



SYSTEMATIC REVIEW

Treating non-specific chronic low back pain through the Pilates Method

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Received 17 September 2007; received in revised form 21 November 2007; accepted 23 November 2007

KEYWORDS

Low back pain;
Rehabilitation;
Exercise therapy;
Pilates

Summary The goal of this study is to review and analyze scientific articles where the Pilates Method was used as treatment for non-specific chronic low back pain (CLBP). Articles were searched using the Medline, EMBASE, PEDro, CINAHL, and SPORTDICUS databases. The criteria used for inclusion were randomized controlled trials (RCT) and clinical controlled trials (CCT) published in English where therapeutic treatment was based on the Pilates Method. The analysis was carried out by two independent reviewers using the PEDro and Jadad Scales. Two RCTs and one CCT were selected for a retrospective analysis. The results of the studies analyzed all demonstrate positive effects, such as improved general function and reduction in pain when applying the Pilates Method in treating non-specific CLBP in adults. However, further research is required to determine which specific parameters are to be applied when prescribing exercises based on the Pilates Method with patients suffering from non-specific CLBP. Finally, we believe that more studies must be carried out where the samples are more widespread so as to give a larger representation and more reliable results.

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Introduction

Chronic low back pain (CLBP) is the most common cause for frequent absenteeism at work in the less than 45-year-old (Carr and Moffett, 2005; Cunningham

and Kelsey, 1984) adult population. It has been estimated that low back pain (LBP) can be found in between 8% and 56% of the population in the United States (Manchikanti, 2000) and amounts to a billion dollars per year in medical expenses and other expenses indirectly related to LBP (Luo et al., 2004).

Philips and Grant have described that between 30% and 40% of patients suffering from LBP never completely recover and, on the contrary, later develop permanent chronic LBP (Philips and Grant,

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1991) symptoms. Although causes for LBP are multifaceted, they are directly related to etiological factors such as social demographic characteristics, habits, as well as physical and psychosocial factors (Manchikanti, 2000). In a prospective study, Lee et al. (1999) demonstrated that an imbalance between flexor and extensor muscles of the trunk is a risk factor that can cause LBP to appear. Other authors have found that dysfunctions and weaknesses that exist in the deep abdominal muscles (transverse muscle of the abdomen, pelvic floor, diaphragm and the multifidus muscles) can be associated to LBP (Hodges and Richardson, 1996; O'Sullivan et al., 1997a). In reference to this, Hodges and Richardson (1999) have added that the function and coordination of the stabilization of low back muscles (mainly the extensors) are reduced in LBP patients.

Several studies mention that LBP is the main reason for physiotherapy consultations (Boissonnault, 1999; Di Fabio and Boissonnault, 1998; Jette and Davis, 1991). Jette and Jette (1996) note that the physiotherapeutic treatment most frequently applied is focused on strengthening and stretching exercises, thermo-therapy, and manual therapy. However, therapeutic exercise seems to be the most effective in treating LBP, according to scientific research described by several reviews (Philadelphia Panel, 2001; Van Tulder et al., 1997, 2002).

The Pilates Method started to be developed by Joseph H. Pilates during World War I (Latey, 2001). It was originally referred to as Contrology and was only later called the Pilates Method during Joseph Pilates lifetime (Anderson and Spector, 2000). This method was introduced in the United States in 1923 and spread in the 1930s and 1940s among choreographers and dance instructors (Anderson and Spector, 2000). These professionals were the first to describe the method as a rehabilitation technique that led to recovery from their sports-related injuries (Anderson, 2001; Anderson and Spector, 2000).

Currently, the Pilates Method is popular in all areas of fitness and rehabilitation, although there is little scientific evidence that describes its benefits. An observational prospective study carried out by Segal et al. (2004) demonstrated significant improvement in flexibility after doing 3 months of Pilates; however, the body's composition values were not modified. In reference to this, Jago et al. (2006) carried out a controlled randomized study on girls practicing Pilates 5 days a week, 1 h per session, for a 4-week period. They obtained positive results in terms of modifying their body composition. As a result, the authors concluded

that Pilates could be a useful preventive measure against obesity.

In terms of aspects related to rehabilitation, Pilates has been shown to improve the dynamic balance in healthy adults (Jonson et al., 2007) and postural stability in senior citizens (Kaesler et al., 2007). There is also good tolerance to the Pilates Method when combined with counter-resistance exercises in hospitalized senior citizens (Mallery et al., 2003). However, the authors concluded that it would be valuable to study the benefits of these exercises with other groups of people. Moreover, Smith and Smith (2004) touch on the theory that the Pilates Method can improve physical features such as flexibility, proprioception, balance, and coordination. They also suggest that these benefits can be integrated into rehabilitation programs, as well as training for improving muscular resistance and balance in senior citizens.

In terms of treating low back and pelvic muscles, García et al. (2004) found significant statistical gains in the strength of low back extensor muscles after 25 Pilates sessions applied to 20 healthy subjects. Moreover, Herrington and Davies (2005) demonstrated that Pilates is more effective than regular abdominal curls in triggering the transversus abdominis contractions in healthy subjects.

In 2004, an article by Maher (2004) focusing on treating CLBP did not recommend Pilates for this type of ailment, as there is no scientific evidence that justifies its effectiveness. However, it is important to mention that randomized clinical studies on this subject began to be published as of 2006.

The goal of this study is to review and analyze scientific articles where the Pilates Method was used as treatment for non-specific CLBP.

Material and methods

Criteria for inclusion

In order to select studies to be reviewed, the criteria used for inclusion considered the following: (a) randomized controlled trials (RCT) and clinical controlled trials (CCT); (b) studies carried out on adults with CLBP; (c) studies where therapeutic treatment was based on the Pilates Method; (d) studies published in scientific journals between 1980 and 2006; and (e) studies published in English.

Search strategy

Searching for articles was done using the following databases: Medline, EMBASE, PEDro, CINAHL, and

SPORTDICUS. The terms used for the search were “Pilates”, “LBP”, “Rehabilitation”, and “Exercise Therapy”. A total of 12 potential studies were found, and the first information analysis was carried out by two independent reviewers. The first analysis was based on the study of information provided by the abstract, the title, and key words. The articles selected from the first analysis were studied in depth using the full text in the evaluation phase. The last day of the search was carried out 17 November 2006.

Evaluation methodology of studies

The evaluation of the methodological quality of the studies was carried out using two instruments, the PEDro (Table 1) and Jadad Scales. The PEDro Scale was based on the Delphi List (Verhagen et al., 1998) and includes 11 items that, overall, aims to evaluate four fundamental methodological aspects of a study such as the random process, the blinding technique, group comparison, and the data-analysis process. According to Sherrington et al. (2000), this scale was used to closely evaluate 3000 articles on controlled random clinical studies indexed in the PEDro database. The reliability of this scale was evaluated and acceptable results (Bhogal et al., 2005; Maher et al., 2003) were obtained. The Jadad Scale (Jadad et al., 1996) is one of the oldest and most commonly used instruments to evaluate the quality of clinical tests. This scale evaluates the quality of the clinical-test design by means of five items: (1) Is the study randomized? (2) Is the study double blinded? (3) Does the study describe if subjects withdraw? (4) Is the randomization adequately described? (5) Is the blindness adequately described? Clark et al. (2001) demonstrated that the Jadad Scale has a good inter-examiner reliability.

Two independent reviewers evaluated the quality of each one of the articles selected using the same methodology. Disagreements between reviewers were resolved by including the criteria of a third reviewer as a means of reaching consensus. The features of the treatments applied, the results, and the conclusions presented in the studies under analysis are explained in a descriptive way in “Results” section.

Results

While searching for articles in the first analysis phase, two RCTs (Rydeard et al., 2006; Gladwell et al., 2006) and one CCT (Donzelli et al., 2006)

Table 1 The PEDro Scale.

1. Eligibility criteria were specified	Yes	No
2. Subjects were randomly allocated to groups (in a crossover study, subjects were randomly allocated an order in which treatments were received)	Yes	No
3. Allocation was concealed	Yes	No
4. The groups were similar at baseline regarding the most important prognostic indicators	Yes	No
5. There was blinding of all subjects	Yes	No
6. There was blinding of all therapists who administered the therapy	Yes	No
7. There was blinding of all assessors who measured at least one key outcome	Yes	No
8. Measures of at least one key outcome were obtained from more than 85% of the subjects initially allocated to groups	Yes	No
9. All subjects for whom outcome measures were available received the treatment or control condition as allocated or, where this was not the case, data for at least one key outcome was analyzed by “intention to perform treatment”	Yes	No
10. The results of between-group statistical comparisons are reported for at least one key outcome	Yes	No
11. The study provides both point measures and measures of variability for at least one key outcome	Yes	No

cases were found where the Pilates Method was applied for non-specific CLBP. Table 2 shows the features of the study in a more descriptive way.

Results of the methodological quality evaluation using the PEDro and Jadad Scales

After evaluating the methodological quality of the studies using the PEDro and Jadad Scales, different results were obtained for each study. However, Gladwell et al. (2006) and Rydeard et al. (2006) were the most similar in terms of study design (Tables 3 and 4). The three reviewers had discrepancies in terms of evaluating points 2, 9 and 10 on the PEDro Scale in all of the studies, whereas the

Table 2 Characteristics of the studies included.

Study	Method	Subjects	Intervention	Outcome
<ul style="list-style-type: none"> Gladwell et al. (2006) 	<ul style="list-style-type: none"> RCT Blinding assessors 	<ul style="list-style-type: none"> N = 49 Age: EG average: 36; CG average: 45 All the participants, average: 40 	<ul style="list-style-type: none"> EG: Pilates on mat CG: Without specific intervention and with continuous health care Duration: 1 session a week for 6 weeks. 	<ul style="list-style-type: none"> Significant statistical effects in improving general health, sports functions, flexibility, proprioception and reducing pain
<ul style="list-style-type: none"> Donzelli et al. (2006) 	<ul style="list-style-type: none"> CCT Blinding assessors 	<ul style="list-style-type: none"> N = 53 Average age: 50 	<ul style="list-style-type: none"> CG: Back School method EG: Pilates on mat Duration: 10 consecutive 1 h sessions 	<ul style="list-style-type: none"> Both groups showed reduced back pain and improved functions. However, there was no comparison between both groups
<ul style="list-style-type: none"> Rydeard et al. (2006) 	<ul style="list-style-type: none"> RCT Blinding assessors 	<ul style="list-style-type: none"> N = 39 Age EG average: 37; CG, average: 34 Sex: F 25, M 14 	<ul style="list-style-type: none"> EG: Pilates on (reformer) machines and on mat CG: Without specific intervention and with continuous health care Duration: 1 h a week and 15 min of exercise at home 6 days a week. Complete Program 4 weeks 	<ul style="list-style-type: none"> Significant statistical effects in reducing pain and improving functions

Table 3 The methodological quality of the studies as measured by the PEDro Scale.

Authors (year)	1	2	3	4	5	6	7	8	9	10	11	Sum
Gladwell et al. (2006)	–	1	1	1	0	0	1	0	0	1	1	6/10
Donzelli et al. (2006)	–	0	0	1	0	0	1	0	0	0	1	3/10
Rydeard et al. (2006)	–	1	1	1	0	0	1	1	1	1	1	8/10

discrepancies were mainly concerned with points 2 and 4 on the Jadad Scale.

Donzelli et al. (2006) obtained the least points and this was due to several inconsistencies in the clarity of the descriptions when referring to research design. One example of this is related to the distribution of the sample. The title of the study says it is a controlled random one, however, in "Methods" section, it does not mention the technique used to make the random distribution, nor does it mention if the distribution was really carried out in a random manner or if it was done according to convenience. Another inconsistency of this study is that it does not compare nor make an adequate statistical analysis between the two

Table 4 The methodological quality of the studies as measured by the Jadad Scale.

Authors (year)	1	2	3	4	5	Sum
Gladwell et al. (2006)	1	1	0	1	1	4
Donzelli et al. (2006)	0	0	0	0	1	1
Rydeard et al. (2006)	1	1	0	1	1	4

groups. What it does is to present the results in a descriptive way.

The Gladwell et al. (2006) study does make an adequate comparison and a good statistical analysis. The only inconvenience is that the data analyzed and described in the results was

completed with less than 85% of the subjects who started the study. This also occurred in Donzelli et al. (2006) study. The data analyzed in Rydeard et al. (2006) study was divided into two phases. During the first, which was carried out at the end of the intervention phase, no subjects left the sample. This means 100% of the data was analyzed. During the second phase, the data analyzed was collected for periods of 3, 6 or 12 months. In this analysis, some of the subjects left the experimental group.

Characteristics of the subjects used for the studies

All of the subjects used in the studies had non-specific chronic low back pain. The subjects of the Rydeard et al. (2006) study had CLBP for more than 6 weeks, whereas in the Gladwell et al. (2006) and the Donzelli et al. (2006) studies, they had CLBP for more than 12 weeks.

The average age for the Rydeard et al. (2006) study was 37 in the experimental group (EG) and 39 in the control group (CG). In the Gladwell et al. (2006) study, the average age was 36 for EG and 45 for the CG. Finally, in the Donzelli et al. (2006) study, the average age was 50.

Discussion

The articles analyzed in this review are similar in terms of the characteristics of the treatment and subjects used. Moreover, the methodological quality of the three studies is acceptable. In terms of the effectiveness of the Pilates Method for treating CLBP, the three studies also show positive results in improving functions and reducing pain. However, only the Rydeard et al. (2006) study, as well as the Gladwell et al. (2006) study are adequately compared to their respective control groups. Therefore, these results are the most representative in terms of the effectiveness of the treatment referred to. The Donzelli et al. (2006) study apparently shows positive results, but the problem is that they are shown in a descriptive way and do not make a statistical comparison with the ones gathered in the control group. This makes the interpretation of these results a little confusing, and also makes it difficult to reach conclusions on this study.

It is fundamental to highlight that prescribing exercise based on the Pilates Method, as described in the studies, is based on parameters adapted for rehabilitation purposes. This is to be distinguished

from the classic Pilates Method. This modified Pilates Method was designed for the improvement of posture and control movement (Rydeard et al., 2006) through neuromuscular control techniques that increase the lumbar spine stability thanks to the targeting of the local stabilizers muscles of the lumbar-pelvic region or "core muscles" (Gladwell et al., 2006; Rydeard et al., 2006). In this version of Pilates, the complexity can be increased by incorporating dynamic movements to the exercise program (Gladwell et al., 2006).

The Gladwell et al. (2006) and the Rydeard et al. (2006) studies coincide in many of the patterns used in prescribing exercise, which means the bases and principles of low back pelvic stabilization exercises have been adapted. Some of the exercise parameters used in the modified Pilates Method are also important in other lumbar-pelvic region stabilizing exercises, such as specific reeducation exercises of the lumbar-pelvic region, progressions from static to dynamic postures, teaching strategies and conditioning training for the maintenance of a neutral spine and pelvis. Moreover, it has been demonstrated that stabilizing lumbar-pelvic exercises are effective in treating LBP (Arokoski et al., 2004; Goldby et al., 2006; Hides et al., 2001; Lewis et al., 2005).

It would be interesting if future research proposals focused more on modified Pilates in the treatment of chronic, lower-back pain. O'Sullivan et al. (1997b) demonstrated that a stabilizing exercise program for patients with chronic lower-back pain specifically due to spondylolysis and spondylolisthesis was the most effective in improving movement and relieving pain. This type of study can help us to better focus on new research areas.

One of the limitations of the three research studies are the modest numbers in the sample used, as well as the fact that some subjects left before the end of the study. This is a factor that must be improved in future research and a more rigorous selection process should be used for both the subjects and for the therapeutic exercises based on the Pilates Method.

In future studies, it would also be important to do more research on which exercises based on the Pilates Method should be prescribed as a therapeutic means in treating non-specific CLBP. It would also be important to determine, for example, the frequency in which the method should be applied so as to get therapeutic gains, the intensity and adequate volume of exercises in the diverse rehabilitation phases, and if Pilates carried out on mats is more effective or adequate than Pilates using machines or vice versa.

Conclusion

The results of the studies analyzed in this review all demonstrate positive effects, such as improving general functions and in reducing pain when applying the Pilates Method in treating non-specific CLBP in adults. What is important to point out is that the exercises prescribed in the studies are adapted to the patient's situation. Finally, we believe that more studies must be carried out where the samples are more widespread so as to give a larger representation and more reliable results. Moreover, we recommend doing more research to determine which specific parameters are to be applied when prescribing exercises based on the Pilates Method with patients suffering from non-specific CLBP. It would also be important to identify and specify which modifications and adaptations are necessary for the classic Pilates Method to be used in various rehabilitation programs.

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