

Effectiveness of the Pilates Method of Exercise in the Treatment of Chronic Low Back Pain: Introduction of a Literature Review.

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Introduction

Low back pain overview:

Back pain is a common cause of disability and work loss, creating a large socioeconomic burden in developed countries. Between 60% and 80% of adults will be affected with low back pain during their lifetime. It has been reported that between 30% and 40% of individuals with acute low back pain never completely recover, developing chronic low back pain (Lim, Poh, Low, Wong, 2011). Back pain has become the most common cause of functional limitation in individuals younger than 45 years. It is the one of the most common and expensive musculoskeletal disorders in Western countries. It has been suggested that the increasing use of physical therapy for patients with low back pain has contributed substantially to an increase in direct health care costs (Pereira, Obara, Dias, Menacho, Guariglia, Schiavoni, Pereira, Cardoso, 2012). In 1998, the direct health care costs of back pain within the United Kingdom, including visits to the general practitioners and referral to therapists was estimated to be £1632 million. Even greater, though, is the expense to the economy caused by informal care and lost working days, calculated to be approximately 5.7 million days during 2001. There is a vital need, therefore, for effective but also affordable treatments for back pain and strategies to help prevent it (Gladwell, Head, Haggart & Beneke, 2006).

Lower back pain is defined as pain localized between the twelfth rib and the inferior gluteal folds, with or without radiation to the lower extremities. It is best defined as a low level continuous or essentially continuous lumbar, sacral or lumbosacral spinal pain that is punctuated by exacerbations of pain, each of which is characterized as ‘acute’. Patients who experience this disability are limited in their daily living activities and may experience inappropriate neuromuscular adaptations to maintain and/or preserve functions such as walking, running, or other activities. In addition to its high prevalence, the source of pain is not well-established in the majority of individuals with back pain, and the term “non-specific chronic low back pain” is often used to describe this population (Posadzki, Lizis, Hagner Derengowska, 2011).

Therapies for chronic lower back pain:

A wide variety of therapeutic interventions are available for the treatment of chronic low back pain, ranging from general physical fitness or aerobic exercise to muscle strengthening, as well as various types of flexibility, stretching exercises and spinal stabilization exercises. There are also educational methods, i.e. Alexander Technique and cognitive-behavioral therapy or other alternative modalities such as

hypnosis, biofeedback, relaxation, massage, spinal manipulation and traction treatment (Posadzki et al., 2011). Physical therapists most frequently focus on strengthening and stretching exercises, thermo-therapy, and manual therapy. However, therapeutic exercise seems to be the most effective in treating chronic lower back pain (La Touche, Escalante, Linares, 2008). According to research there is no evidence to support the effectiveness of exercise therapy on functional status, overall improvement, return to work and pain intensity for *acute* low back pain, but exercise may be helpful for *chronic* back pain (Pereira et al., 2012). Rydeard, Leger and Smith (2006) support the effectiveness of an exercise approach in a chronic low back pain population with the specific diagnosis of spondylolysis or spondylolisthesis. A significant reduction in pain intensity and functional disability levels was found in the group who received specific exercise with maintenance of effect over a 30-month follow-up. No significant changes were seen in a control group receiving usual care.

Cause of chronic lower back pain:

Although causes for lower back pain are multifaceted, they are directly related to etiological factors such as social demographic characteristics, habits, physical and psychosocial factors, as well as certain risk factors (La Touche et al., 2008). Some of these factors are repetitive motion, curvature and torsion of the spine, pushing and pulling activities, stumbles, falls, and static or sitting work posture. One important mechanical function of the lumbar spine is to support the upper body by transmitting compressive and shearing forces to the lower body during the performance of everyday activities. To enable the successful transmission of these forces, mechanical stability of the spinal system must be ensured. The lumbar musculature has an effective role in the mechanical stability of the spinal system (Limba da Fonseca, Magini, Helena de Freitas, 2009).

It has been demonstrated that an imbalance between flexor and extensor muscles of the trunk is a risk factor that can cause lower back pain to appear. Also, the coordination of the stabilization of low back muscles (mainly the extensors) is reduced in lower back pain. Other dysfunctions and weaknesses that have been examined are those of the deep abdominal muscles (transverse muscle of the abdomen, pelvic floor, diaphragm and the multifidus muscles), which can be associated with lower back pain because of their important role in maintaining spinal stability. The Pilates method strengthens these muscles and hence may be an effective modality for lower back pain (La Touche et al., 2008; Posadzki et al., 2011).

Pilates background and goal:

The Pilates method was developed by Joseph Pilates during the First World War. It was originally referred to as Contrology and was called the Pilates Method after Joseph Pilates died in 1967. This method was introduced in the United States in 1923 and spread in the 1930s and 1940s among choreographers and dance instructors. These professionals were the first to describe the method as a rehabilitation technique that led to recovery from their sports-related injuries (La Touche et al., 2008). Pilates' initial concept mixed elements of gymnastics, martial arts, yoga, acrobatics and boxing, controlling muscles by performing movements while maintaining as much awareness as possible. For every movement of the method the participant is supposed to incorporate the following 6 principles: Centering, Concentration, Control, Precision, Breath and, at a more advanced level, Flow.

The exercises involve isometric contractions of the “powerhouse”, which is the muscular center responsible for the static and dynamic stabilization of the body. These exercises are considered to be similar to spinal stabilization exercises. During the exercises, the powerhouse strength center is activated during exhalation, when there is demand for contraction of the multifidus, transversus abdominis, pelvic floor, and diaphragm muscles. The goal of Pilates training is to improve general body flexibility and health, core and overall strength, posture, balance, muscle symmetry, body awareness and proprioception (Posadzki et al., 2011).

The method includes hundreds of exercises, which can be divided into two categories: Mat Pilates (exercises performed on the ground) and exercises with the Pilates apparatus. The first exercises developed by Pilates were performed on the ground; he then created over ten pieces of apparatus on which to perform exercises against resistance provided by springs and pulleys. The latter method can be incorporated to either challenge the participant by working *against* spring resistance, or for support by working *with* their resistance comparable to external muscles. The springs and pulleys of each apparatus can be used to make the exercises easier or more difficult.

In general, modified Pilates method movements can be used by the general population; and the complexity of all exercises, on mat and apparatus, can be increased gradually as more dynamic movements, requiring increased ranges of motions and increased strength, are progressively added.

Challenges & gaps in research:

In recent years, Pilates-based exercises have begun to be used by physical therapists to support the rehabilitation programs for musculoskeletal conditions, sports injuries, and neurological disorders, focusing especially on the spine and its stabilization. The increasing use of Pilates-based exercises makes it imperative to understand, among other characteristics, its applications, its contraindications, and how to use it appropriately. With this knowledge, practitioners can prescribe an appropriate technique for each patient.

Even though numerous studies about Pilates and lower back pain have been authored, it is very difficult to draw a definite conclusion because of the following limitations:

- *Not many studies meet scholarly standards:* Some studies are not randomized controlled clinical trials or are not peer reviewed.
- *Different types of Pilates apparatus are used:* Most studies use only mat exercises, but some studies also use the Pilates equipment, which works the body quite differently.
- *Different types of Pilates are used:* Even though all studies utilize the Pilates Method, the applications vary widely. Some use “classical Pilates” which is exclusively based on the original teachings of Joseph Pilates while emphasizing continuous movement; others use “contemporary Pilates”, which incorporates concepts from physical therapy and neuromuscular education, with slower movements which focus on the correct origination of the movement.
- *Different types of non-Pilates-exercises are added:* Some studies add other types of exercises, such as relaxation poses.

- *Use of subjective data analysis tools:* Some studies only use scales and questionnaires that evaluate pain intensity and disability but don't measure the functional capacity of the patient.
- *Differences in study designs:* The most significant factor observed was the differences in intervention length (4 weeks to 6 months) and frequency (1-5 times/week). A significant difference was also observed in the amount of exercises given, which ranged from 4 to >10.

The limitations above are also largely responsible for the fact that study results vary widely. Following a comparison of the results of four peer-reviewed studies that utilize mat-based Pilates: Gladwell et al. (2006) report that in the Pilates group, when comparing pre- and post-intervention questionnaire based data, significant increases are revealed in general health and sports functioning, with a significant decrease in pain. In the control group, the questionnaire based data shows no significant differences following the intervention period when compared to baseline. In the Pilates group, additional increases are found in the post-intervention data in the two physiological functional performance measures, with both flexibility and proprioception increasing following Pilates intervention compared to baseline. Meanwhile, in the control group, no significant differences following intervention period compared to baseline are seen in these physiological functional measures. When the two groups are compared, a significant difference is found in flexibility with a greater increase in the flexibility of the Pilates group compared to controls. Gladwell et al. (2006) are the first to show that Pilates used as a specific core stabilization exercise incorporating functionally active methods can improve non-specific chronic low back pain in active individuals compared to no intervention. They prove that Pilates can improve general health, pain level, flexibility, proprioception and sports functioning in individuals with chronic low back pain.

Curnow, Cobbin, Wyndham and Boris Choy (2009) also report that pelvic stability improves with a correctly performed basic Pilates exercise program. The addition of a relaxation posture and a postural training exercise improves the outcomes of the basic exercise program as measured by a reduction in the intensity lower back pain symptoms. However, once the exercises cease to be performed, the gains in duration and intensity on the short pain episodes are quickly lost. Curnow et al. (2009) claim that even though Pilates intervention has a positive outcome on the reduction of lower back pain symptoms and the improvement of pelvic stability, more attention should be paid to the structure of exercise regimes, regular follow-up should be included to ensure correct execution as well as to monitor other activities that may impact exercise.

Notarnicola, Fischetti, Maccagnano, Comes, Tafuri and Moretti (2013) assess that the review of literature underlines the clinical and functional effectiveness of few weekly sessions of Pilates. An important improvement of pain, disability and physical and psychological perception of health (physical and social functioning, general health and vitality) has been observed in individuals who practice Pilates daily. At the same time the choice of physical *inactivity* is associated with clinical and functional deterioration of low back pain, therefore specific physical activities are effective for the management of chronic lower back pain. However, more research of the role of quality and quantity of exercise and physical activity is needed.

Miyamoto, Pena Costa, Galvanin and Nunes Cabralb (2013) report that the effectiveness of motor control exercises in patients with nonspecific chronic lower back pain show improvement in global perceived effect, disability, and patient-specific disability in the short term, which is maintained in the medium term. For pain intensity, however, there is only a significant reduction in the long term. There is no convincing evidence that specific exercises are better than general exercises for this condition, although a short-term advantage of the addition of using modified Pilates interventions in patients with chronic lower back pain over an educational booklet in their study has been observed.

Objective and scope:

The aim of this review is to assess the efficacy of the Pilates method in the treatment of chronic low back pain from aforementioned selected studies. In order to successfully compare the studies and draw reliable conclusions from their results, they were required to fulfill the two common denominators of a) meeting scholarly standards and b) not using any Pilates equipment. The selected four studies are peer reviewed and they all utilize mat-based Pilates. They are either a randomized controlled clinical trial (Miyamoto et al., 2013; Gladwell et al., 2006), a randomized clinical trial (Curnow et al., 2009), or a controlled clinical trial (Notarnicola et al, 2013).

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