International Journal of Physical Education, Sports and Health 2021; 8(3): 297-303

P-ISSN: 2394-1685
E-ISSN: 2394-1693
Impact Factor (ISRA): 5.38
IJPESH 2021; 8(3): 297-303

www.kheljournal.com
Received: 19-03-2021
Accepted: 21-04-2021

Shalima KP
Assistant Professor, AKG Cooperative Institute of Health Sciences, Kerala, India

Rajasheker Sannasi
Principal, Srinivas College of Physiotherapy and Research, Pandeshwar, Mangalore, Karnataka, India

Corresponding Author:
Rajasheker Sannasi
Principal, Srinivas College of Physiotherapy and Research, Pandeshwar, Mangalore, Karnataka, India

Effect of motor control exercise on a subgroup of nonspecific chronic low back pain

Shalima KP and Rajasheker Sannasi

Abstract
Background and Objective: Back pain is the most frequent cause of activity limitation in people aged younger than 55 years. The purpose of this case series is to describe the use of classification system in the evaluation of patients with Non specific chronic low back pain (NSCLBP) system for the management of 6 patients with chief complaints of low back pain. Patients were initially classified into flexion and active extension subgroups based on history, clinical examination and specific motor control tests. This system was used to develop management program in which the patients were instructed in symptom reducing strategies for positioning and functional movement. Exercises to address the direction-specific impairments were prescribed. Limited evidence has been found till now on treatment emphasizing motor control exercises using classification system. Even though many studies had been done on low back pain patients by using motor control exercises, systematic reviews concluded that future studies are required on subgroup of NSCLBP. Thus this study is intended to do the study on the classification, intervention, and outcomes for patients with active extension and flexion syndrome.
Methodology: The study was conducted on 6 Low Back Pain subjects and they were sub classified in to flexion and active extension group. Exercises to address the direction-specific impairments were prescribed for both subgroups. The patient participated in 3wks motor control exercise programme. Pain and disability were measured for all the 6 LBP population before and after giving motor control exercises and then follow up after 10weeks, 3months and 6 months. The patients reported a decrease in symptoms, disability, and frequency of recurrences.
Results: The results revealed that there was significant difference in pain and disability after giving motor control exercise to those subgroup of patients.
Interpretation and Conclusion: It was concluded that there was a significant improvement in pain and disability among LBP patients after giving motor control exercise for 10 weeks.

Keywords: case series, classification, disability, low back pain, motor control

Introduction
Low Back Pain (LBP) is defined topographically as pain occurring between the lower margins of the 12th rib and above the inferior gluteal folds with or without leg pain [1, 2]. Low back pain results in significant levels of disability producing restrictions on usual activity and participation, such as inability to work [3]. In India, occurrence of low back pain is alarming; nearly 60 per cent of the people in India have significant low back pain at some time or the other in their lifespan [4].
There are several considerations to be taken when assessing patients with LBP [5]. In the majority of patients LBP is non-specific (NSCLBP) and 10% of LBP individuals can be assigned to a specific LBP category, such as nerve root compression, vertebral fracture, tumour, infection, inflammatory diseases, spondylolisthesis, spinal stenosis or definite instability [4].
After an initial episode of LBP, 44-78% people suffer relapses of pain occur and 26-37%, relapses of work absence [6]. Acute LBP tends towards becoming a complex chronic pain disorder, involving anatomical, physiological, psychological and social aspects [7].
In order to treat patients effectively and with a good outcome, there has been an increasing demand and need for sub-classification of the NSCLBP population [8]. Numerous CS have been proposed such as McKenzie 1981 [9]; Spitzer *et al*.1987 [10]; Delitto *et al* 1995 [11]; Sahrmann 2001 [12]; Petersen *et al*. 2003 [13]; O'Sullivan 2005 [8].

However, only a few are found sufficiently reliable and valid, even fewer consider the disorder from a bio psychosocial perspective. Petersen *et al*. 1999 [14]; McCarthy *et al* 2004 [15]; O'Sullivan 2005; Dankaerts *et al* 2006 [16]; Quebec Task Force CS and O'Sullivan classification system [8].

O'Sullivan proposes a new mechanism based classification system of NSCLBP, which classifies as either centrally or peripherally evoked LBP. The centrally evoked pain is associated with psychosocial factors, (30%) peripherally evoked LBP is mechanically caused and is further divided into movement impairment and motor control impairment (MCI) each approximately 30% [8].

Movement impairment disorders are associated with a painful loss of normal physiological movement about a spinal region. This could occur secondary due to connective tissue changes or more likely to muscle guarding around the sensitized spinal region [16]. These patients will generally avoid moving into the painful range and this can be related to flexion, extension, lateral flexion or it can be multidirectional.

Motor control impairment appears to be most common in clinical practice. These disorders are associated with impairment or deficits in the control of the symptomatic spinal segment in the primary direction of pain. In these disorders there is no movement impairment in the direction of pain. Pain in these disorders is associated with a loss of functional control around the neutral zone of the spinal motion segment due to specific motor control deficits of the spinal stabilizing muscles. This is manifest during dynamic and/or static tasks [8]. Patients with flexion control impairment sit more flexed in their usual sitting position. In contrast, patients with active extension impairment sit in more extension [17].

Optimal treatment for patients with NS-CLBP remains largely enigmatic, and that caring for chronic LBP, is one of the most difficult and unrewarding problems in clinical medicine as no single treatment has been shown to be clearly effective [19]. Randomized Controlled Trials (RCTs) have failed to find consistent evidence for improved outcomes. One explanation offered for the inability to identify effective treatments is the lack of success in defining sub-groups of patients who are most likely to respond to a specific treatment approach. Indeed, it has been proposed that the LBP group conceals a large heterogeneous group of patients [18]. Any specific treatment applied to a falsely assumed homogenous sample may result in improvement, failure to respond or aggravation of the disorder.

Patients with motor control deficits are a substantial subgroup that they may benefit from specific motor control exercise. After the patient have been explained the mechanisms of the ongoing pain sensitization, they will be educated on the mechanics of the spine, the nature of ongoing tissue sensitization with their habitual adoption of end range postures and the importance of the muscle system of the lumbo-sacral region to control spinal motion segments and minimize strain. They will often have to be made aware of the lack of control, or sense of their neutral spine positions [16].

To our knowledge, limited evidence has been found till now on treatment emphasizing motor control exercises using classification system. Even though many studies had been done on low back pain patients by using motor control exercises, systematic reviews concluded that future studies are required on classified NSCLBP [21-25].

Materials and Methods

Methodology

Source of Data: Subjects were taken from Srinivas OPD and Srinivas Hospital Mangalore

Study Design: Case Series

Sampling Technique: Purposive sampling

Sampling Size: 8 non specific chronic low back pain patients

Criteria for Selection

Subjects for the study were selected based on following criteria.

Inclusion Criteria

- NS-CLBP with motor control impairment of FP or AEP >3-mo nonspecific LBP
- Age18-58 yrs (both females and males).
- Pain localized to the lower lumbar spine (L4/L5 or L5/S1) region.
- Absence of "red flags" (specific causes of LBP such as cauda equina syndrome or inflammatory disease)
- Absence of dominant "yellow flags" (identification of beliefs, emotions, and behaviors that interact with the pain problem)
- Clear mechanical basis of the disorder (pain related to postures and movements)
- Associated impairments in the control of the motion segment (s) in the provocative movement direction (s)
- Absence of impaired movement of the symptomatic segment in the painful direction of movement or loading (based on clinical joint motion palpation examination)
- Clinical diagnosis of a FP or AEP disorder.

Exclusion Criteria

- Signs of neurologic involvement (radicular pain), non-mechanical pain, more generalized pain
- Evidence of specific diagnosis, e.g., spondylolisthesis, Inflammatory disease
- Presence of red flags
- Presence of dominant yellow flags
- Previous spine surgery, pregnant at the time of the study or 6 months, postpartum
- Recently undergone a period of motor control rehabilitation.

Tools Used for Data Collection

- Consent form
- Roland- Morris questionnaire – Kannada version
- Beck's depression questionnaire
- Tampa scale for kinesophobia
- Rolando –Morris questionnaire- English version
- Numeric pain rating scale
- Pen
- Pad
- Pressure biofeedback unit

Materials

- Data recording sheet: to record the data
- Pressure Biofeedback Unit (PBU)
- Plinth
- Swiss ball

Outcome Measures
- Numerical pain rating scale
- Rolland Morris Disability Questionnaire

Method of Collection of Data
Permission was taken from Srinivas hospital to recruit the patients. LBP patients who had directly come to the Physiotherapy Department and those referred by orthopaedicians from various hospitals during the month of March 2013 to month of December 2014 were recruited. Patients were assessed and diagnosed by physical examination by the clinicians at OPD.
All subjects were asked to sign the written consent form stating the voluntary acceptance to participate in the study. Eligible subjects were selected based on the inclusion and exclusion criteria. Preparticipation screening questionnaire was administered to the patient (Beck's depression questionnaire and Tampa scale for kinesophobia) prior to the initial evaluation for yellow flags and disability.
The subjects were assigned to one of the following subgroups based on the results of motor control tests that they perform.

They were assigned either into
- Flexion pattern
- Active extension pattern

Motor control tests for flexion and active extension pattern are
Motor control tests for flexion pattern
- Waiter's bow test
- Sitting forward lean test
- Chest drop test(Quadruped position)
- Double knee extension test
- Ischial weight bearing test

Motor control tests for active extension pattern
- Back flattening on wall standing (test for lumbar extension control).
- Forward lean test
- Chest lift test
- Hip extension lift test
- Prone knee bend test

Baseline Data
Baseline data including the Demographic information, [i.e. Age, Sex, Duration of symptoms, Pain intensity, Pain during measurement, Previous LBP history, Education level, Onset (gradual, sudden), Pain pattern (Body chart), medication history etc were collected from all the selected subjects.
- Rolland Morris disability Questionnaire, NPRS score, were measured prior to and after the treatment.
- LBP patients will be evaluated before and after intervention

Results
Data was collected from the subjects of LBP and the following variables and its values of pre and post intervention were described using tables and graphs.
Gender, Age, Beck's depression questionnaire, Tampa scale for kinesophobia, Rolando Morris questionnaire- English version and Numeric pain rating scale were documented.

Table 1: Mean and standard deviation of 6 patient

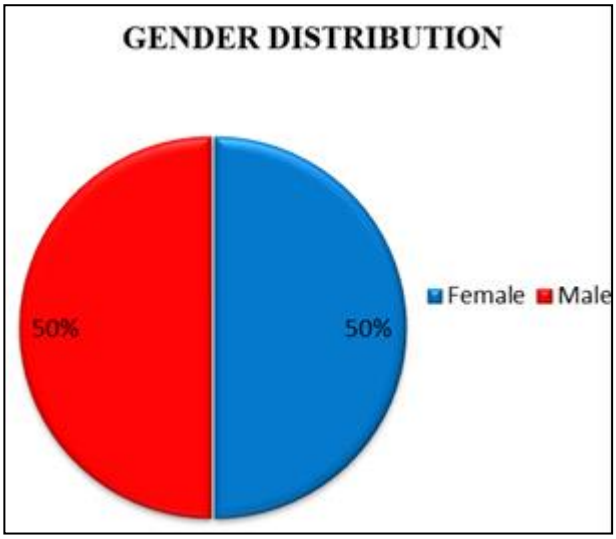
Variable	Minimum	Maximum	Mean	SD
Age	20	46	30.7	9.9
Pre NPRS	7	9	8.2	0.8
Post NPRS	0	3	1	1.3
Pre Disability	10	21	15.7	3.9
Post Disability	0	4	1.2	1.6

Table 2: Baseline Status Patient Characteristics and Outcome Measures

Patient	Age	Sex	Pre Intervention (NPRS) Score	Post Intervention NPRS Score			Pre Intervention (RMQ) Score	Post Intervention Disabilitty Score		
				After 10 wks	After 3mnt	After 6mnts		After 10wks	After 3mnts	After 6mnts
1st patient	20	M	9	3	2	1	13	10	2	0
2nd patient	29	F	8	3	1	2	16	13	3	0
3rd patient	26	M	7	3	4	0	10	6	1	2
4th patient	39	F	8	1	3	0	19	10	0	0
5th patient	24	F	8	2	1	0	15	9	1	1
6th patient	46	M	9	4	6	2	21	14	7	4

Table 3: Baseline characteristics

Variable	Frequency	Percentage
Gender		
Female	3	50
Male	3	50



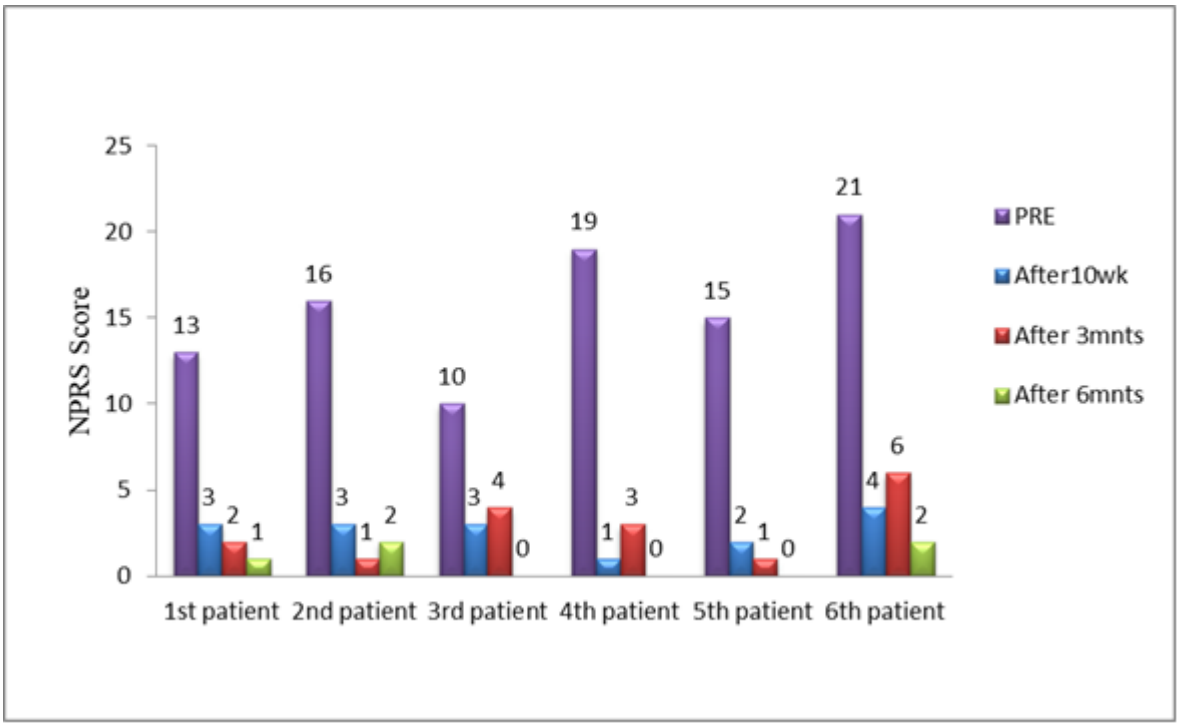
Graph 1: Gender

Analysis on NPRS

NPRS of pre and post intervention for 6 patients were compared.

Table 4: Statistical values for NPRS

NPRS	Minimum	Maximum	Mean±SD	p- value
Pre Test	7	9	8.2±0.8	0.026
Post Test	0	3	1±1.3	



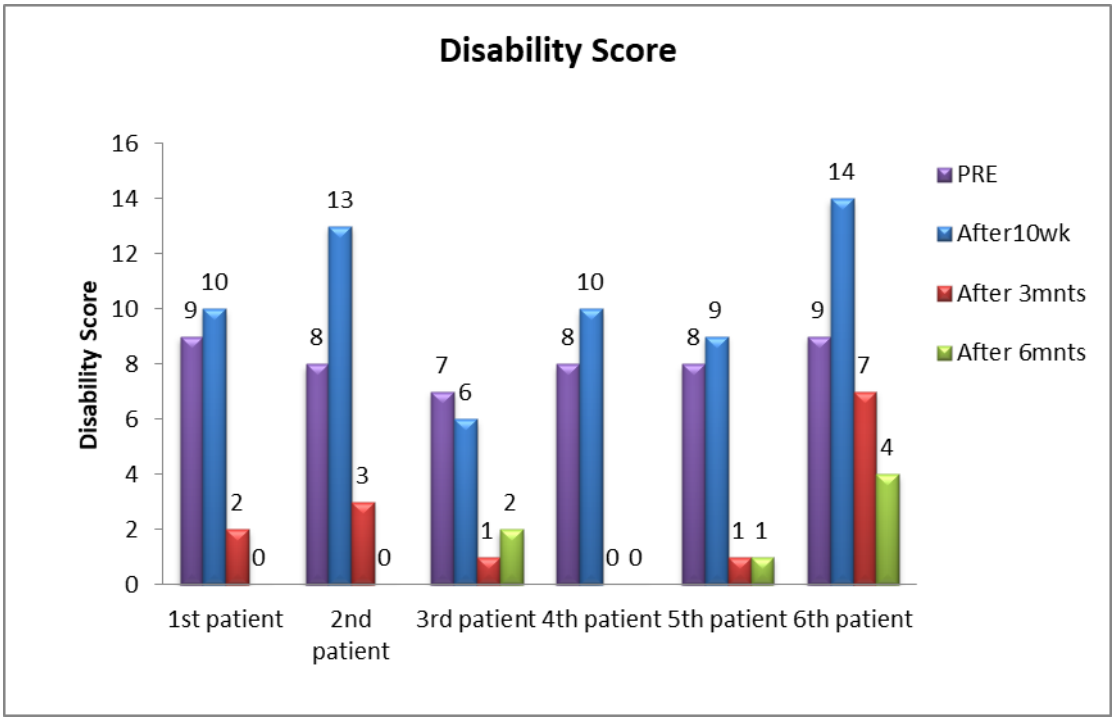
Graph 2: Pre and Post Interventionmean of NPRS Scores

Analysis on RMDQ

Table 5: Statistical values for RMDQ scores

Disability	Minimum	Maximum	Mean±SD	p- value
Pre Test	10	21	15.7±3.9	0.028
Post Test	0	4	1.2±1.6	

Rolland Morris disability questionnaire's scores of pre and post test score for 6 patients were compared



Graph 3: Pre and Post Intervention Mean of RMDQ Scores

Discussion

Numerous interventions are available for patients with low back–related disorders [34]. The challenge for physical therapists is to identify the most appropriate intervention for each patient, based on the findings from a standardized examination. This task is difficult because the etiology of LBP is unknown in the majority of cases [34]. The intention of this study is to describe the clinical reasoning process of clinicians when deciding how to classify patients into subgroups for treating specific impairments.

This was the first study to evaluate a series of cases on motor control ability before and after physiotherapy treatment. So far, only 2 case reports have been published on the efficacy of exercises based on specific movement control findings in LBP (Maluf *et al*., 2000, Van Dillen *et al*.2005 [37].

The patients in this study had a predisposition to flex, hyperextend or rotate, and laterally bend their lumbar spine when assuming different positions during various movements of the trunk and limbs. Since the prevalence of flexion and extension related symptoms are common in LBP, we didn't focus on other direction related symptoms like lateral shift pattern and multi directional instability pattern. In this study, we did screening using Beck's depression questionnaire and Tampa scale for kinesophobia to rule out the yellow flags in order to find only motor control impairment LBP.

Patient #1 and #2 had a 5-6 point decrease in his average NPRS initially after the 10weeks of intervention and a 9-point decrease after the 6 month follow up. After 3 months patient reported 85% reduction in RMDQ and 99% after 6 month follow-up. A 2-point change on the NPRS represents the MCID for these tools. On initial assessment for the third patient pain scores on the NPRS ranged from 3 point reduction after 3 months and no pain was reported after the 6 months follow up and 90% of reduction in disability after 6months. After 10wks physical therapy visits, fourth patient reported 7-point change in pain and no pain after 6 months follow up and no disability after 6 months follow up in her RMDQ score. Patient #5 achieved a 4- point improvement on her NPRS and a 1-point improvement after 3 weeks of intervention. The initial disability scores (RMDQ) ranged from 21-points to 4-points after 6 months. Three patients had low disability scores (less than 15%), whereas 1 patient had a significant disability score with less improvement in both pain and disability. All patients improved their score after treatment and shows significant improvement after 6months. After treatment, the improvement regarding pain perception in all 6 symptomatic patients was superior.

Improvement of movement control through exercises leads to a decrease of LBP and improves functional disability due to back pain. However, as no control groups were included, no direct conclusions on the efficacy can be drawn. This case series further illustrates the effectiveness of sub grouping LBP patients, as all patients in this study achieved better results regarding the pain and disability.

Symptoms associated with disorders of the low back typically resolve within 6 weeks of onset, and only 5% of individuals have symptoms that persist longer than 3 months. The LBP episode described in this case series began more than 3 months prior to the patient's initial therapy visit to our department, which is beyond the time frame typically associated with natural resolution of LBP.

Improvement in both functional ability and symptom reduction after the treatment were observed. The patients did not experience a recurrence of low back–related symptoms in the 6 months following discharge from our clinic, during which time they continued their home exercise program and activity modifications. Together, these observations suggest that our approach may have positively influenced the patient's recovery**.**

Reference

1. Tulder MV, Becker A, Bekkering T, Breen A, Maria Teresa Gil del Real, Hutchinson A *et al*. Chapter 3. European Guidelines for the management of acute non specific low back pain In primary care. Eur Spine J 2006;15(2):169-91.

2. Airaksinen O, Brox JI, Cedraschi C, Hildebrandt J, Klaber-Moffett J, Kovacs F *et al*. European guidelines for the management of chronic nonspecific low back pain. Eur Spine J 2006;152:192-300
3. Lehmann TR, Spratt KF, Lehmann KK. Predicting long-term disability in low back injured workers presenting to a spine consultant. 1993;18(8):1103-12.
4. Shyamal K, Gurupreet S, Rupali S. Severity of Disability in Elderly Patients with Low Back Pain in Amritsar 2008;10:265-268
5. Waddell G. Volvo Award in clinical sciences. A new clinical model for the treatment of low-back pain. Spine 1987;12:632-44.
6. Maurits van Tulder, Annette Becker, Trudy Bekkering, Alan Breen, Maria Teresa Gil del Real *et al*. European Guidlines For The Management Of Acute Nonspecific Low Back Pain In primary care on behalf of the cost B13 Working Group on Guidelines for the Management of Acute Low Back Pain in Primary Care November 2004 Amended version, 2005.
7. Hides JA, Richardson CA, Jull GA. Multifidus muscle recovery is not automatic after resolution of acute, first-episode low back pain. Spine 1996;21:2763-9.
8. O'Sullivan P. Diagnosis and classification of chronic low back pain disorders: Maladaptive movement and motor control impairments as underlying mechanism. Manual Therapy 2005;10:242-255.
9. McKenzie R. The Lumbar Spine, Mechanical Diagnosis and Treatment. Spinal Publications Ltd.: Waikanae, New Zealand 1981.
10. Spitzer WO. Scientific approach to the assessment and management of activity -related spinal disorders. A monograph for clinicians. Report of the Quebec Task Force on Spinal Disorders. Spine 1987,S1-S59.
11. Delitto A, Erhard RE, Bowling RW. A treatment-based classification approach to low back syndrome: identifying and staging patients for conservative treatment. Physical Therapy 1995;75:470-85.
12. Sahrmann S. Movement Impairment Syndromes of the Lumbar Spine. Mosby: St. Louis 2002.
13. Petersen T, Laslett M, Thorsen H, Manniche C, Ekdahl C, Jacobsen S. Diagnostic classification of non-specific low back pain. A new system integrating pathoanatomic and clinical categories. Physiotherapy Theory and Practice 2003;19:213-37.
14. Petersen T, Thorsen H, Manniche C, Ekhdahl C. Classification of non-specific low back pain: a review of the literature on classification systems relevant to physiotherapy. Physical Therapy Review 1999;4:265-81.
15. McCarthy C, Arnall F, Strimpakos N, Freemont A, Oldham J. The biopsychosocial classification of non-specific low back pain: a systematic review. Physical Therapy Reviews 2004;9:17-30.
16. Wim Dankaerts, Peter O'Sullivan, Angus Burnett, Leon Straker, Paul Davey, Ritu Gupta. Discriminating Healthy Controls and Two Clinical Subgroups of Nonspecific Chronic Low Back Pain Patients Using Trunk Muscle Activation and Lumbosacral Kinematics of Postures and Movements A Statistical Classification Model 2009;34:15
17. Dankaerts W, O'Sullivan PB, Straker LM *et al*. The inter-examiner reliability of a classification method for non-specific chronic low back pain patients with motor control impairment. Man Ther 2006;2:28–39.
18. Hayden JA, Van Tulder MW, Tomlinson G. Systematic review: strategies for using exercise therapy to improve outcomes in chronic low back pain. Ann Intern Med 2005;142:776-85.
19. Fersum KV, Dankaerts W, O'Sullivan PB, Maes J, Skouen JS, Bjordal JM. Integration of subclassification strategies randomised controlled clinical trials evaluating manual therapy treatment and exercise therapy for non-specific chronic low back pain: a systematic review.Br J Sports Med 2010;44:1054-1062.
20. Kendall N, Main C. Guide to assessing psychosocial yellow flags in acute low back pain. In: N, K. (ed.) Commitee ARCICoNZatNH. Wellington, New Zealand 1997.
21. Macedo LG, Maher CG, Latimer J *et al*. Motor control exercise for persistent, non-specific low back pain: a systematic review. Phys Ther 2009;89:9-25.
22. May S, Johnson R. Stabilisation exercises for low back pain. Systematic review. Physiotherapy 2008;94:179-189.
23. Hauggaard A, Persson AL. Specific spinal stabilisation exercises in patients with low back pain - a systematic review. Phys Ther Rev 2007;12:233-248
24. Ferreira PH, Ferreira ML, Maher CG *et al*. Specific stabilization exercise for spinal and pelvic pain: a systematic review. Aust J Physiother 2006;52:79-88.
25. Rackwitz B, Debie R, Limm H *et al*. Segmental stabilizing exercises and low back pain. What is the evidence? A systematic review of randomized controlled trials.Clin Rehabil 2006;20:553-67.
26. Martin Gustaf Byström, Eva Rasmussen-Barr, Wilhelmus Johannes Andreas Grooten. Motor Control Exercises Reduces Pain and Disability in Chronic and Recurrent Low Back Pain. A Meta-analysis 2013;6:E350-E358.
27. Hannah Carlsson, Eva Rasmussen-Barr Clinical screening tests for assessing movement control in non-specific low-back pain. A systematic review of intra- and inter-observer reliability studies. Manual Therapy 2012,1-8p.
28. Andreas Monnier, Joachim Heuer, Kjell Norman, Björn O Äng. Inter- and intra-observer reliability of clinical movement-control tests for marines. BMC Musculoskeletal Disorders 2012;13:263.
29. Augustine aluko, Professor Lorraine Desouza, Professor Janet Peacock. Evaluation of trunk acceleration in healthy individuals and those with low back pain International journal of Therapy and Rehabilitation 2011;18(112):18-25.
30. Refshauge, James H McAuley, Matthew D Jennings Latimer, Paul W Hodges, Robert D *et al*. Motor Control Exercise for Chronic Low Back Pain: A Randomized Placebo-Controlled Trial.Phys Ther 2009;89:1275-1286
31. Luomjoki H, Kool J, De,Bruin ED, Alraksnen O. Movement control tests of the low back; evaluation of the difference between patients with low back pain and healthy controls. BMC Musculoskelet Disord 2008;9:170.
32. Luomajoki H, Kool J, De Bruin ED, Airaksinen O. Reliability of movement control tests in the lumbar spine BMC Musculoskeletal Disorder 2007;12(8):90-100.
33. O'Sullivan, Wagner PB, Linda R Van Dillen, Shirley A Sahrmann, Joannem Wagner. Classification, Intervention, and Outcomes for a Person With Lumbar Rotation With Flexion syndrome. Phys Ther 2005;85:336-351.
34. Van Tulder MW, Koes BW, Bouter LM. Conservative treatment of acute and chronic nonspecific low back pain: a systematic review of randomized controlled trials of the

most common interventions. Spine. 1997;22:2128-2156.
35. Rubinstein S, Terwee C. Spinal Manipulative Therapy for acute low back pain. Cochrane Review. Spine 2013;38(4):E158-E177.
36. Andersson G. Epidemiological features of chronic low-back pain. Lancet 1999;354(9178):581–5.
37. Maluf KS, Sahramann SA, Van Dillen LR. Use of a classification system to guide nonsurgical management of a patient with chronic low back pain. Physical Therapy 2000;80:1097-1111.
38. Adams M, Bogduk N, Burton K, Dolan P. Functional pathology. In: Adams M, Bogduk N, Burton K, Dolan P, eds. The Biomechanics of Back Pain. Edinburgh, United Kingdom: Churchill Livingstone 2002,159-187.