

Effect of core strengthening exercise on chronic low back pain: A single study design

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Abstract

Objective: To examine the effectiveness of core stretching exercises on chronic low back pain.

Design: A single system design

Setting: Outpatient clinic.

Participant: A 40 years old female with Low back pain since 10 months, who finds difficulty in doing her ADLs.

Intervention: Core strengthening exercises.

Main Outcome Measure: Roland-Morris Low Back Pain and Disability Questionnaire (RMQ) & NRS.

Results: After intervention for core strengthening exercises for 5 weeks the NRS score & RMQ scores decreased remarkably.

Conclusions: core strengthening exercises remarkable decreases pain levels in a patient with chronic low back pain.

Keywords: chronic low back pain, core strengthening exercises, Roland-Morris Low Back Pain and Disability Questionnaire (RMQ)

Introduction

Low back pain (LBP) is the most common type of disability which commonly affects individuals in Western countries, and the assessment of LBP-related disabilities is always a challenge¹. Approximately 80% of people suffer from LBP at some stage in their lives^[2, 3]. The impact of chronic LBP is severe and profound as chronic LBP often results in lost wages and additional medical and incurring expenses^[4, 5]. Core stability training is becoming a popular fitness trend that has begun to be applied in rehabilitation programs and in sports medicine^[6]. Many studies have considered Core stability as a part of rehabilitation protocol for chronic low back pain^[7, 8].

Performing Core stability exercises provides various benefits to the musculoskeletal system, like maintaining a low back health and also helps in preventing back injury. So the maintenance of core stability is very important for physiotherapists, sports persons, and musculoskeletal researchers. Core stability is the ability of the lumbopelvic hip complex to prevent buckling and to return to equilibrium after perturbation. Although bone and soft tissue contribute to some degree, core stability is predominantly maintained by the dynamic function of muscular elements. Many research support the concept that, decreased core stability strength predisposes injury and that appropriate training may also help in reducing the injury. Appropriate intervention help in decreasing the rates of back and lower extremity injury^[9]. Lack of sufficient coordination in core musculature can lead to decreased efficiency of movement and compensatory patterns, causing strain and overuse injuries. Thus motor relearning of inhibited muscles may be more important than strengthening in patients with LBP and other musculoskeletal injuries^[10].

Methods

Participant

Subject aged 40 years old female, who is a school teacher by profession spends 5-6 hours standing and complaints of low back pain which has been there since the last 10 months. She came for physiotherapy as she was unable to go to school and missed monthly wages. Even her ADLs also were affected. Her BMI was 31.1. She has lumbar lordosis and rounded shoulders on observation. On examination paraspinal muscles were tense and taut. Spinal mobility was remarkable reduced. Hamstrings were tight. Her NRS was 8 at the time of the first assessment.

Study Measures

The Roland-Morris Questionnaire (RMQ) is a self-administered disability measure in which greater levels of disability are reflected by higher numbers on a 24-point scale. The RMQ has been shown to reflect level of disability. The patient is asked to put a mark next to each appropriate statement. Add up the total number of marked statements to get a patient's score.

Roland and Morris did not provide descriptions of the varying degrees of disability (eg, 40%-60% is severe disability). Clinical improvement over time can be graded based on the analysis of serial questionnaire scores. If, for example, at the beginning of treatment, a patient's score was 12 and, at the conclusion of treatment, their score was 2 (10 points of improvement), we would calculate an 83% (10/12 x 100) improvement.

NRS (Numeric Rating Scale)- The Numeric Pain Rating Scale (NPRS) is a measure of pain intensity in adults. The NPRS is a segmented numeric version of the visual analog scale (VAS)

in which a respondent selects a whole number (0–10 integers) that best reflects the intensity of his/her pain. The 11-point numeric scale ranges from '0' representing one pain extreme (e.g. "no pain") to '10' representing the other pain extreme (e.g. "pain as bad as you can imagine" or "worst pain imaginable")

Procedure

To start with core strengthening exercises first muscle length imbalances was checked and corrected. Spinal flexibility maintained. Warm-up included the "cat" and "camel" stretches and a short aerobic program. Next subject was taught the first stage of core stability training which was learning to activate the abdominal wall musculature like abdominal hollowing, which may activate the transversus abdominis, as well as abdominal bracing, which activates many muscles including the transversus abdominis, external obliques, and internal obliques, is an important beginning step.

The next level of exercises included curl-up, side bridge (side plank), and quadruped position with alternate arm/leg raises ("bird dog"). The prone plank and bridging was also added at this stage [11]. Pelvic bridging is particularly effective for activating the lumbar paraspinals [12].

Once the initial core strength was achieved and pain scores had come down, emphasis was placed on developing balance and coordination while performing a variety of movement patterns in the three cardinal planes of movement: sagittal, frontal, and transverse. Exercises were performed in a standing position and mirror functional movements. Functional training typically consisted of acceleration, deceleration, and dynamic stabilization. An advanced core stabilizing program which she followed under the supervision of the physiotherapist was to train reflexive control and postural regulation [11].

The subject performed the core strengthening exercises 15 min walking and 30 min flexibility (warm-up) exercises; 2 sessions/week, 60 min/session, 5 weeks, total 10 sessions [16].

Data analysis

The NRS score came down from 8 before intervention to 2 after 5 weeks of treatment with core strengthening exercise. The RMQ scores also decreased remarkably from 18 to 2. There was 16 point overall improvement during the course of the treatment. The improvement percent was $16/18 \times 100 = 88.88\%$.

week	0 week	1 st week	2 nd week	3 rd week	4 th week	5 th week
score	18	13	12	10	4	2

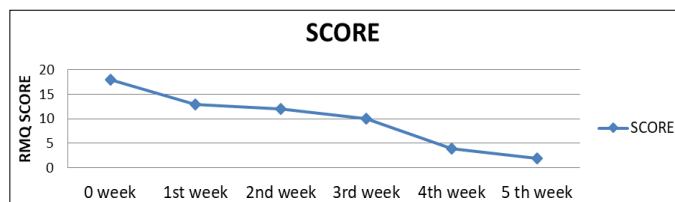


Fig 1

Results

The results of the intervention of core strengthening exercise were a remarkable decrease in pain scores of the subject after a period of 5 weeks. The NRS scores came down to 2 and RMQ improvement was 88.88%.

Subject was able to resume all her ADL and join back job after physiotherapy help.

Discussion

The causes of Chronic LBP are innumerable and several of which are unknown¹³. One major cause of LBP is weakening of the shallow trunk and abdominal muscles [13, 14]. Strengthening these low back muscles helps in improving mobility and decreasing chronic low back pain¹³. Another cause of chronic LBP is the weakening of or insufficient motor control of the deep trunk muscles, such as the lumbar multifidus and transversus abdominis.

Core stability (or core strengthening) has become a well-known fitness trend that has also been practised in the sports field. Several other popular fitness programs like Pilates, yoga, and Tai Chi, follow the same principles as core strengthening. The major benefits of core stabilization range from improving athletic performance and preventing injuries, to alleviating low back pain [10]. Core strengthening can also be considered as a preventive regimen, as a form of rehabilitation, and as a performance-enhancing program for various lumbar spine and musculoskeletal injuries.

Gatti *et al* [15] and França *et al*. [16] in their study found that the Roland-Morris questionnaire, OSWDQ, and SF-12 results showed significant improvements in the experimental group compared with the control group. Evaluating subjects' disability level primarily involves analysing their ability to perform functional (e.g., climbing stairs) and occupational activities. Gatti *et al*. [16] asserted that disability scale levels are primarily evaluated based on functional activities that are a daily concern of Chronic LBP patients.

Compared with typical resistance training, core strength training is easier for chronic LBP patients to learn, although it is more challenging [16]. Moreover for performing it, no special equipment is required, and patients can independently practice core strength training at home, which is essential because home-based exercise programs can yield additional benefits for motivated patients. Furthermore, several studies have shown that typical resistance training can easily injure CLBP patients [16, 17].

Limitation

The duration of the study can be increased. It core strengthening exercises for managing low back pain for large number of subjects and variety of age group of population.

Conclusion

Core stability exercise is effective in decreasing pain and may improve physical function in patients with chronic LBP in the short term. Core strengthening, often called lumbar stabilization, and also has been used as a therapeutic exercise treatment regimen for low back pain conditions. Core strengthening has been promoted as a preventive regimen, as a

form of rehabilitation, and as a performance enhancing program for various lumbar spine and musculoskeletal injuries.

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