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Is Pilates an Effective Treatment for Improving Functional Disability and Pain in Patients with Nonspecific Low Back Pain?

Koren V. Fleming
Philadelphia College of Osteopathic Medicine, korenfl@pcom.edu

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A SELECTIVE EVIDENCE BASED MEDICINE REVIEW

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ABSTRACT

OBJECTIVE: The objective of this selective EBM review is to determine whether or not "Is Pilates an effective treatment for improving functional disability and pain in patients with nonspecific low back pain?"

STUDY DESIGN: Review of three English language primary studies, two of which were published in 2006 and the other in 2009.

DATA SOURCES: Three single-blind randomized control trials comparing the Pilates method of treatment to a control group that did not receive Pilates intervention were found using PubMed and EBSCOhost databases.

OUTCOMES MEASURED: Each of the studies had patients participate in Pilates sessions for six to seven weeks. The outcomes measured include whether or not there was a decrease in low back pain and improvement in functional disability. The subjective measurement of outcomes included NRS-101 pain scale, Roland Morris Questionnaire, Owestry Low Back Pain Disability Questionnaire, symptom report, sport functioning questionnaire, visual analog pain scale, and present pain intensity scale. The tools used to assess significance of outcomes measured were P-values and change in mean from baseline.

RESULTS: All of the single-blind randomized control trials showed a significant decrease in low back pain after the Pilates intervention. The Rydeard et al single-blind randomized control trial also showed a significant improvement in functional disability after the Pilates intervention.

CONCLUSIONS: The results of the RCT's reviewed demonstrate Pilates method to be an effective treatment for improving functional disability and decreasing low back pain. Further research is needed to determine length, intensity, and specific Pilates exercises that may yield maximum results and long term relief.

KEY WORDS: Pilates, low back pain

INTRODUCTION

Low back pain is a common and bothersome complaint in the United States. Though some people are able to deal with their low back pain, for many the pain can become unbearable and debilitating. An estimated 80% of the population will suffer from low back pain throughout their lifetime. This fact makes low back pain the most common cause of disability in patients younger than 45 years old.[1,2] Due to its high prevalence, low back pain is the second most common reason for visits to the doctor's office.[3] The 4-5% of all annual healthcare visits due to low back pain results in an estimated $50 billion that is spent annually on the condition.[3,4] This paper evaluates three randomized controlled trials (single-blind) comparing the effectiveness of Pilates for nonspecific low back pain to control groups that received no intervention.

Nonspecific low back pain is defined as pain located in the lower region of the spine (below the ribs and above the legs) due to an unknown cause. This condition can be categorized as acute (< 3 months), chronic (> 3 months), or recurrent.[5] The onset of the low back pain can be sudden or gradual depending on the cause. Low back pain can be described as localized or diffuse pain that occurs in the lower lumbar region and the symptoms vary depending on the cause.[5] Some symptoms of low back pain include stiffness, dull or sharp pain, muscle spasms, and leg complaints such as burning, numbness, or tingling.[5]Although the specific cause is unknown, there are multiple causes that can contribute to back pain such as accidents, overweight, poor posture, spinal injuries, muscle strain/sprain, aging, osteoporosis, disc herniation, neurological and/or musculoskeletal disorders.[5]

The goal of treatment for low back pain is to alleviate pain and symptoms. Most patients attempt to treat the back pain on their own until the pain becomes so disabling that they are not able to fully function and find it necessary to seek medical advice. Some of the more common

methods used to treat low back pain are bed rest, ice packs or heating pads, nonprescription pain medication (acetaminophen, ibuprofen), spinal manipulation, and physical therapy.[5]

Patients will often gain relief with the treatment options mentioned above but these treatment options do not address the structural issues that can be causing the low back pain. Pilates is a therapeutic approach that focuses on addressing the structural imbalances that can result in low back pain. The Pilates method of exercise increases deep abdominal muscle strength which decreases the compression and stress on joints in the back.

OBJECTIVE

The objective of this selective EBM review is to determine whether or not "Is Pilates an effective treatment for improving functional disability and pain in patients with nonspecific low back pain?"

METHODS

Randomized control studies were selected based on those that included a population of patients with nonspecific low back pain between the ages of 18 and 60. Articles that compared the Pilates method of intervention for low back pain to a control group were considered. The outcomes measured were decreases in low back pain and improvement in functional disability. Under these criteria, three single-blind randomized controlled studies were identified and included in this review.

A detailed search via PubMed and EBSCOhost using the key words Pilates and low back pain were used to find relevant articles. All of the studies found and used in this review were published in peer-reviewed journals and written in English. The author completed the research using articles that were selected based on their relevance and on the importance of outcomes to the patient (POEMs). The included studies were RCTs that were published after 1996 with

participants that had nonspecific low back pain and the chosen method of treatment was Pilates intervention. Those excluded were studies with participants that had low back pain due to a specific cause. The summary of statistics reports were P-values and change in mean from baseline. Table 1 includes the demographics of the included studies.

Table 1: Demographics & characteristics of included studies

Study	Type	# Pts	Age	Inclusion Criteria	Exclusion Criteria	W/D	Intervention
Da Fonseca JL, 2009	Single blind RCT	28	18-59	Independent gait execution without the use of any support device (crutch, walking stick, etc), complaints of low back for at least 6 months (low-back group), no complaints of low back pain or musculoskeletal pain (control group)	Neurological disease, major visual deficits, true leg-length discrepancy greater than 2cm, and history of ankylosing spondylosis, disc herniation, tumor, infection or fracture, cauda equine syndrome, spine-fusion surgery, or any low extremity orthopedic surgery within 1 year	0	15 sessions of Pilates exercise, 2 sessions per week
Gladwell, 2006	Single blind RCT	49	18-60	LBP chronic for at least 12 weeks not due to any specific pathology, patient able to travel independently, patient is otherwise medically fit to perform physical training, able to consent and understands what the study entails	Back pain attributed to any specific pathology, unable to walk without a walking aid, involved in regular Pilates classes, constant or severe back pain judged on clinical grounds due to nerve root irritation, major surgery within the past year	15	Six week program of Pilates (six one hour classes, one class per week)
Rydeard, 2006	Single blind RCT	39	20-55	Physically active adults (30 min session per	Pregnancy, past spinal surgery or fracture,	0	Pilates - Three 1 hr sessions/wk

				week), LBP > 6 weeks duration or recurrent low back pain (2 painful incidences per year)	inflammatory joint disease, systemic metabolic disorder, rheumatic disease, or chronic pain syndrome, neurological compromise or acute inflammatory process		& training in a 15 min home program performed 6 days/wk for 4 weeks

OUTCOMES MEASURED

The outcomes measured were patient oriented evidence that matters (POEMs). To help measure the outcomes several subjective tools were used by patients to assess the outcome of RCTs. da Fonseca et al used the visual analog pain scale (0 = no pain, 10 = most severe pain) and present pain intensity scale (5 = excruciating, 4 = horrible, 3 = distressing, 2 = uncomfortable, 1 = mild, 0 = no pain). Gladwell et al used the Roland Morris Pain Rating Visual Analog Scale (RMVAS), Owestry Low Back Pain Diability Questionnaire (OSWDQ), and symptom report. The OSWDQ assessed the limitation of various daily living activities. A decrease in the OSWDQ score signifies improvement in functional disability. Symptom reports included subjective improvement in back pain related to symptoms that occur during functional movements. Rydeard et al used RMQ and NRS-101. RMQ uses a scale from 0 which is no disability to 24 which is severe disability. The NRS-101 scale was used to measure pain intensity (0 = no pain, 100 = pain as bad as it could be).

RESULTS

Three single-blind RCTs compared Pilates method with control groups that received no Pilates intervention. All of the studies used the Pilates method for treatment but the interventions varied slightly with each study. Each study had similar inclusion and exclusion criteria (see Table 1). All of the studies maintained a level of safety by providing certified Pilates instructors

to properly teach and monitor patients while performing exercises. Patients were also instructed to only perform exercises to the best of their ability and to stop with any onset pain that occurs with exercise.

Note that the data from all three randomized controlled studies included in this review contained continuous data that could not be converted to dichotomous data. Therefore, the analysis of risk reduction (RRR), absolute risk reduction (ARR), and number needed to treat (NNT) could not be calculated.

The study conducted by da Fonseca et al compared Pilates method to a control group. The participants were randomly assigned to a Pilates group who participated in 15 instructed sessions (2 sessions per week) or to the control group that continued with their normal activities and did not undergo any other type of treatment. A total of 28 participants (control group, n = 11 and low back group, n = 17) participated and completed the trial. All of the participants in the Pilates group were on the same exercise regimen that consisted of basic-level Pilates exercises designed to increase core muscle strength. The Pilates sessions began with simple exercises that involved patients in prone, supine, and side-lying positions. As the study progressed, patients began to engage in more functional exercises and advanced positions such as box and sitting. Up until the seventh session participants were also assigned home exercises to perform once a day. After eight sessions, participants were to begin engaging their core muscles regularly with daily activities.

da Fonseca et al included multiple outcomes in the study, but for the purpose of this review the outcomes measured were limited to visual analog pain scale and present pain intensity. According to the visual analog scale and the present pain intensity scale, the Pilates group showed a significant decrease in pain compared to the control group (no Pilates) which did

not show any significant difference after the intervention. Table 2 summarizes the results of the study by da Fonseca et al.

Table 2: Questionnaire Pain Data Before and After Pilates Intervention, Mean ± SD

	No-Pilates Group	No-Pilates Group	Pilates Group	Pilates Group
	Before	After	Before	After
Visual Analog Pain Scale	6.1 ± 1.8	4.9 ± 2.5	5.9 ± 2.0	3.0 ± 3.4*
Present Pain Intensity	2.0 ± 0.7	1.9 ± 0.9	2.8 ± 1.5	1.1 ± 1.1*

* Significant difference within the Pilates group before and after the intervention

In the second study conducted by Gladwell et al, a total of 49 subjects were randomly assigned to a Pilates group (n = 25) or a control group that received no intervention (n = 24). Both groups were encouraged not to make any changes to their current medications, including analgesics, or daily activities. However, only thirty-four participants completed the trial (14 for control and 20 for Pilates group) due to some participants having to be withdrawn from the trial because they were not able to complete all of the Pilates sessions. Patients in the Pilates group were also encouraged to perform two thirty minute sessions of home exercises and record them in a diary. According to participant diaries, the overall compliance with home exercises was 90%.

Each Pilates session included an educational and exercise component of Pilates. The educational component, taught by a Pilates Institute Instructor, was intended to remind patients of important concepts such as proper posture, how to properly engage core muscles, and controlled breathing. The exercise component consisted of exercises such as modified side kick, modified one leg stretch, modified shoulder bridge, the hundred, swimming, modified swan dive, modified roll up, modified spine twist, double arm stretch, and modified one leg circle.

Multiple outcomes were described in this study, but for the purpose of this review the outcomes measured were limited to decrease in pain, improved symptoms, and a reduction in

functional disability. As described in Table 3, there was a significant decrease in pain with the Pilates group ($P < 0.05$) using the Roland Morris pain rating visual analog scale (RMVAS). The scores for the RMVAS showed a 0.5 point decrease in pain when comparing week one with week six after the Pilates intervention was completed. When using the OSWDQ, reports showed a decrease in scores between both the control and Pilates group. In the control group there was a significant decrease in the OSWDQ score by 6 points ($P < 0.05$) while the Pilates group only had a decrease of 1 point (Table 3).

Table 3: Questionnaire Data Before and After Pilates Intervention, Mean(SD)

	Control Group	Control Group	Pilates Group	Pilates Group
	Before	After	Before	After
RMVAS	2.4 (0.9)	2.4 (0.8)	2.7 (0.9)	2.2 (0.9)**
OSWDQ	24.1 (13.4)	18.1 (13.0)*	19.7 (9.8)	18.1 (11.2)
Symptom Report	2.3 (0.5)	2.3 (0.6	2.4 (0.6)	2.2 (0.6)

** Significant difference ($P < 0.05$) within Pilates group before and after intervention
* Significant difference ($P < 0.05$) within control group before and after

The study conducted by Rydeard et al, compared Pilates intervention method to a control group that received no intervention. Thirty-nine subjects with low back pain were randomly assigned to participate in a Pilates group (n=21) or a control group (n=18). All of the participants completed the main study (part 1) but some began to drop out during the follow up (part 2) period of the study that occurred at three, six, and twelve months. At three months, there was an 86% response rate compared to 57% at six months and 62% at twelve months. This particular study had the Pilates group participate in a four-week program that consisted of three one-hour sessions per week and training in 15 minute home program exercises six days a week. Participants performed a variety of Pilates exercises that progressed in difficulty throughout the study. The Pilates intervention consisted of floor mat exercises and also exercises performed on

the Pilates Reformer. Participants were also assigned and encouraged to perform home exercises. The compliance to the home exercise program was recorded on personal log sheets.

The two outcomes measured in the Rydeard et al study were pain intensity using the NRS-101 scale and functional disability using the RMQ. Table 4 describes the significant decrease that occurred in the Pilates group both with pain intensity and functional disability after treatment. Both outcomes were considered significant due to P-values less than 0.05 for pain intensity (P = .002) and functional disability (P = .023) and narrow confidence interval.

Table 4: Pretest means (SEM) and adjusted posttest means for functional disability and pain intensity comparing Pilates group and control group

	Control Group (n=18)	Control Group (n = 18)	Pilates Group (n = 21)	Pilates Group (n = 21)	
Outcomes Measures	Pretreatment	Post-treatment	Pretreatment	Post-treatment	P-value
Functional Disability	4.2 (0.8)	3.2 (0.4) *95% CI (2.5 to 4.0)	3.1 (0.6)	2.0 (0.3) *95% CI (1.3 to 2.7)	.023
Pain intensity score	30.4 (4.2)	33.9 (3.5) *95% CI (26.9 to 41.0)	23.0 (3.9)	18.3 (3.2) *95% CI (11.8 to 24.8)	.002

SEM = standard errors of the mean
* Narrow confidence interval (CI) for post-treatment adjusted means in pain intensity and functional disability

Part two (retention efficacy) of the Rydeard et al study which contained follow up information was not available for some participants. Therefore, a sensitivity analysis with four intention to treat analyses was conducted to evaluate the retention of treatment effect. The first intention to treat analysis showed a significant decrease in the RMQ scores over the twelve month follow-up period (P < .01). The other intention to treat analyses also supported these

results, however, when the worst case value was calculated the results did not prove to be of significance (P = .12).

DISCUSSION

Due to significant results from numerous studies, the Pilates method of intervention has been recognized as a successful treatment for nonspecific low back pain and many other conditions. Healthcare professionals are starting to include Pilates in their treatment plans for patients with low back pain. The drawback is that Pilates is often seen as a progressive therapy by most insurance companies and the costs may not be covered.[7] However, licensed providers that deem Pilates intervention to be a medical necessity can refer their patient to a physical therapy office that incorporates Pilates into the rehabilitation program.[7] This helps with insurance costs because most insurance companies will cover physical therapy costs.

The RCTs studied for this review demonstrated that Pilates method, which focused on developing core muscle strength to assist in the structural imbalances, is effective in the treatment of low back pain. However, there were some factors that might have affected the results of the trials. In the da Fonseca et al and the Gladwell et al study, both the control and Pilates groups were encouraged to make no changes to their normal exercise, activities, and drug treatment which included analgesics. Therefore, some of the participants could have engaged in other forms of exercise or used medications that could have also contributed to pain relief. The Rydeard et al study allowed the control group to seek other treatment if they wished which could lead to improved benefits in low back pain from the control group. All the studies reviewed encouraged the participants to perform home exercises throughout the duration of the study. Since there was no way to determine whether or not the participants were truly performing their at home exercises, besides patient logging which was based on honesty and integrity, it is

difficult to determine the maximum benefit that could have been achieved for decreased low back pain.

CONCLUSION

Pilates method of intervention is an effective treatment for improving pain in patients with nonspecific low back pain. The three RCTs studied in this review provide evidence supporting that Pilates significantly decreased low back pain and improved patient's functional ability. Rather than using a temporary method for pain relief, such as analgesics, Pilates is an alternative method that focuses on strengthening core muscles, correcting posture, improving pelvic instability, and other issues that may be contributing to the structural imbalances causing low back pain. However, more research needs to be conducted to determine Pilates' ability to maintain improvements in low back pain over longer periods of time.

In order to maintain personalized instruction and guidance on proper technique for Pilates, future studies need to keep a small sample size. Since improvement in pain and functional disability are subjective outcomes there must be tighter controls on future studies in order for results to be accurate. In order to provide more accurate results, future studies need to eliminate participants from engaging in other exercises and treatments that are not part of the Pilates intervention.

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