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Therapeutic Exercises in the Management of Non-Specific Low Back Pain

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1. Introduction

Low back pain (LBP) is neither a disease nor a diagnostic entity of any sort (Ehrlich, 2003). It is a common problem which affects the majority of adults at least once in a life time. It is irksome, of global concern, as common as headache affecting all age groups and races (May, 2001; Hazard, et al, 1996). It is a prevalent musculoskeletal condition, and a common cause of disability especially in its chronic/recurrent state. The majority of LBP episodes resolve spontaneously while a significant minority becomes recurrent and a small percentage remain persistent (Dunn and Croft, 2004). LBP has a point prevalence of about 7 to 33% and lifetime prevalence of nearly 85% (Walker, 2000). Frank et al, (1996); Vollin, (1997) reported similarly that it affects about 70-85% of individuals once in their lifetime.

Management of LBP is costly; accounting for a large and increasing proportion of health care expenditures without evidence of corresponding improvements in outcomes (Martin et al, 2008). Frymoyer, (1988) reported that the major costs of LBP can be identified with the chronic and recurrent LBP. Low back pain occurs in a wide variety of medical, musculoskeletal, and neurologic conditions (Roach et al, 1997, Cypress, 1983). Most individuals reporting at the clinic for management of excruciating LBP have experienced pain in the low back many times before the episode that brings them to the hospital. Low back pain accounts for serious job absenteeism in industrialized societies, a case that would have been similar in most parts of Africa except that there is hardly any financial compensation for sick leave, hence less report of LBP in clinics.

Low back pain was defined as pain and discomfort, localised below the costal margin and above the inferior gluteal folds, with or without leg pain (sciatica) (Omokhodion et al, 2002), and as "pain limited to the region between the lower margins of the 12th rib and the glutei folds" with or without leg pain (sciatica) (Manek and Macgregor, 2005). It is specifically an aggregation of symptoms of pain/discomfort originating from the lumbar spine apparatus with or without radiation of pain to the gluteal fold and legs. It is regarded as a symptom from impairments in the structures in the low back which originates e.g. from muscles, ligaments, intervertebral disc. Low back pain is a symptom of myriads of causes ranging from mechanical causes; accounting for about 90% of cases and non-mechanical causes i.e. secondary to an underlying pathology in the rest of the population. It is a symptom which appears in the clinic as a disease entity because it is highly reported. It can be primary i.e.

mechanical/non-specific and also secondary with an underlying pathology i.e. non-mechanical. Non-specific LBP appears to be commoner affecting mostly individuals between ages 30 and 50years; in children and adolescents however, LBP appears to be usually secondary to an underlying pathology.

2. Classification

Low back pain can be acute, sub-acute or long-term; acute-on-chronic, with recurrence rearing its head among a significant minority. Acute low back pain is usually defined as the duration of an episode of low back pain persisting for less than 6 weeks; sub-acute as LBP which lasts between 6 and 12 weeks and long-term LBP as persisting for 12 weeks or more; chronic LBP is defined as LBP persisting for 12 weeks or more. Recurrent low back pain is defined as a new episode after a symptom-free period of 6 months, but not an exacerbation of chronic low back pain (van Tulder et al, 2004). Walker, 2000 estimated that 70-95% of any adult population will suffer at least one episode of back pain in its lifetime, while Truchon, 2001 proposed 60-80%. Fifty per cent of such cases will recur within 3 months (Lawrence et al, 2006). Recurrent and chronic LBP accounts for more than 70% of cases reported at clinics. Acute LBP is a common presentation of back pain and it is usually self-limiting; lasting less than 3 months and may not need any medical intervention. About half of those individuals who experience acute LBP will have recurrences within the first year of the first episode, leading to a possible history of chronic low back pain (Moffroid, 1997). Waddell and Bry-Jones (1994) submitted that LBP not settled within 8–12 weeks is likely to result in chronic disabling pain.

Acute LBP tends towards becoming a complex chronic pain disorder, involving anatomical, physiological, psychological and social aspects (Roach et al, 1997). Chronic/recurrent LBP is a chief source of incapacitation, suffering and expense frequently resulting in significant worry and interference with daily activities leading to significant level of disability. It is a tremendous burden on patients and health service providers. It usually results from acute pain of muscular or connective tissue origin, which persists in approximately 30% of cases in adults and 20% of cases in adolescents.

3. Schools of thought

There are several schools of thoughts regarding the management of LBP that have thrived through decades of physiotherapy practice, ranging from the crude methods of tying a patient to a ladder and dropping him, James Mennell, Cyriax and Kaltenborn schools of thoughts, the William's flexion exercise, Richardson and other researchers spinal stabilization theory and McKenzie's standardized basis of classification of LBP with its extension and flexion protocols of treatment. Other schools of thought include Nwuga's vertical and transverse oscillatory manouevres of treatment of disc lesion, also Alexander and Mulligan's technique of management of LBP. James Mennell pointed at the facet joints, postural strain, and adhesions as causative factors in back pain. He proposed treating low back pain with manipulations designed to restore joint play in joints for the relief of pain and restoration of normal voluntary movement and functions (Nwuga, 2007). In 1933 Mixter and Bar reported that the intervertebral disc as a major factor in back pain with or without sciatica. James Cyriax also agreed with this school of thought and identified two types of disc lesion, viz: nuclear protrusion and annular protrusion. He applied a rotational torsion

stress on the spine. His treatment has been criticized over the years as being non specific with massive tractive force. Maitland distinguished between mobilization and manipulation and puts emphasizes on mobilization where oscillatory movements are performed on a chosen joint and within the available range of movement within the limit of the patient's tolerance, mobilization was better accepted as being milder and easy to learn. Nwuga in 1976 worked on integrating the thoughts of these authors with some innovations of his own and came up with his own vertical and transverse oscillatory pressure. He came up with the Nwugarian institute for back pain management in 1996 to promote the training of Nigerian physiotherapists in the art and science of manipulative therapy (Nwuga, 2007). His technique is popularly employed by physiotherapists in Nigeria in treating low back pain.

The concept of spinal stability was introduced in medical research in 1970 (Barr et al, 2005). It was theorized that back injury and therefore pain could be caused by the gradual degeneration of joints and soft tissue over time from repetitive microtrauma, which was caused by poor control of spinal structures (Farfan, 1975). This theory has evolved and conclusions are that spinal stability is a dynamic process that includes both static positions and controlled movement which includes both an alignment in sustained postures (Figure 1) and movement patterns that reduce tissue strain, trauma to the joints or soft tissue, and allows for efficient muscle action (Sahrmann, 2002). It was also theorized that movement patterns that were altered by faulty strength and flexibility, fatigue from poor endurance, or abnormal neural control would eventually cause tissue damage. Tissue damage would lead to decreased stability of spinal structures, increased challenges to the already inefficient muscles, and the perpetuation of a degenerative cascade (Magee, 2002).

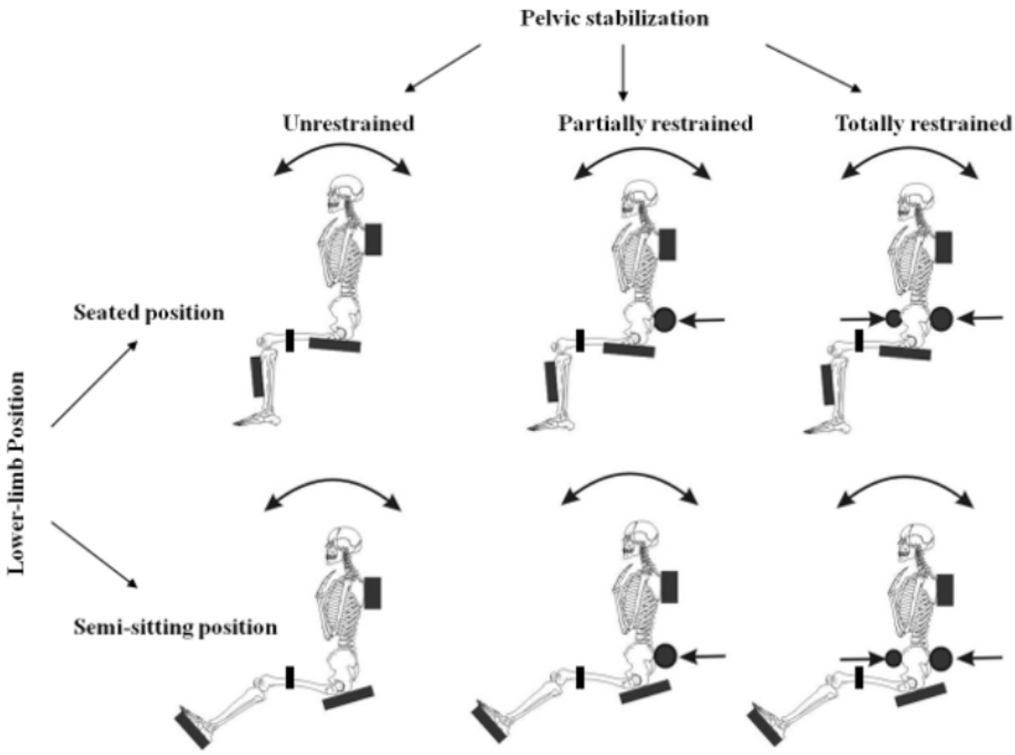

Fig. 1. Pelvic Stabilization in Sitting Positions (da Siva et al, 2009)

The lumbar multifidi and abdominals especially the transversus abdominis have been implicated in LBP and in face of muscle deactivation subsequent to recovery from an episode of LBP. Furthermore evidences by Hides et al (1992, 2008) are in support of the positive role of the lumbar multifidus muscle in segmental stabilization of the lumbar spine. Barr et al, (2005) in their review on lumbar stabilization submitted that the multifidi and transversus abdominus muscles are major stabilizers of the spine. Biomechanical studies have also highlighted the role of the multifidus muscle in provision of segmental stiffness (Keifer and Shirazi, 1995; Wilke et al, 1995), control of the spinal segment's neutral zone (Panjabi et al, 1989; Panjabi 1992) and its capacity to stabilize the spine when spinal stability is challenged. It has been reported that within a day subsequent to the first episode of LBP, the lumbar multifidus muscle showed ipsilateral pain related decrease in muscle bulk and this loss of bulk is not recovered even after recovery from back pain (Hides et al, 1994, 1996).

Panjabi (1992) reported evidences of lumbar instability, low muscular strength and endurance among subjects with LBP. Instability according to him could be a result of tissue damage, making the segment more difficult to stabilize, low muscular strength or endurance, or poor muscular control; bone and ligaments: lumbar instability is usually a combination of all three. These three components are interdependent, and one system could compensate for deficits in another. The multifidi extend along the entire length of the spine and is much thicker at the low back and waist (Johnson, 2002), comprising superficial and deep fibers (Figure 2). The transverses abdominus is the chief abdominal stabilizer of the spine (Figure 3). The quadratus lumborum (Mc Gill, 2002), pelvic floor muscles (Sapsford and Hodges, 2001), internal and external oblique, rectus abdominus, iliopsoas and paraspinal muscles are other muscles that contribute to stability of the spine.

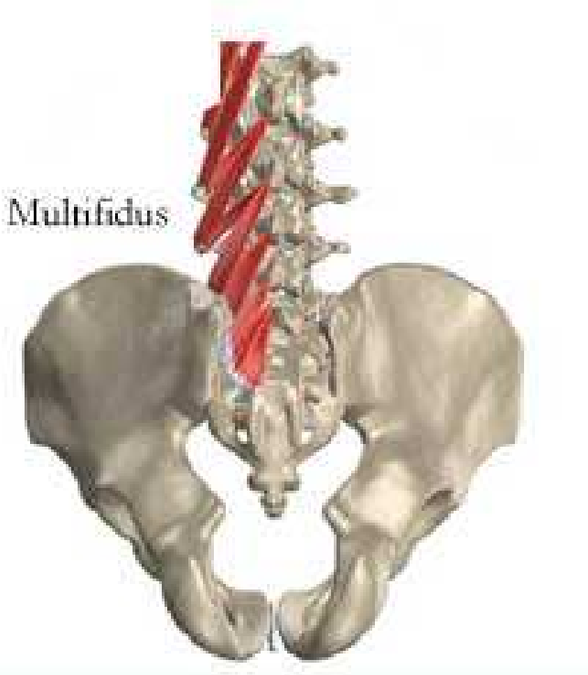

Fig. 2. Multifidus Muscles
Source: coreconcepts.com.sg. Accessed 23rd December, 2011

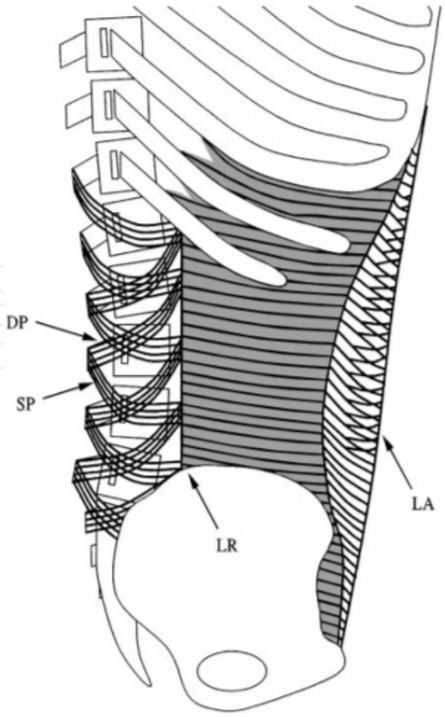

Fig. 3. Anatomy of transversus abdominis. The attachments of tranversus abdominis to the lumbar vertebrae via middle ananterior layers of the thoracolumbar fascia are not shown. Todemonstrate the bilaminar fascial attachment of the posterior layer of the thoracolumbar fascia it is shown connecting only to the spinous processes. LR ± lateral raphe, LA ± linae alba, SP ± superficial lamina of the posterior layer of the thoracolumbar fasica, DP ± deep lamina of the posterior layer of the thoraco-lumbar fascia.
Source: Hodges, (1999)

McKenzie purported the use of repeated movements and sustained positions in the examination and treatment of low back disorders (The McKenzie Institute, 2001). McKenzie subsequently classified mechanical LBP into three syndromes; postural, dysfunction and derangement syndromes (McKenzie, 1981). Patients with postural syndrome are individuals who have intermittent episodes of pain believed to be the result of prolonged stress on soft tissues (bad posture) around the lumbar spine. They have full range of movements, no deformity and they are treated with postural advice (McKenzie, 1981; Porter, 1993). Patients with dysfunctional syndrome are individuals who are believed to have had trauma or a postural problem producing adaptive shortening of the soft tissues. Pain is triggered by over use, posture is poor, movement in the spine is restricted and there is pain at the end-range (McKenzie, 1981; Porter, 1993). Patients with derangement syndrome of the intervertebral disc may be with or without kyphotic or scoliotic deformity. There are two types of derangement, posterior derangement D1 to D6 and anterior derangement D7. Treatment for these derangements is usually to move the individual to D1 where they can manage themselves (McKenzie, 1981; Porter, 1993). Pain is usually centralised, after which, patients can care for themselves with extension activity and maintain lumbar lordosis and subsequently obtain functional recovery (Mckenzie, 1981; Donelson et al, 1990; Porter, 1993). All these theories addressed the intervertebral disc and or the facet joint as probable sources

of problem in non-specific back pain. Mulligan (2004) however submitted a theory that incorporates the intervertebral discs and facet joints. He opined that facet joint mobility brings improvement in minor cases of LBP. He reported on sustained natural apophyseal glides (SNAGS) which are a combination of sustained facet glide with movement. This he reported improves mobility of the facet joint and simultaneously heals the intervertebral disc.

A large number of muscles cross the spine, and all contribute to the modulation of lumbar stability and movement to some extent. This is a complex system consisting of deep muscles that have their origin or insertion on the lumbar vertebrae, which theoretically are responsible for the control of stiffness and intervertebral relationships, and the global muscle system that encompasses the large superficial muscles of the trunk that are the torque generators for spinal motion and handle external loads applied to the spine (Bergmark, 1989; Barr et al, 2005). Weakness of abdominal and back muscles especially the back extensors, muscular dysfunction in the low back, and abdominal muscles, and poor joint flexibility in the back and hamstring are reported as precursors for LBP (Biering Sørenson, 1984, Pollock and Wilmore, 1990, Robinson, 1992, Richardson and Jull, 1995, McArdle et al, 1996,). Several tests have been developed to identify individuals with weak abdominal and leg muscles with the aim of preventing low back pain. Kraus Weber test of minimum fitness is a series of exercises that measure strength and flexibility of the back, abdominal, psoas and hamstring muscles, it was developed by Kraus and Hirschland in 1954 from their clinical experience that majority of back disorders could have been prevented by maintaining a certain level of fitness. Persons who could pass this test were considered to be unlikely candidates for developing low back problems (Safrit and Wood, 1995). The Kraus Weber test addressed strength and flexibility and not muscular endurance. Muscular endurance capabilities of back muscles may be as important as or even more important than strength in the prevention and treatment of low back pain. Moffroid (1997) submitted that lack of endurance of the trunk muscles is an important factor in LBP. Evidences are in literature linking weaknesses of abdominal and back extensor weakness with low back pain or and its susceptibility in, adults and children (Holmstrom et al, 1992, Mannion and Dolan, 1994, Luoto et al, 1995, Adegoke and Babatunde, 2007; Mbada and Ayanniyi, 2008; Johnson et al, 2009), and the Biering Sørenson's back muscles endurance tests of back pain susceptibility uphold this submission (Biering Sørenson, 1984). Biering Sørensen test of Static Muscular Endurance (BSME) is a simple clinical tool for the assessment of low back muscular endurance. It has been reported to be valid, reliable, safe, practical, responsive, easily administered and inexpensive (Alaranta, 2000; Udermann et al, 2003). The BSME either in its original version or as variants is believed to provide a global measure of back extension endurance capacity (Moreau et al, 2001).

4. Management

Low back pain is a costly quality of life-related health problem (Selkowitz, 2006), and its management has remained a formidable challenge in medical practice all over the world (Feurstain and Battie, 1995). It is also a complex multivariate problem that has been known to be resistant to simple solutions (The Back Letter, 2001) and its management has remained an unending task for health service providers especially because quite a sizeable proportion of the population will attend the clinic sometime in their lifetime complaining of LBP.

Efforts have hence been exerted to improve the efficacy of its treatment especially in its recurrent or chronic nature (Feurstain and Battie, 1995). Physiotherapy is probably the treatment most widely used for back complaints of mechanical origin especially in the sub-acute and chronic states. Spinal manipulation for patients who are failing to return to normal activities have however been suggested among patients with LBP (van Tulder et al, 2009).

Several approaches of management have been used in managing non-specific low back pain with varying degrees of success. Drugs have been widely accepted in managing acute LBP. Physiotherapy is central to the overall management of LBP in the sub-acute and chronic phases. Physiotherapy management of long term low back pain favours active low back treatment programmes involving improving aerobic fitness, increasing the strength and flexibility of the lumbar musculature and ensuring lumbar stability (Shiple, 1997). Physiotherapy modalities including cryotherapy, Transcutaneous Electrical Nerve Stimulation (TENS) and heat therapy, back care education, back school, biofeedback, and functional restoration are used as adjunct to physiotherapy regimens including massage, heat, traction, ultrasound, short wave diathermy, back care education. It also involves the use of physical agents and modalities in physiotherapy to manage LBP. These include rest using supports e.g lumbar corsets, heat therapy, cold therapy, spinal manipulation and electro analgesia (Low and Reed, 1994; Foster et al, 1999; Li and Bombardier, 2001; Gracey et al, 2002). These rehabilitative and physical treatments can be helpful and with the aim of combating relapse, however when LBP become complex, the psychological components become an important part of the treatment. Pain management programme/pain clinics are used in managing psychological aspect of pain. Work hardening is also introduced to restore physical, behavioural and vocational functions facilitating return to work.

5. Exercise therapy

Several treatment strategies, for instance, joint mobilization and manipulation, soft tissue massage techniques, electrotherapy, acupuncture, and traction, are utilized in clinical practice to treat low back pain, with varying degrees of effectiveness. Exercises are commonly prescribed for LBP by physiotherapists, but only seem to be supported as an intervention by evidence for patients with chronic LBP further more conclusions from systematic reviews are that exercises are effective in managing chronic LBP Hayden, (2005); Liddle, (2004). Lewis et al, (2008) in their systematic review also reaffirmed that exercises were effective in reducing pain in people with CLBP. Most studies concluded that active exercises were a valuable therapeutic approach in managing LBP, despite the lack of consensus on the optimal exercise techniques, intensity or active intervention (Abenhaim, 2000).

Exercise therapy appears to be the most often-used physical therapy intervention in treating people with back pain (Nachemson, 1990). It aims at abolishing pain, restoring and maintaining full range of motion, improving the strength and endurance of lumbar and abdominal muscles, thereby contributing to early restoration of normal function (Nachemson, 1990; Brukner and Khan, 1993). Additionally mechanical support to the low back which helps to obtain recovery with minimal chance of relapse is provided. Exercise training are often used improve function in low back rehabilitation and to prevent

deconditioning of lumbar musculature, to prevent persistent low-back pain (Chok et al, 1999; Shiple, 1997). Jackson and Brown (1983) opined that exercises will decrease pain, strengthen muscles, decrease mechanical stress to spinal structures, improve fitness level, prevent injury, and improve posture and mobility in patients with low back pain. The exercise modes used by physiotherapists managing LBP patients include aerobic exercise, range of motion and stretching exercises and strengthening exercises for the trunk musculature (Brukner and Khan, 1993). Also balance training for better trunk and abdominal control, stabilization exercise and endurance exercises (Biering Sorenson, 1984; Foster and Fulton, 1991; Panjabi, 1992). In a study by Franca et al (2010) segmental stabilization and strengthening exercises effectively reduced pain and functional disability in individuals with chronic low back pain. Additionally segmental stabilization further improved transversus abdominus muscle activation capacity.

The role of exercise in back pain transcends all the phases of medical or health management namely preventive, curative and rehabilitative phases. It is probably the cheapest physiotherapeutic intervention and which gives the patient some measure of direct control over her treatment (Brukner and Khan, 1993). Exercise and movements cause alternate compression and relaxation of the articular cartilage, and ensure the movement of the synovial fluid into the articular cartilage as the area of pressure changes over the surface (Twomey, 1992). This allows for good health and optimal functioning of the articular cartilage. It also results in thicker, stronger ligaments that maintain their compliance and flexibility and that also become stronger at the bone-ligament-bone complex. The nutrition and health of the intervertebral discs is equally enhanced by exercises. Exercise also reduces the risk of developing osteoarthritis and osteoarthritic changes have been shown to begin only in areas where collagen is not often stressed by movement and pressure (Twomey, 1992). Exercises are done as mainstay of treatment to improve trunk stabilization. Exercises which results in proper muscle function will compensate for structural damages in spinal structure (Barr et al, 2005); nevertheless the deficits that have been defined in lumbar stabilization in patients with LBP seem to be mostly related to muscular and neurologic function.

Bone and muscle are both dynamic structures that respond positively to exercises and adversely to disuse (Mernard and Stanish, 1991). A strong inverse relationship exists between muscle mass and osteoporosis such that a decline in muscle mass is matched by an increasing fragility of bone. However the loss of muscle mass due to disuse can be substantially reversed by exercise training programme (Shepard, 1988, Menard and Stanish, 1991). It has hence been suggested that physiotherapists have the responsibility to include exercise as an essential part of prophylaxis and treatment in addition to other more passive treatment modalities such as massage, mobilization, manipulation and traction (Twomey, 1992).

Endurance of the back muscles is associated with LBP (Nourbakhsh and Arab, 2002). Endurance can be defined as the ability to perform prolonged bouts of work without experiencing much fatigue or exhaustion (Wilmore, 1982). It was similarly defined as the ability of a muscle to contract repeatedly or generate tension, sustain that tension, and resist fatigue over a prolong period of time (Delateur, 1982). It is probably the most underrated component of the total physical training program and is comprised of two different components (Wilmore, 1982) and is more important than strength in low back muscles

training. Muscular or local endurance refers to the ability of an isolated muscle group to perform repeated contractions over a period to time (Kisner and Colby, 1996). This kind of endurance exercise is both rhythmical and repetitive in nature or static with resulting fatigue confined to the local group of muscles that is exercised (Wilmore, 1982). General or cardiovascular endurance is the ability to perform large dynamic exercise for long periods of time (Kisner and Colby, 1996). Muscular strength is to muscular endurance as development of the cardiovascular and respiratory system is to cardiovascular endurance (Wilmore, 1982). Endurance is mechanically defined as either the point of isometric fatigue, where the contraction can no longer be maintained at a certain level or as the point of dynamic fatigue, when repetitive work can no longer be sustained at a certain force level (Alaranta, 2000)

Endurance exercises incorporating the back extensors and the abdominal muscles have been proposed for use in the management of low back pain (Biering Sorenson, 1984; Foster and Fulton, 1991). This is possibly because individuals with greater levels of muscular strength and endurance and cardiovascular fitness tend to have fewer spinal problems (Cady et al, 1979; Mayer and Gatchel, 1988; and Nelson et al, 1995), and that trunk muscle endurance has been identified as a potential risk factor for the development of back pain (Biering Sorensen, 1984).

Chok et al (1999) reported that trunk endurance training reduced pain and improved function at 3 weeks after the onset of treatment in their study to evaluate the effectiveness of trunk extensor endurance training on pain and disability in subjects with sub-acute low back pain of 7 days – 7 weeks onset. Johannes et al (1995) compared the effects of intensive training of muscle endurance and a treatment protocol that emphasized coordination in the trunk and found that the two groups studied, improved in pain, disability and spinal mobility. Johnson et al (2010) compared the efficacy of McKenzie exercise, endurance training and endurance training and back care education and concluded that McKenzie exercise was effective in modulating long-term LBP and proposed that a combination therapy involving McKenzie exercise, endurance training with McKenzie exercise was more effective. Exercise training increases endorphins and alter perception of pain, perhaps by reducing anxiety and depression (Blumenthal et al, 1982). Identifying high or low muscular endurance has been reported to alert the patient and clinician to a need for possible modifications to the usual treatment regime (McIntosh et al, 1998).

Figures 4-12: Low Back Core Stabilization Exercises; 4-9 level one exercises; 10-12, level two exercises; Source: Dr. Douglas M.G. DC; http://www.chirogeek.com

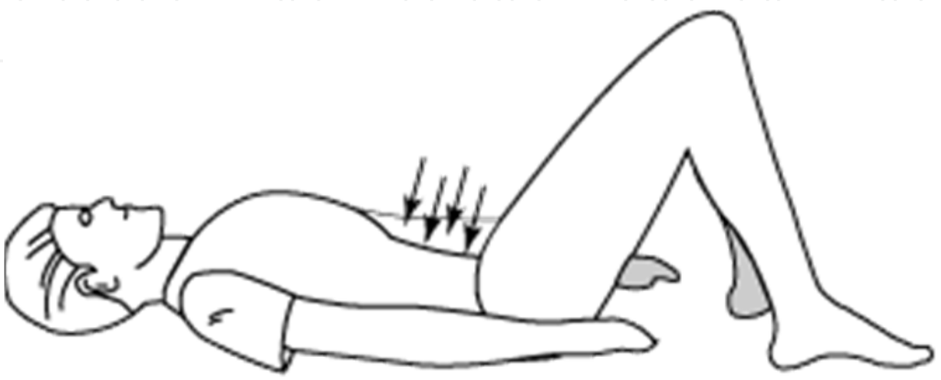

Fig. 4. Pelvic tilt: Exercise for the core spinal stabilizer transversus abdominus muscle

Fig. 5. Supine leg drag to the chest

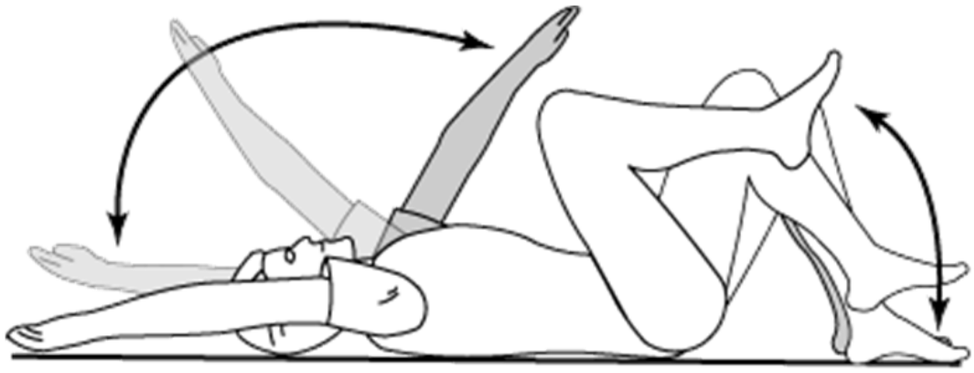

Fig. 6. Supine lying alternate arm and leg

Fig. 7. Prone leg extension

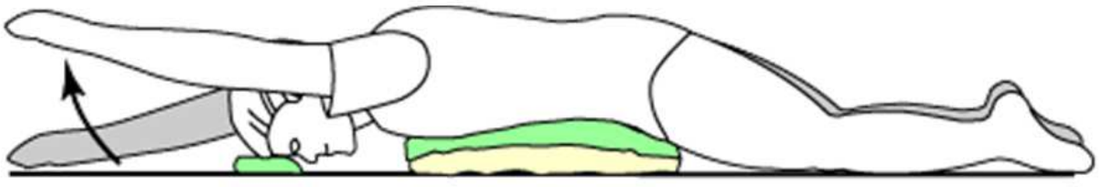

Fig. 8. Prone single arm extension

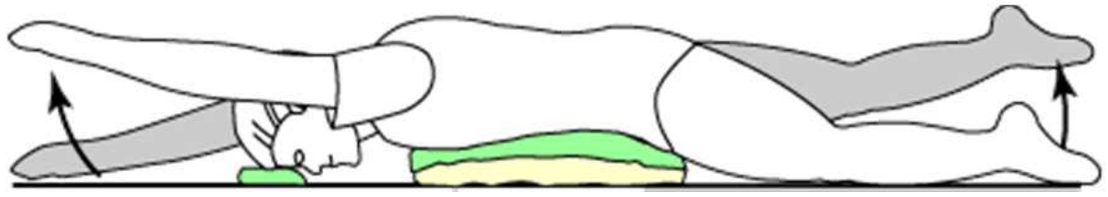

Fig. 9. Prone alternate arm and leg extension

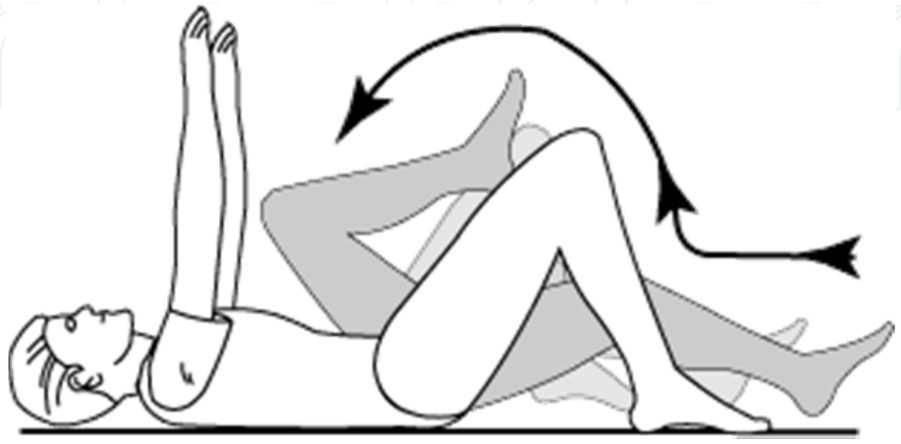

Fig. 10. Supine heel drag to extended arms

Fig. 11. Supine sit-up

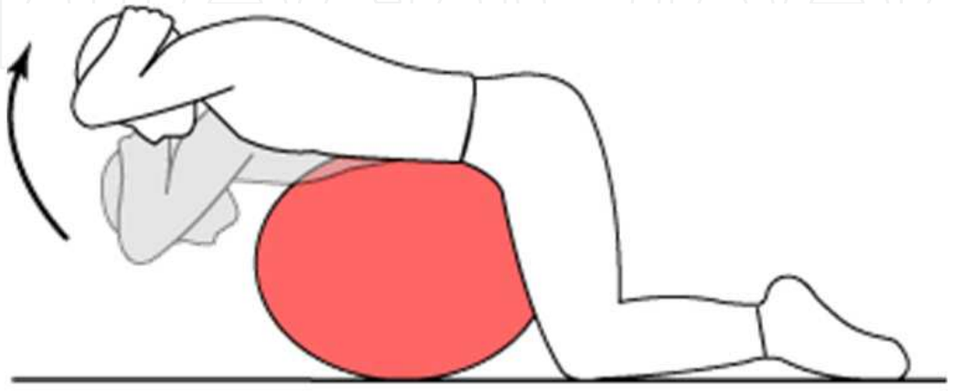

Fig. 12. Ball hyperextension

a. Manipulative Therapy

The application of controlled force to a joint, moving it beyond the normal range of motion in an effort to aid in restoring health is referred to as manipulation. It may be performed as a part of other therapies or whole medical systems, including chiropractic, massage, and naturopathy. It is a broad term encompassing massage, passive and active assisted range of motion and joint distraction or traction (Farell and Jensen, 1992). It was earlier proposed that manipulative therapy works by reducing subluxations, correcting vertebral mal-alignment, adjusting nuclear prolapse or tearing joint adhesion. However, evidence from studies reviewed by Twomey (1992) suggested a mechanism in which 'gapping' or separation of the joint surfaces by manipulation or movement would allow a piece of firm articular cartilage, caught between the articular surfaces the of the zygoapophyseal joint, blocking movements thereby returning the facet joint to its normal position. Studies have shown that spinal manipulation provides mild-to-moderate relief from low-back pain and appears to be as effective as conventional medical treatments (US DHHS, 2009). In a 2007 guidelines, the American College of Physicians and the American Pain Society included spinal manipulation as one of several treatment options to consider using when back pain does not improve with self-care. Spinal manipulation appears to provide relief from LBP at least over the short term (i.e., up to 3 months), and such effects may continue for up to 1 year. Nevertheless evidences in research are still under way to determine whether the effects of spinal manipulation depend on the duration and frequency of treatment.

Spinal manipulations are contra indicated in pateients with herniated discs resulting in or worsening cauda equina syndrome. Side effects of spinal manipulations minor discomfort in the treated area, headache, or tiredness. These effects usually go away in 1 to 2 days (US DHHS, 2009).

b. Back school

Back schools are health education programmes on back pain. Many back schools have been developed for different populations since 1969 when the first one was developed in sweden by Zachrison-forsell (Zachrison-forsell, 1980). The term "back school" implies providing information about the anatomy and function of the spine as well as advice on activities regarding prevention and self-treatment (Dihta, 1999); the teaching is carried out in group sessions. It is common to include instruction and practical guidance for exercise during back school sessions. The back school usually lasts approximately 4-6 hours. Often, the theoretical instruction is an integrated element of a comprehensive course of back rehabilitation, which also includes exercise programs. The integrated rehabilitation program is usually of 15-30 hours duration, spread over weeks to months (Dihta, 1999). Back school programs are usually led by physiotherapists, ergo therapists and relaxation therapists. The philosophy of the traditional back school was guided by "be careful" messages, such as; sit correctly, lift correctly, avoid forward bending, and so forth. In a modern back school the emphasis is to avoid fear, and the philosophy is to "ignore the pain as much as possible". This change in attitude has resulted in improved preventive results (Dihta, 1999).

A study compared high- and low-intensity back schools with usual care in occupational health care in Netherland, among workers sick-listed because of sub acute nonspecific low back pain (Heyman et al, 2006). The low-intensity back school was most effective in

reducing work absence, functional disability, and kinesiophobia, and more workers in this group scored a higher perceived recovery during the 6-month follow-up. Akinpelu and Odebiyi (2004) determined the effect of a Nigerian back school model on some Nigerian industrial workers' knowledge of low back pain and back care and reported that the subjects' mean knowledge score increased significantly immediately and at 8 weeks after back school model administration. The authors therefore concluded that the back school model was effective in improving the workers' knowledge of LBP and back care. Also reports of Cochrane back reviewers (Heymans et al, 2004; Heymans et al, 2005) and a meta analysis (Maier and Harter, 2001) on the efficacy of back school versus sham diathermy and placebo was that back school was superior to sham diathermy and placebo for short term recovery and return to work and not for pain or long term recurrences. Authors have generally submitted that back school should be integrated into the other effective means of management e.g exercises. Daltroy et al (1997) designed an educational program modeled after several well-known back schools to reduce low back injuries among 4000 postal workers and observed increased knowledge among experimental unit workers, but no significant improvements in behaviours associated with back health or in proportion of workers with tired backs.

6. Back care education

An essential of physical therapy management is the education of patients with low back pain on appropriate musculoskeletal structures, functions and the basic pathology of the patient's problem, and lifestyle adaptation that may be necessary to prevent recurrence of LBP (Twomey, 1992). Teaching is necessary and professionally desirable as the active role of the physiotherapist in the management of back pain and other conditions (Sotosky, 1984). The five educational elements commonly used in physical therapy sessions are- teaching, provision of information about illness, instructions for home exercises, giving advice, information and counselling about stress related problems (Sluijis, 1991). Patients in back care programmes are made to understand age changes and their effects on the spine and the spine's vulnerability to stress under particular loading conditions. They are then given instructions on home exercises for back and advised on the best postures for activities in standing, sitting and even lying positions (Twomey, 1992).

7. Pain clinics in the management of LBP

Behavioral and cognitive behavioral, inpatient and outpatient multidisciplinary pain clinics are usually considered to be the last resort as a treatment option. This course of treatment usually is offered late in the course of chronic LBP, typically after the patient has adopted a disability lifestyle automated by refractory operant influences. True behavioral modification is most effectively accomplished in an inpatient setting, where all aspects of the patient's waking and sleeping activities can be structured and controlled. The cost of hospitalization and interdisciplinary services in this venue must be weighed against other economic factors, such as those related to further medical or surgical care, loss of productivity, and compensated disability (Wheeler, 2007). Cognitive-behavioral pain treatment programs are usually combined with a functional rehabilitation approach and prove to be a successful treatment for many (Wheeler, 2007). There are few studies on the use of pain clinics in the

management of LBP, however Adam-Wilkey et al (2008) controlled trial compared outcomes in perception of pain and disability for a group of patients suffering with chronic LBP when managed in a hospital by either a regional pain clinic or a chiropractor and reported that reduction in mean pain intensity at the end of the study was 1.8 points greater for the chiropractic group than for the pain-clinic group.

I compared nineteen studies on effects of different physiotherapy regimens in the management of sub-acute and chronic mechanical LBP under the following headings viz: sample size, age and type of LBP, sampling technique and treatment methods which included duration of study, methods of treatment, and outcomes of the studies from 1985 to 2010. Two of the studies were done in the eighties, five in the nineties and nine in years two thousand and three till two thousand and ten. Sample sizes for the study were between thirty and two hundred and sixty. Most of the studies however involved approximately sixty individuals. Only one study, Petersen et al (2002) involved 148 subjects. Six of the studies were randomised clinical trials, quite a number assigned subjects into the groups randomly and four did not specify what they did. Subjects' age range fell between eighteen and seventy years. Although this is quite a wide range, most studies involved individuals from eighteen years to about forty to fifty five years. Only Risch et al (1993) involved an age range of twenty two to seventy years but a couple of other studies simply referred to their populations as adult populations. Most of the studies reviewed involved individuals with chronic LBP but , Chok et al, (1999), Petersen et al (2002) and Akosile et al (2006) involved individuals with , sub-acute, or both sub-acute and chronic LBP. Hides et al (2001) studied only individuals with acute LBP.

The least duration of any of these studies was 4 weeks; most of them took between 6-8 weeks and others above 8 weeks even up to 3 months. The vast array of the treatment methods had physiotherapy in form of exercises of different types including trunk muscle strengthening and endurance, McKenzie exercises, low impact aerobic exercise, spine stabilization. A study by (Nwuga and Nwuga, 1985), compared William's flexion exercise and McKenzie exercise and Akosile (2006) involved spine manipulation. Johnson et al, (2010) administered a combination treatment involving, McKenzie exercise, endurance training and back care education. Most studies incorporated back care education as baseline treatment and sometimes for comparison. Only four studies incorporated heat therapy in the management and only one study (Hides et al, 2001) involved medical management and this was the only study that involved subjects with acute LBP. It can be observed from these studies that most protocols of exercise were effective in the management of chronic LBP. The methods were not effective when it was either placebo or back care education solely or massage plus thermotherapy of some sort. These were however incorporated in some of the exercise protocols and the protocols were effective in the management of LBP. The only instance when exercise was not solely effective was in the study involving acute LBP (Hides et al, 2001). In this instance medical management was more effective in modulating acute LBP and stabilization exercise prevented recurrence of the LBP in the same study. Hides et al (2001) concluded that biomechanical research may explain why it is important to focus on particular muscles for their stabilizing functions in rehabilitation (Hides et al 2001). Franca et al (2010) reported superiority of segmental stabilization over strengthening exercise in combating muscle deactivation subsequent to episode of LBP. Muscle deactivation due to an episode of LBP has been implicated for recurrence of LBP.

8. Conclusion

Researchers have used exercises of various types in the management of LBP with varying degrees of successes but not many studies have been able to rate one exercise protocol over another in the management of chronic LBP and not so much is in place as to which exercise is favourable at either the sub-acute or chronic stages. Combination physiotherapy regimens involving exercise of different types, back care education, specific schools of thoughts have also been used in managing low back pain and authors have reported better clinical improvement with combination of regimens focusing not just on the disc or facet joint for pain modulation but also on muscles reconditioning and patient education. Psychosocial component of management must be in focus in chronic/long-term cases, although not much has been documented in this regard. Waddell and Watson (2004) reviewed rehabilitation interventions for LBP, analysed within a biopsychosocial framework to test the hypothesis that effective rehabilitation interventions should have all three biological, psychological and social elements to address all of the potential obstacles to recovery. They concluded that virtually all the interventions included some form of exercise or physical activity element aimed at addressing the biological problem and restore physical function. However, this physical element alone was insufficient to achieve return to work. Most successful interventions also addressed beliefs in one way or another, and many of them included some kind of occupational intervention (work hardening). Most of the programmes that did not explicitly address these latter two elements were unsuccessful in achieving return to work. This evidence appears to support the hypothesis that a rehabilitation intervention is more likely to produce successful vocational outcomes if it addresses all three bio-psycho-social elements of disability and obstacles to recovery in chronic/long term LBP. Back care education on the other hand has is accepted as an important adjunct to other physiotherapy procedures in the management of low back pain and not necessarily as solely an effective means of managing LBP (Daltroy et al, 1997; Lønn et al, 1999), and evidences supporting back school as sole treatment modality are weak. Endurance exercise however has been reported to be effective in preventing chronic/long-term LBP but has not been investigated in many randomized controlled trials. Optimal functioning of the muscle system is desirable to control and protect the spinal segments following injury. Despite initial resolution of painful symptoms, failure to protect spinal segments could increase the likelihood of a recurrence of symptoms. Specific exercise training targeting the back and abdominal muscles including the multifidus and transversus abdominus muscles have been shown to decrease pain and disability in chronic low back pain patients.

McKenzie's classification is a standardized approach of assessing LBP as it identifies a directional preference for spinal movement which can form basis for classification in treating LBP. When this approach like any other mobilization is used in combination with rehabilitation of the abdominal; and back muscles, much better outcomes may be realized in combating LBP, especially when it is sub-acute, chronic/long-term. Treatment should be individualized, and where group treatment is considered, classification should form the basis of grouping. Group exercise will improve patient interaction and participation which may further ensure better and more specified outcomes and forestall recurrence. Prevention strategies should be introduced early in life, hence more studies to look into low back pain in children and adolescents.

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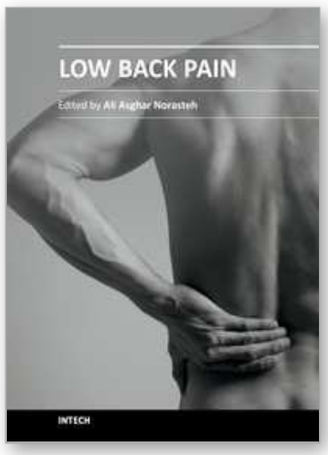

Low Back Pain

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This book includes two sections. Section one is about basic science, epidemiology, risk factors and evaluation, section two is about clinical science especially different approach in exercise therapy. I envisage that this book will provide helpful information and guidance for all those practitioners involved with managing people with back pain-physiotherapists, osteopaths, chiropractors and doctors of orthopedics, rheumatology, rehabilitation and manual medicine. Likewise for students of movement and those who are involved in re-educating movement-exercise physiologists, Pilates and yoga teachers etc.

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