yoga treatment with the group who had received the standard medical procedure. These authors applied a 12-week program following the system developed by Karen Sherman, using the exercises given by the author in his research (Sherman et al., 2005). Tilbruk and associates (Tilbrook et al., 2011) choose the comprehensive system of Iyengar yoga exercises, and they have a control group treated with the standard medical procedures for LBP, but they neither state which asanas they had used, nor the number of postures used during the research.

## **Discussion**

Based on the selected works, it is noticed that only Williams and associates (table 1) show the yoga protocol using the original names of the asanas used during the treatment of LBP/CLBP in the part on methodology. The other authors quoted in this study use their own names or translations from the Sanskrit. Galantino and associates (2004) did not give the precise explanation of the postures (e.g. sitting: plain, on the knees), nor the structure of the activities during the exercise. In this case it is unclear whether they are referring to the children's sitting position (sitting on the feet) or the sitting position with the legs flexed (at the 90 degree angle) and leaning on the floor, i.e. whether they are referring to the Vajrasana. Therefore, if a system of yoga exercises was used, it is necessary to use the original names of the asanas. For instance, in the asanas Paschimottanasana, Uttanasana or Parsvottanasana it is clear what the starting position is, the structure of the activity and the final position, while all three asanas involve movement of the head towards the foot.

For better understanding, and in connection with the selection of the yoga asanas to be used, it is necessary to note that LBP is related to deviation from the correct posture, so the changes to the spinal column in the lumbar segment and all the soft tissues are characterized by the change in the position of the lumbar vertebrae and the pelvis. The main reason for the appearance of LBP (aside from the degenerative disorder of the discus, discus hernia, spondylolistesis, spinal stenosis, piriformis syndrome, structural disorders, traumas, rheumatic diseases, infectuous diseases, tumors) is muscular weakness resulting from inactivity, which leads to poor posture, poor movement biomechanics, (Mačak-

Hadžiomerović, 2009), inclination of the pelvis as a result of muscular disbalance. In the cases of lordosis, the increase of the lumbar curvature is characterised by rotation of the pelvis, the upper edge forward and downwards, and increased inclination appears (over 65° for women and over 55° for men). Lordotic poor posture as a functional disorder can be eliminated by corrective exercises, in the easier cases caused by weak abdominal musculature (functional disorder without pathological changes to the vertebrae). In the structural stage, i.e. when lordosis has been diagnosed, in addition to strengthening the musculature of the abdomen and the back, it is necessary to introduce the exercises for stretching the shortened muscles of the back and hamstrings, and this is where yoga exercises can be very important. The examples of the indicated asanas are: Supta Padangusthasana (stretching the hamstring muscle group), Paschimottanasana, Halasana which stretches the back muscles (m. erector spinae) and the muscles of the dorsal side of the lower limbs (Kaminoff, 2010). The asanas which also stretch and strengthen the muscles of the abdomen, the back and the dorsal side of the thighs are: Pawanmuktasana, Apanasana, Upavistha konasana, Balasana, Salabhasana, Navasana, Makarasana (as the starting position, retroflexion of the body with the arms stretched to the sides and bent at the elbows).

William and associated have applied Iyengar yoga in the treatment of LBP using props. In kinesiological therapy treatment of LBP/CLBP, where other types of body exercise were employed, props are also used frequently (sandbags of different weight as well as lighter dumbbells, pilates balls, etc.) with the goal of making the exercises harder to perform. In the acute phase of LBP, kinesiology therapy treatment employs suspension and derived positions to make it easier for the patient to perform the given exercises. At the end of the acute phase, performing the asanas is recommended with the goal of strengthening the muscles which stabilize the trunk (the surface and the deep layers). Therefore, beside the asanas with local benefits, any Hatha yoga asanas which have general influence on the body can be used – e.g. Surya Namaskar or the sequence of exercises from Asthanga, Vini yoga, Art Yoga Similiris, etc.

## Conclusion

According to the research performed so far, the use of yoga in treating LBP/CLBP indicates the possibility of pain reduction and elimination. Yoga exercises may increase muscular strength, muscular and cardio-respiratory endurance, the range of motion and general flexibility. (Tran et al., 2007; Bhowmik et al., 2012). The studies cited in this paper indicate that practising yoga is more efficient than any medication and standard medical treatments. However, the correct selection and sequence of the yoga exercises is of vital importance in using yoga as a kinesiological operator, and this should be done taking into account the general health status and physical condition of the patient/person. Yoga instructors can find their place in all programs aiming to prevent and treat LBP. However, it needs to be emphasised that they need to undergo advanced training in correct postural status and deviations from it. The knowledge of biomechanical laws and kinesiology principles contributes to the right choice of the asanas, physical postures, and good selection of exercise combinations, with the goal of eliminating and alleviating LBP/CLBP. During the acute phase of LBP, the choice and the use of asanas contributes to relief in the lumbar segment. The asanas which are present in almost all systems of yoga exercises, and are the most significant for the patients in the acute phase of LBP are: Supta Padangusthasana, Paschimottanasana, Halasana, Pawanmuktasana, Apanasana, Upavistha konasana, Balasana, Makarasana (initial position bending backwards and hands bent in elbows and head resting on them).

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