International Journal of Yoga, Physiotherapy and Physical Education
ISSN: 2456-5067; Impact Factor: RJIF 5.24
Received: 10-09-2020; Accepted: 25-09-2020; Published: 11-10-2020
www.sportsjournal.in
Volume 5; Issue 5; 2020; Page No. 15-20

Effectiveness of swiss ball exercise v/s iyengar yoga for core muscle strengthening among non-specific lower back pain patients

Bijal S Patel[1], Unika I Purohit[2]
[1] BPT, Physiotherapist, Anand, Gujarat, India
[2] MPT Sports, Assistant Professor, Modern College of Physiotherapy, Pune, Maharashtra, India

Abstract
Non-specific lower back pain has become a major public health problem worldwide. The life time prevalence of low back pain is reported to be as high as 84% and the prevalence of chronic low back pain is about 23% with 11-12% of the population being disabled by low back pain. There has been little evidence that alone Swiss ball exercise is effective in reducing pain and Oswestry Disability Index but Iyengar yoga will be more effective and Iyengar yoga is effective in improving core muscles TrA strength but Swiss ball exercise will be more beneficial. This is the comparative study to check whether Swiss ball is effective or Iyengar yoga is effective.

Keywords: non-specific low back pain, visual analogical scale, oswestry disability index, transverse abdominis

Introduction
Non-specific low back pain is tension, soreness and/or stiffness in the back, between the bottom of the rib cage and the top of the legs [1]. Most people's low back pain is described as "non-specific "meaning that it is not possible to identify a specific cause of their pain. Several structures may contribute to the symptoms including the joints, discs and connective tissues [2, 3]. When you develop pain some muscles can become tight or spasm. This can increase tension on joints or nerves and in turn cause stiffness and pain.[4] Moving gently can help to ease this and provide other benefits such as reducing pain by increasing the blood flow, which helps healing; lubricating your joint, which helps reduce stiffness; stretching and stimulating your joints, ligaments, muscles and nerves, which helps to reduce pain; reducing tissue swelling by increasing the local circulation; and releasing natural chemicals which help to reduce pain [5, 6]. The use of Swiss ball training for core muscle development has been popular for several years [13]. The physical object Known as a ''Swiss ball'' was developed in 1963 by Aquilino cosani, an Italian plastics manufacturer [14] Klein-Vogelbach advocated the use of ball techniques to treat adults with orthopaedic or medical problems [15] An exercise ball, also known as a Swiss ball, is a ball constructed of soft elastic with a diameter of approximately 35 to 85 centimetres.14 to 34 inches and filled with air. The air pressure is changed by removing a valve stem and either filling with air or letting the ball deflate [16] Multiple studies have examined core muscle recruitment during varying types of Swiss ball abdominal exercises and during traditional abdominal exercises. Swiss ball exercises are used in training and rehabilitation to enhance core development and stability and improve core muscle strength, reduce pain and Oswestry scale [17].

Yoga comes from the Sanskrit word union of the spiritual plane of the individual self with the union of the body, mind, emotional and intellect. Paying close attention to anatomical detail and alignment of each posture. The word yoga is derived from the Sanskrit root yuj meaning to bind, join, attach and yoke, to direct and concentrate one's attention on, to use and apply [20]. It also means union or communion. It is the true union of our will with the will of god. JB.K.S.Iyengar has systemised over 200 classical yoga poses. Iyengar yoga is the practice of precision, poses are held for long periods and often modified with props cultivating strength , flexibility ,stability and awareness and can be therapeutic for specific conditions.[21] The Iyengar method uses supportive props and strictly designed sequences of postures to address an individual's medical issues. Sequencing, timing and intricacy of poses in Iyengar method provide a framework to structure the progression and content of therapy [25] Williams's preliminary study showed that the practice of Iyengar yoga provides significant improvement of CLBP in individuals with mild disability [26].

Need of study
Many studies have been done earlier to lay physiotherapy protocol for non-specific low back pain. TENS, SWD, static exercises etc. have been proved to be effective in improving pain in patients with non-specific low back pain. Studies have been done earlier on swiss ball is effective for non-specific low back pain, but no study until now has proved the effect of Iyengar yoga in patients with non-specific low back pain . A need for study arises to see which therapy is more effective in low back pain and functional disability among non-specific low back pain patients.

Aims and objectives
The aim of this study is to compare the Effectiveness of Swiss Ball Exercises v/s Iyengar yoga for core Muscle Strengthening among Non-Specific Lower Back Pain Patients.

Objectives
- To relieve pain by Swiss Ball Exercises and Iyengar yoga on Non-Specific Lower Back Pain.
- To improve core muscle strength by Swiss Ball Exercises and Iyengar yoga on Non-Specific Lower Back

- Pain.
- To reduce the Functional Disability by Swiss Ball Exercises and Iyengar Yoga on Non-Specific Lower
- Back Pain.

Methodology

- Design: Comparative Study.
- Sample Size: 30.
- Sampling Design: Simple random sampling.
- Study Setting: Parul Sevashram Hospital Waghodia, Vadodara.
- Duration of Study: 3 days per week for 5 weeks.

Inclusion criteria

- Age: 18-70 years
- Gender: Male & Female both
- Low Back Pain with symptom persisting for <3 months.
- Oswestry Disability Index: 10-60.
- Visual Analog Scale: 3-8 cm.
- Ability to get up and down from the floor and rise to a standing position without assistance.
- Agree to not get Chiropractic treatment , Massage therapy, Pilates or Acupuncture or to participate in
- Any other Yoga program.

Exclusion criteria

- Spinal conditions like stenosis, Pseudoclaudication, Ankylosing Spondylitis, Spondylolysthesis with
- Radiculopathy, Structural Kyphosis or Scoliosis, Radicular pain with weakness or loss of reflexes etc.
- Abdominal or Spinal tumor.
- Osteoporosis with Vertebral Fracture/Spinal Infection.
- Rheumatologic disorder.
- Surgical reasons
- Spine exercise training in the 3 months before the onset of the study.
- Other conditions like Pregnancy, pre surgical spine candidates actively undergoing cancer treatment,
- Abdominal hernia, compromised cardiopulmonary system, widespread neurological disorder.

Materials

- Pen
- Paper
- Camera
- Pencil
- Sphygmomanometer
- Mat
- Swiss ball
- Chair

Outcome measure

1. Visual analogue scale (VAS)
2. Transverse Abdominis Activation capacity (Tra)
3. Oswestry Disability Index (ODI)

Procedure

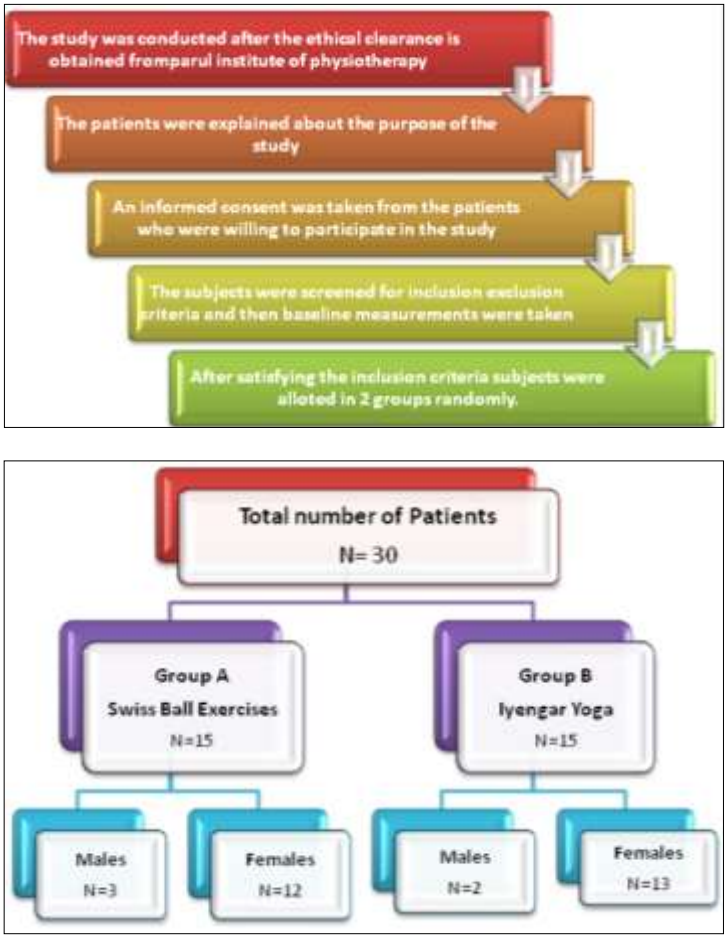

Fig 1

Application of Swiss Ball Exercises: This is in having a total 8 different exercises. It mainly consists of coremuscles.

Group A: Swiss Ball Exercises for Non-Specific Lower Back Pain

1. Roll Out: kneel on the floor and rest your forearms on a Swiss ball. Keeping your core braced, roll the ball forward so your arms are extended.
2. Y – Raise: Lie face down on top of a Swiss ball with your back is flat and your chest off of the ball. Let your arms hang by your shoulders.
3. T – Raise: Lie face down on Swiss ball with your back flat and your chest off of the ball. Let your arms hang straight down from your shoulders.
4. Back Extension: Lie prone on a Swiss ball with your feet hip width apart. You can place your feet against a wall for better stability. Clasp your hands.
5. Russian Twist: Lie with shoulder blades and head on a Swiss ball, and feet flat on the floor. Raise arms straight in the air. Clasping hands together. Slowly rotate shoulders.
6. Hip Raise: Lie in supine on Swiss ball. Head, Upper back supported on the Swiss ball and slowly raise body in the air.
7. Bridges: Lie on floor and place your feet and legs on a Swiss ball with your feet together. Extend your arms directly out from your shoulders at your sides. Initiating in hip with knee 90-90 flexed 15 repetitions. After hip and knee fully extend 15 repetitions [5, 17, 18, 26].

Group B: Iyengar Yoga (Level-1) For Non-Specific Lower Back Pain

1. Sukhasana: Change cross one (1x for 5 minutes)
2. Sukhasana Twist: Simple cross legs , twist , change cross and repeat (2x Total 15 repetitions with both sides)
3. Adho Mukha Virasana: Extend arms forward then change cross (15 repetitions)
4. Utthita Trikonasana: (2x each side Total 15 repetitions)
5. Virabhadrasana 2: (2x Total 15 repetitions with both sides)
6. Adho-Mukha Svanasana: (15 repetitions)
7. Bharadvajasana: In chair (2x Total 15 repetitions)
8. Savasana: (for 5 minutes) [21, 25].

Outcome measures

1. **Pain:** The Visual analogue scale is a simple and frequently used method for the assessment of variations in intensity of pain. Pain was assessed using a visual analogical scale(VAS).With the left extremity indicating "no pain" and the right extremity indicating "unbearable''. Participants were asked to use the scale to indicate their current level of pain. To which are assigned intensity values [19].
2. **TrA activation capacity:** It was assessed by using the sphygmomanometer. It is a simple device that registers changing pressure in an air filled pressure cell allowing body movement, especially spinal movement, to be detected during exercise. The pressure cell allows body measures from 0-200 mmHg. with a precision of 2 mmHg. Changes in body position modify the pressure, and they are registered by the sphygmomanometer. The device was placed on the TrA (above the anterior superior iliac spines) while participants were in ventral decubitus over a rigid surface. The depression of the abdominal muscles over the spinal cord typically decreases the pressure by 4-10 mmHg .Before individual work asked to contract the muscle the device was inflated to a pressure of 70 mmHg. The participants were instructed to draw the lower stomach gently off the pressure sensor without moving the back or the hips and to sustain it for 10 seconds, measured by a stopwatch [23].
3. **Functional Disability:** Functional disability was estimated by the Oswestry disability question naire, a functional scale assessing the impact of low back pain on daily activities. The score is calculated by the addition of the value assigned for each of the 10 individual questions and is used to categorize disability as: mild or no disability(0-20%), moderate disability(21-40%), severe disability (41-60%), incapacity (61-80%), restrict to bad (81-100%) [24].

Data Analysis

Table 1: Shows the table age mean for group A & B

Age	Mean	Minimum	Maximum	Sd
Group A	22.6	18	52	8.4
Group B	19.8	18	25	2.17

Table 2: Shows the table intra (pre-post) group comparison for group-A & B

Groups	Outcomes	Pre		Post		Value	P Value
		Mean	SD	Mean	SD		
Group A	VAS	5.46	2.16	0.96	0.48	Z-3.41	0.000
	TrA	75.13	3.04	79.13	2.69	T-12.35	0.000
	ODI	74.32	7.37	71.70	7.27	Z-3.41	0.000
Group B	VAS	6.06	1.16	0.26	0.41	Z-3.43	0.000
	TrA	74.33	0.50	78.80	3.63	T-12.30	0.000
	ODI	70.89	3.47	68.70	4.23	Z-3.40	0.000

Table 3: Shows the table inter (post) group comparison for group A & B

Outcome Measures	Group	Mean	SD	T value	P value
VAS (cm)	A	0.96	0.48	4.261	0.000
	B	0.26	0.41		
TrA (mmHg)	A	79.13	2.69	0.308	0.000
	B	78.80	3.63		
ODI (%)	A	71.70	7.27	1.380	0.000
	B	68.70	4.23		

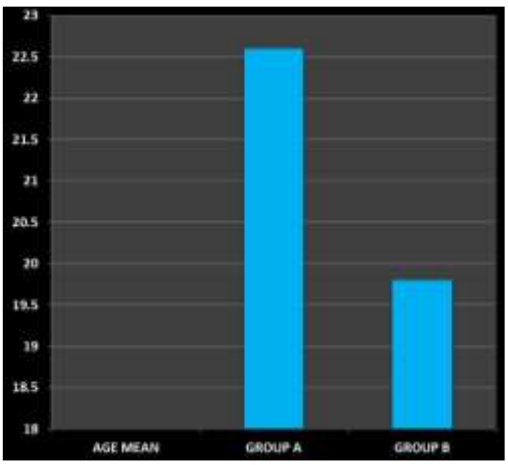

Fig 1

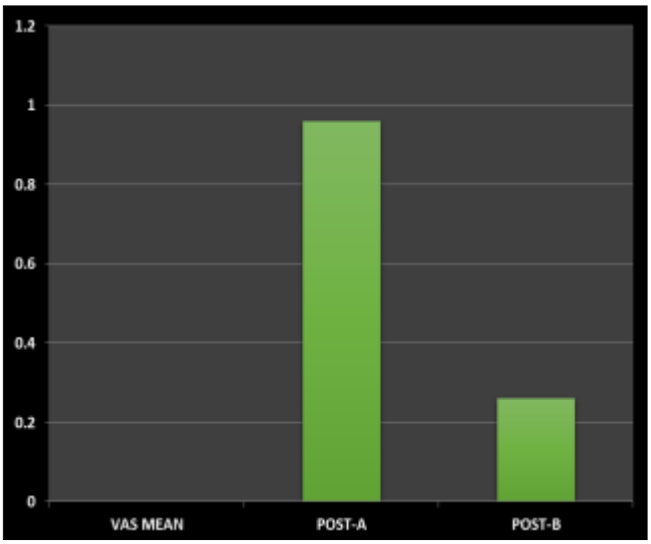

Fig 2

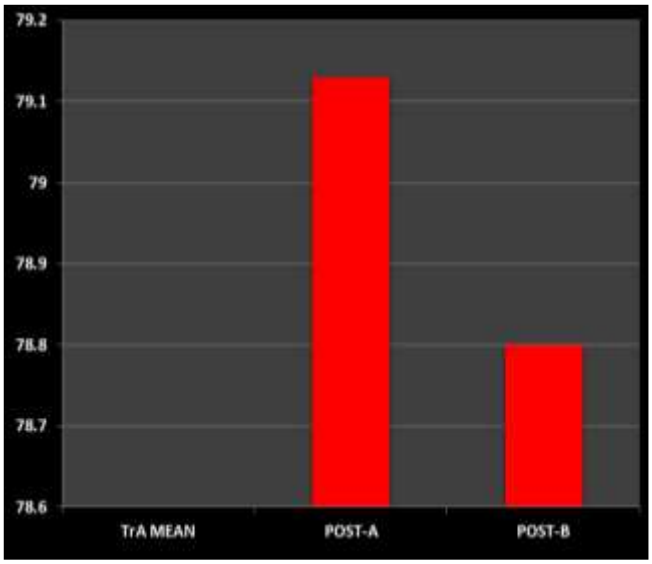

Fig 3

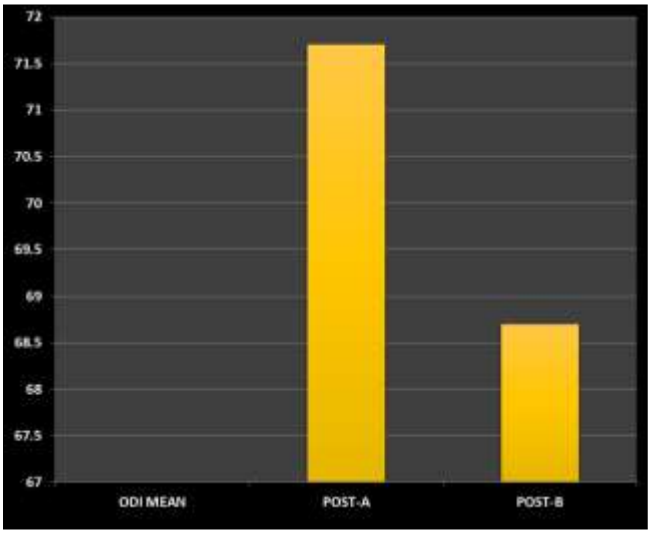

Fig 4

Results

The results of the study showed that the following:

- Swiss ball exercises are significantly effective to decrease the VAS, ODI & improve TrA activation capacity on non-specific lower back pain.
- Iyengar yoga is significantly effective to decrease the VAS, ODI & improve TrA activation capacity on non-specific lower back pain.
- Both groups (A & B) were statistically effective to decrease the VAS, ODI & improve TrA activation capacity on non-specific lower back pain.
- Group a Swiss ball exercises and Group B Iyengar yoga.
- Clinically, Group A had greater effectiveness to improve TrA activation capacity & Group B had greater effectiveness to decrease the VAS & ODI.

Discussion

The present study was done to see the effectiveness of Swiss ball exercises v/s Iyengar yoga for VAS, TrA activation capacity, ODI on non-specific lower back pain.

For the study 30 subjects were divided into 2 groups of 15 each. Group A received Swiss ball exercises and Group B received Iyengar yoga. Patients with non-specific lower back pain were selected having pain with symptoms persisting for the last 3 months. Other types of systemic conditions, Spinal conditions (stenosis, spondylolisthesis with radiculopathy etc.), Rheumatologic disorders were excluded. Study was done in parul sevashram hospital waghodia (vadodara) for 5 weeks. Data was collected pre and post treatment. Pain was measured by visual analogue scale, TrA strength measured by TrA activation capacity, Disability measured by Oswestry disability index [2, 6].

The present study result demonstrates that subjects with non-specific lower back pain patients receiving Swiss ball experienced greater improvement in TrA strength when compared with subjects receiving Group A underwent Swiss ball [18, 26].

After the completion of study the patients were reassessed by visual analogue scale, TrA activation capacity and oswestry disability index on non-specific lower back pain and the result showed the significant improvement in pain, strength & disability in non-specific lower back pain patients [19, 23, 24].

Here, in this study Group A which received Swiss ball exercises improved visual analogue scale with pre-test mean 5.46(cm) to post-test 0.96(cm),SD 2.16 to 0.48.This shows that individuals who received Swiss ball exercises decreased their intensity of pain on visual analogue scale significantly. Table -1 shows the Mean and Standard deviation (SD) of group-A [19].

Group-a for TrA activation capacity with pre-test mean 75.13(mmHg) to post-test 79.13 (mmHg), SD 3.04 to 2.69.Group-a for ODI pre-test mean 74.32(%) to 71.70 (%), SD7.37 to7.27 [23, 24].

Group-b for VAS pre-test mean 6.06(cm) to 0.26(cm),SD 1.16 to 0.41.TrA activation capacity with pre-test mean 74.33(mmHg) to post mean 78.80(mmHg),SD 0.50 to 3.63.and ODI for pre-test mean 70.89(%) to68.70(%),SD 3.47 to 4.23 [19, 23, 24].

Here, in this study Group A&B comparison shows in table 2 & graphs 1,2,3.VAS for group-A 0.96(cm) & group-B 0.26(cm).TrA for group -A79.13(mmHg)& group – B78.80(mmHg).ODI for group-A 71.70(%) & group-B 68.70(%) [19, 23, 24].

According to this study by LUDMILA M.COSIO-LIMA, the central nervous system and body proprioceptors work together to refine patterns of movements. A Swiss ball

exercises showed improvement in core muscles (transverse abdominis muscles) strengthening [17, 18, 20].

According to the study by Ravi B. Wattamwar, As it works to correct underlying internal malfunction through process of helping people allowing to rest the area of pain, then educating them in proper alignment of bones, muscles and connective tissues and movements that the healing occurs and changes the underlying root cause of discomfort, and it may also exert benefits through its effects on mental focus [6, 7, 8, 9, 10].

Conclusion

There is significant improvement in both groups Swiss ball exercises and Iyengar yoga on non-specific lower back pain patients .But the group receiving Swiss ball exercises showed more powerful improvement in TrA strength, Iyengar yoga decreases pain and disability in non-specific lower back pain.

Summary

A comparative study was conducted in between two groups. The study was conducted on 30 subjects in a community. The subjects were divided into two groups. Group A was given Swiss ball exercises and group B was given Iyengar yoga. A pre-test outcome measures VAS, TrA and ODI were given. Interventions were carried out for 5 weeks. The results were derived by using statistical methods with the help of statistics software SPSS 17.0.

SPSS 17.0 software, intra group comparison for “Z-test” on VAS and ODI.” Paired t-test” on TrA. Inter group comparison for VAS and ODI by “monte carlo test” and TrA by “unpaired t- test” was used. After statistical analysis there was significant difference in pre-test and post values within three outcomes variables of each group and also significant differences in pre-test and post-test values between two groups. The study showed significant improvement in core muscle strength by group A and VAS, ODI improvement by group B statistically.

Limitations

- The study was that the number of subjects recruited for the study were very few (30), 15 subjects in each group.
- The duration of the study was also very short to conclude that Iyengar yoga.
- The Iyengar yoga level-1 in position no.6 is excluded because patients are not able to do this position.
- Sampling was done as per convenience.
- ODI in section no.8 is excluded.

Future research

- Further study can be done with Iyengar yoga level-1 in position no.6.
- Swiss ball exercise can be compared with other techniques while improving core muscles strength.
- Iyengar yoga can be compared with other techniques while reducing pain and functional disability.

References

1. Balagué Federico. "Non-specific low back pain." The Lancet, Level of evidence 1A. 2012; 379(9814):482-491.
2. 3.0 to 3.1 Prabhu LV. "Vertebral body integrity: a review of various anatomical factors involved in the lumbar region." Osteoporosis international Level of evidence 2A. 2007; 18(7):891-903.
3. Fortin Maryse, Luciana Gazzi Macedo. "Multifidus and paraspinal muscle group cross-sectional areas of patients with low back pain and control patients: a systematic review with a focus on blinding." Physical therapy. Level of evidence 2A, 2013.
4. Truchon M. Determinants of chronic disability related to low back pain: towards an integrative bio psychosocial model. Disabil Rehabil Level of evidence 2B. 2001; 23(17):758-67.
5. Vivek Gaur, Sukriti Gupta, Manish Arora, Julie A Hides, Carly L Boughen, Warren R Stanton, *et al*. Journal of orthopaedic & sports physical therapy. 2010; 40(1):4-10.
6. Hancock MJ, Maher CG, Latimer J, *et al*. Systematic review of tests to identify the disc, SIJ or facet joint as the source of low back pain. Eur Spine J level of evidence 1A. 2007; 16:1539-50.
7. Gregory J Lehman, Trish Gordon, Jo Langley, Patricia pemrose, Sara Tregaskis, Dynamic Medicine. 2005; 4(1):6.
8. Van Tulder M, Becker A, Bekkering T. Chapter 3. European guidelines for the management of acute nonspecific low back pain in primary care. Eur Spine J. 2006; 15(2):S169-91. level of evidence 1A.
9. ROUX EB. Medical approach to low back pain, Bailli~re's Clinical Rheumatology. Level of evidence C, 1992, 6(3).
10. Prabhu LV. "Vertebral body integrity: a review of various anatomical factors involved in the lumbar region." Osteoporosis international Level of evidence 2A. 2007; 18(7):891-903.
11. Marshall PW, Murphy BA. Journal of manipulative and physiological therapeutics. 2006; 29(7):550, 2006.
12. Flett Maureen, Swiss Ball. For Strength, Tone and Posture. Sterling Publishing Company, Inc, 2003. ISBN1-85648-663-X.
13. Klein-Vogelbach Susanne. Functional Kinetics: Observing, Analyzing, and Teaching Human Movement. Springer-Verlag, 1990. ISBN 0-387-15350-0.
14. Carriere Beate, Renate Tanzberger. The Swiss Ball: Theory, Basic Exercises and Clinical Application. Springer, 1998. ISBN 3-540-61144-4.
15. Paul WM Marshall, Bernadette A Murphy, journal of Manipulative and Physiological Therapeutics. 2006; 7(29):550-560.
16. Peter BO Sullivan, Lance Twomey, Garry T Allison, Journal of orthopaedic & Sports Physical Therapy. 1998; 27(2):114-124.
17. Richard A Ekstrom, Robert A Donatelli, Kenji C Carp, Journal of orthopaedic & sports physical therapy. 2007; 37(12):754-762.
18. Varoli FK, Pedrazzi V. Adapted version of the McGill pain questionnaire to Brazilian Portuguese. Braz Dent j. 2006; 17:328-35.doi:10.1590/s0103644020060004000 12.
19. Yoga Hatha I. Title. RA 781.7.1941977613.776-48857. Iyengar, B.K.S. Light on yoga, 1918. ISBN 0-8052-1031-8.
20. Iyengar BKS. Light on Yoga. New York: Schocken Books, 1976.
21. Garfinkel MS, Schumacher HR Jr, Husain A, Levy M, Reshetar RA. Evaluation of a yoga based regimen for

treatment of osteoarthritis of the hands. Schumacher, Jr. Yoga-based int Journal of Rheumatology. 1994; 21:2341-2343.
22. Richardson C, Jull g, Hodges PW, Hides JA. Therapeutic Exercise for Spinal Segmental Stabilization in Low Back Pain: Scientific Basis And clinical Approach. 1A ed. Sydney: Churchill Livingstone, 1999.
23. Vigatto RA, lexandre NM, Filho HR. Development of a Brazilian Portuguese version of the Oswestry Disability Index. Spine. 2007; 32:481-6.doi:10.1097/01.brs.0000 255075.11496.47.
24. Biology in Yoga and Shamanism, David Alexander Plessy, BIOL, 2015.
25. Milligan James. Swiss Ball For Total Fitness: A Step by step Guide, 2005.