Does a Program of Pilates Improve Chronic Non-Specific Low Back Pain?

Valerie Gladwell, Samantha Head, Martin Haggar, and Ralph Beneke

**Objective:** To evaluate the effect of a program of modified Pilates for active individuals with chronic non-specific low back pain. **Design:** A single blind randomized controlled trial. **Participants:** 49 individuals with chronic low back pain were randomly allocated to control (n = 24) or Pilates group (n = 25). Thirty-four individuals completed the study (14 and 20 individuals for control and Pilates group, respectively). **Intervention:** The Pilates group undertook a six week program of Pilates. Both groups continued with normal activity. **Main Outcome Measures:** An assessor blinded to group allocation conducted functional and questionnaire-based assessments pre- and post-intervention. **Results:** Improvements were seen in the Pilates group post-intervention period with increases (P < 0.05) in general health, sports functioning, flexibility, proprioception, and a decrease in pain. The control group showed no significant differences in the same measures post-intervention. **Conclusions:** These data suggest that Pilates used as a specific core stability exercise incorporating functional movements can improve non-specific chronic low back pain in an active population compared to no intervention. Additionally, Pilates can improve general health, pain level, sports functioning, flexibility, and proprioception in individuals with chronic low back pain. **Key Words:** back pain, exercise therapy, rehabilitation.

Back pain is one of the most widely experienced health-related problems in the western world. In a recent survey, for the United Kingdom, 40% of 5500 people interviewed had experienced back pain within a single year, with pain existing throughout the year in 15% of these cases. 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.
Exercise therapy designed to target key areas of back pain to increase individuals’ confidence in the use of their spine and to overcome the fear of physical activity has become an evidence-based treatment. Additionally, exercise therapy has been shown to be more effective than usual care by a general practitioner (which includes staying active and taking analgesics as required) and just as effective as conventional physiotherapy. Furthermore, it may be more cost effective than the latter, as an exercise therapy program can be performed in groups. However, there are no recommendations of the specific type of exercise to be undertaken, and the effectiveness of specific types of exercised therapy still needs to be evaluated.

Back pain has been associated with dysfunction and weakness of deeper abdominal muscles. These deeper abdominal muscles, including the \textit{m. transversus abdominis} (TA), \textit{m. multifidus} (MF), pelvic floor muscles, and the diaphragm muscle will be referred to throughout this paper as the “core muscles.” Pilates techniques aim to specifically train all the above mentioned “core muscles” submaximally to increase the tone and strength of these muscles, to lengthen and stretch the lumbar spine thus decreasing compression of the joints, and cause an alteration in the tilt of the pelvis. In the very few studies that have been conducted using Pilates, Pilates training has been shown to result in changes in posture of the lumbar spine and cause improvements in the sensory-motor control of the trunk and its relationship to limb movements. Although no studies have been performed on the specific muscle activation patterns of the “core muscles” during Pilates techniques, other studies have investigated the activation of MF and TA. Electromyography showed that the MF and TA could be activated using a maneuver, which is described as a gentle drawing toward the spine and maintaining a low level contraction. This is a maneuver used in Pilates. Furthermore, it should be noted that the important elements of improving back pain, including biological, educational, and psychological aspects, are encompassed within the principles of Pilates training. Pilates is currently recommended by practitioners as an active functional treatment for back pain with anecdotal reports by both practitioners and clients, indicating that significant benefits may indeed exist including improvements in functional ability and return to normal daily living. However, to date there is no objective evidence to support the use of Pilates in the treatment of chronic low back pain.

The main aim of the current study was to evaluate the effect of a program of modified Pilates for active individuals with chronic non-specific back pain. These results were additionally compared to active controls with low back pain who underwent no intervention. Modified Pilates techniques were used as they have been adapted and simplified from the traditional Pilates methods and are therefore appropriate for use by the general population. The modified Pilates exercise program used in our study was designed to specifically target the “core muscles” and gradually increase complexity by using dynamic movements. Our hypothesis was that individuals with non-specific low back pain would find the Pilates program effective in decreasing pain, subjectively improve symptoms, reduce functional disability, increase general overall health rating, increase flexibility, and increase proprioceptive balance. Additionally, we proposed that the Pilates group will improve significantly in these measures compared to a control group of active individuals with chronic low back pain who had no additional intervention.
Methods

The design of the study was a single blind randomized controlled trial. Ethical approval for the study was obtained from the University of Essex ethics committee. Individuals with chronic low back pain living within the Colchester region were offered the chance to participate in this study via posters and letters given to local doctors’ clinics and via e-mailed information to staff and students at the local University.

Participants

After volunteering to participate in the study and giving informed consent, 49 participants who had had non-specific chronic low back pain for more than 12 weeks (located below the scapulas and above the cleft of the buttocks) were randomly allocated to Pilates group or control group. Individuals were included if they had back pain of a non-specific nature (as defined by European Guidelines for management of chronic low back pain). Additional criteria for inclusion and exclusion is given in Table 1.

Pilates was applied as an additional intervention to their current drug treatment, including analgesics with both groups encouraged to make no changes to their normal exercise or activities. Participants were not undergoing regular physiotherapy or osteotherapy during the time of the study.

Intervention

The intervention period lasted for six weeks. The control group continued with their normal activities and pain relief. The Pilates group performed six one-hour classes of Pilates exercise (maximum class size = 12), one class per week. The Pilates exercise program was taught by a certified Pilates Institute Instructor. In the first class, the basic principles of Pilates were explained and a handout was provided to participants for home reading. Basic principles were reiterated at the beginning of every class throughout the intervention period with an increasing portfolio of relevant Pilates techniques (Figure 1). In each one hour class, an educational aspect was provided followed by specific modified Pilates exercises (Table 2). Educational aspects included posture check (including neutral spine and pelvis), recruitment of “core muscles,” and encouragement not to substitute from global muscles; all aspects were completed during controlled breathing. The exercises were “cued” by appropriate verbal instructions given by the instructor. All exercises (Table 2) started at the base level and were progressed by incorporating limb movement, when participants were able to maintain control of the spine. Additional exercises were also added during each session. All participants progressed at same rate; however, participants were advised not to exceed a comfortable range of movement. The participants were advised not to work through any pain or discomfort and they were advised to inform the instructor if they experienced any pain during the exercises or if they found any exercise too challenging. If necessary, selected exercises were modified by decreasing lever lengths for any individual participants who found the particular exercise too challenging to enable participant to maintain neutral spine. Furthermore, if the participant felt loss of control for a movement they were advised to go back to a base position for that particular exercise.
<table>
<thead>
<tr>
<th><strong>Inclusion</strong></th>
<th><strong>Exclusion</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Low back pain chronic for at least 12 weeks not attributable to any specific</td>
<td>Back pain attributed to any specific pathology: eg, disc herniation, tumor, infection or fracture, osteoporosis, structural deformity, inflammatory disorder, radicular syndrome, or cauda equina.</td>
</tr>
<tr>
<td>pathology (see exclusions) located below the scapulas and above the cleft of</td>
<td>Patient is unable to walk without a walking aid.</td>
</tr>
<tr>
<td>the buttocks.</td>
<td>Patient already involved in regular Pilates classes.</td>
</tr>
<tr>
<td>Patient is able to travel independently.</td>
<td>Constant or severe back pain judged on clinical grounds due to nerve root irritation.</td>
</tr>
<tr>
<td>Age between 18 and 60 years old.</td>
<td>Major surgery within the past year.</td>
</tr>
<tr>
<td>Patient is otherwise medically fit to perform physical training.</td>
<td></td>
</tr>
<tr>
<td>Able to consent and understands what study entails.</td>
<td></td>
</tr>
</tbody>
</table>
The modified side kick: Side lying legs straight, one hand in front to support.
Progression: remove support hand, lift legs, move top leg forward and back to centre.
The modified one leg stretch: Crook lying, slide one leg away as far as possible and then return to start position.
The modified shoulder bridge: Crook lying, “peeling” the bottom off the mat.
Progression: Increase the range of movement (more of the spine away from the mat).
The hundred (base level modification): Crook lying, lifting one leg with knee above the hip and shin parallel to the floor. Repeat on other leg.
Swimming (a modification from a four point base): Box position, slide one foot along the floor behind, return to the start position. Repeat on other leg.
Modified swan dive: Prone position (keep hands and forearms in contact with the floor). Gently lengthen the thoracic spine allowing the upper part of the chest to lift off the floor.
Modified roll up: Starting in a seated position with knees bent with hands behind thighs. Begin with a pelvic tilt and small ROM, gradually increasing the range of movement of back.
Modified spine twist: Sitting position, individual comfortable position, arms folded, trunk turning while pelvis is kept square and forward facing. Alternate direction.
Double arm stretch: Crook lying, raise both arms toward the ceiling and with both arms make small circle, reverse the circle. Progression: increase circle size.
Modified one leg circle: Crook lying, lift knee over hip. Hand on knee to guide, small circle motion from the hip. Reverse circling. Repeat on other leg. Progression: increase circle size.

Figure 1 — A description of exercises used in Pilates classes.

The exercises taught within a class were also repeated individually during two 30 minute sessions each week performed at home without supervision. No progression of exercises was made during home sessions. Compliance with home based exercises was recorded in a diary.

Outcome Measures

In a recent review assessing studies that investigated the effectiveness of rehabilitation therapy for back pain, the authors only reviewed studies that included at least one of the following primary outcome measures: (1) pain visual analogue scale, (2) subjective improvement of symptoms, (3) an assessment of back-specific functional status, and (4) return to work status. In our study, three out of the above four measures were included. Return to work statistics were not included in our study as no participants were currently off work. Furthermore, we also included functional measures including lower back flexibility, generic functional status (SF-12), and proprioception, which were also deemed to be important for assessing effectiveness of rehabilitation programs.

Pre and post the six weeks intervention, a questionnaire-based assessment (incorporating the measures above) and a functional assessment were performed by an assessor blinded to the allocation of individuals to the two groups.

Pain. A Roland Morris pain rating visual analogue scale (RMVAS), which is a generally accepted outcome measure, was used to assess pain on day of
Table 2  Content of Pilates Classes

<table>
<thead>
<tr>
<th>Week</th>
<th>Educational</th>
<th>Exercise</th>
</tr>
</thead>
</table>
| 1    | Posture check  
Lateral thoracic breathing  
Neutral spine and pelvis  
Recruitment of *transversus abdominis* or pelvic floor  
Enforcement of Pilates principles  
Encouragement not to substitute from global muscles | Side Kick, One Leg Stretch,  
Shoulder Bridge  |
| 2    | As week 1                                                                   | As week 1 plus: The Hundred                                               |
| 3    | As week 1                                                                   | As week 2 plus: progression of exercises                                 |
| 4, 5, 6 | As week 1 plus:  
Encouragement of flowing movements executed with precision & control | As week 3 plus: progression and exercises:  
Swimming, Swan Dive, Roll Up,  
Spine Twist, Double Arm Stretch,  
One Leg circle  |

The educational aspect was provided followed by the exercises. Throughout each exercise the educational aspects were applied and reinforced. All exercises started at base level and progressed to include limb movement. The exercises were “cued” by appropriate verbal instructions. Each of the exercises are modified from the original Pilates techniques in accordance with the Pilates Institute training manual. These exercises were also repeated during 2 additional sessions each week, which were performed at home (approximately 20 minutes per session).

pre- and post-intervention testing. Further, as multiple measures of pain intensity over time have been shown to give a better indication of daily pain patterns and thus improve the reliability and validity of pain assessment, all participants were asked to complete daily pain diaries throughout the intervention period. The pain diary comprised of the RMV AS. Participants were instructed to estimate the pain score at the end of each day and to reflect on the levels of pain for that day. A decrease in RMV AS score is considered to be a positive improvement. Reliability for RMVAS is 0.91.

**Back-Specific Functional Status.** The Oswestry Low-Back Pain Disability Questionnaire (OSWDQ) was used to assess the limitation of various daily living activities. A decrease in the OSWDQ score is considered to be a positive improvement. Reliability of this questionnaire is 0.99.

**General Functional Status.** The SF-12 was used as a simple generic measure of health. Subdomains within the questionnaire were analyzed separately and included general health, physical functioning, role functioning, social functioning, health perception, and bodily pain. An increase in any of the subdomains of the SF-12 score is considered to be a positive improvement apart from bodily pain where a decrease is an improvement. Reliability for SF-12 is 0.89.

**Subjective Improvement (Identity).** A symptom report was used to give an indication of subjective improvement in back pain related symptoms, including pain,
soreness, stiffness, and discomfort during different functional movements including walking, sitting, lifting, and sleeping. A decrease in subjective score is considered to be a positive improvement. Reliability for subjective improvement is 0.81.

**Sports Functioning.** Additionally, a brief sports functioning questionnaire was administered to determine whether the participants could do more vigorous physical activity following the intervention period. An increase in sports functioning score is considered to be a positive improvement. Reliability and validity for sports functioning are 0.91 and 0.76, respectively.

**Physiological Functional Performance**

The *stork stand* test was used to assess one footed static balance, as it is an easy to perform measure with high reliability (0.87) and validity (0.99) values. Participants were instructed to first stand with their right foot on the floor and left foot on the inside of the supporting knee with hands on hips. Participants were then asked to close their eyes. Balance was maintained for as long as possible without moving the foot from its original position on the floor, putting the other foot on the floor, opening the eyes, using trunk movements, or removing their hands from the hips. Balance time was recorded in seconds. The procedure was then repeated with the left foot on the floor. Three trials were given for each leg; the time of the longest balance for each leg was recorded and these two values were summed together.

A *sit-and-reach test* using a sit-and-reach box (Cranlea Medical Electronics, Birmingham, UK) was performed in accordance with American College of Sports Medicine guidelines. It was used to assess the flexibility of the hamstrings and additionally a small amount of lower back flexibility. Reliability values are high (0.94).

A daily diary was completed by the participants in which the participants were asked to record their attendance of Pilates sessions, participation in home-based Pilates exercises as well as supplementary information on treatment, pain relief, and additional exercise.

**Statistical Analysis**

Data are expressed as mean (standard deviation, SD). Data were tested for normality using Kolmogorov-Smirnov. Data were found not to be normally distributed in the majority of cases and therefore non-parametric tests were performed. Wilcoxon sign ranked tests were used to identify any significant changes pre- and post-intervention within each group. Differences in baseline data and post-intervention changes between the groups were analyzed using either Mann-Whitney U or Chi-squared. Analysis was carried out using the statistical package SPSS for windows version 11.5. Statistical significance was at the $P < 0.05$ level. All values are given as two-tailed.

**Results**

A total of 49 individuals were recruited for the study. Twenty-five participants were allocated to the Pilates group and 24 to the control group. However, 15 participants did not complete the trial, which included 10 participants from the control group
who did not attend for post-tests despite numerous reminders. The further five participants were in the Pilates group, who were unable to attend the Pilates sessions at the allocated time due to other commitments. Two of these participants attempted to attend sessions but only made 4 out of the 6 sessions and were therefore withdrawn from the trial.

Thirty-four participants completed all aspects of the trial with 20 in Pilates group and 14 in the control group (Table 3) and are therefore used in the statistical analysis. No significant differences were found between control group and Pilates group in baseline data for duration of back pain or measured physical characteristics (height and weight; Table 3). Despite randomization, age was found to be significantly different between the groups ($P < 0.05$) with age being greater in the control group compared to the Pilates group.

There were no significant differences, however, between the groups of the percentage of participants that were male, partaking in regular physical activity, or taking analgesics (Table 3). Further, no significant differences were found in the baseline measures of functional testing or the questionnaire based data. The type of analgesic was similar in both groups pre- and post-intervention including ibuprofen, paracetamol, aspirin, co-proxamol, codeine, diclofenac, and co-codamol. Over 60% of all the participants took part in regular physical activity, which included aerobics, swimming, gym work, cycling, golf, and walking.

Pain and daily diaries were completed well with a full set of information for all days of the study from the 34 participants that returned for post-testing, apart from one participant from the control group who returned an incomplete diary. The attendance of classes by the Pilates group was excellent with an overall attendance of 16/20 participants attending all sessions, and 4/20 participants missing one session. However, these four participants completed an additional session at home in the week they missed a class. As determined from the diaries, the compliance of participation in home exercises by the Pilates group was high with an overall percentage participation of 90% of individuals completing two home-based sessions per week and all of the participants in the Pilates group completing at least one home-based session per week.

### Table 3  Baseline Data for All Participants Who Completed the Trial

<table>
<thead>
<tr>
<th></th>
<th>All participants</th>
<th>Control group</th>
<th>Pilates group</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>34</td>
<td>14</td>
<td>20</td>
</tr>
<tr>
<td>Age (yrs)</td>
<td>40.6 (9.7)</td>
<td>45.9 (8.0)</td>
<td>36.9 (8.1)*</td>
</tr>
<tr>
<td>Pain duration (yrs)</td>
<td>10.4 (10.1)</td>
<td>11.6 (12.3)</td>
<td>9.6 (8.4)</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>166.1 (7.8)</td>
<td>168.6 (9.2)</td>
<td>164.5 (6.2)</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>73.3 (14.9)</td>
<td>79.2 (19.3)</td>
<td>69.2 (9.2)</td>
</tr>
<tr>
<td>% male</td>
<td>21</td>
<td>29</td>
<td>15</td>
</tr>
<tr>
<td>% currently taking analgesics</td>
<td>68</td>
<td>71</td>
<td>65</td>
</tr>
<tr>
<td>% taking regular exercise</td>
<td>62</td>
<td>64</td>
<td>60</td>
</tr>
</tbody>
</table>

Control group and Pilates group data are provided as Mean (Stdev) or as % of group.

*significant difference between groups.
In the Pilates group, when comparing pre- and post-intervention questionnaire based data, significant increases were revealed in general health (SF-12) and sports functioning, with a significant decrease in pain (RMVAS; all \( P < 0.05 \); Table 4). Furthermore, in the Pilates group the averaged daily pain scores of week 1 and week 6 (also measured using RMVAS on a daily basis) showed a significant decrease following Pilates intervention of 0.5 points in the Pilates group \( (P < 0.05; \) Table 4). Additionally, when compared to the control group, the decrease following the intervention period was significant between the two groups.

In the control group, the questionnaire based data showed no significant differences following the intervention period when compared to baseline apart from the OSWDQ. A significant decrease of six points \( (P < 0.05) \) was found (Table 4). Additionally, when compared to the Pilates group, the decrease following the intervention period was also significant with a greater decrease in the control group \( (P < 0.05; \) Table 4).

In the Pilates group, additional increases were 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 \( (P < 0.05; \) Table 5). Meanwhile, in the control group, no significant differences following intervention period compared to baseline were seen in these physiological functional measures. When the two groups were compared, however, a significant difference was found in flexibility \( (P < 0.05) \) with a greater increase in the flexibility of the Pilates group compared to controls (Table 5).

### Table 4 Questionnaire Based Data Before and After the Intervention Period

<table>
<thead>
<tr>
<th></th>
<th>Control group</th>
<th>Pilates group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before</td>
<td>After</td>
</tr>
<tr>
<td>RMVAS</td>
<td>2.4 (0.9)</td>
<td>2.4 (0.8)</td>
</tr>
<tr>
<td>OSWDQ</td>
<td>24.1 (13.4)</td>
<td>18.1 (13.0)(^b)</td>
</tr>
<tr>
<td>Symptom report</td>
<td>2.3 (0.5)</td>
<td>2.3 (0.6)</td>
</tr>
<tr>
<td>General health</td>
<td>3.4 (0.9)</td>
<td>3.6 (1.0)</td>
</tr>
<tr>
<td>Physical functioning</td>
<td>3.1 (0.5)</td>
<td>3.1 (0.5)</td>
</tr>
<tr>
<td>Role functioning</td>
<td>3.0 (0.8)</td>
<td>3.0 (0.7)</td>
</tr>
<tr>
<td>Social functioning</td>
<td>3.4 (0.6)</td>
<td>3.4 (0.6)</td>
</tr>
<tr>
<td>Bodily pain</td>
<td>3.9 (0.9)</td>
<td>3.9 (0.8)</td>
</tr>
<tr>
<td>Health perception</td>
<td>2.8 (0.7)</td>
<td>2.8 (0.7)</td>
</tr>
<tr>
<td>Sports Functioning</td>
<td>2.8 (0.8)</td>
<td>2.9 (0.7)</td>
</tr>
<tr>
<td>Pain Diary</td>
<td>2.3 (0.7)</td>
<td>2.4 (0.9)</td>
</tr>
</tbody>
</table>

Values are given as Mean(Stdev)

\(^a\) indicates significant difference \( (P < 0.05) \) within Pilates group before and after intervention.

\(^b\) indicates significant difference \( (P < 0.05) \) within Control group before and after intervention

\(^c\) indicates significant difference \( (P < 0.05) \) between groups for the change post-intervention.
Rehabilitation of Back Pain With Pilates

This is the first study to evaluate Pilates as a specific functional exercise therapy for back pain. The findings from the present study indicate that a program of modified Pilates exercises can help to decrease pain (daily pain and pain on day of administration of questionnaires) in individuals with long standing low back pain to a greater extent than those individuals with no intervention. Furthermore, Pilates exercises can improve overall general health and increase proprioceptive balance and flexibility in participants with chronic non-specific low back pain. Additionally, sports functioning was improved. These improvements are observed despite the study being performed on already active individuals, indicating that the specificity of Pilates is important.

Previous work has demonstrated that weakness and atrophy of the “core muscles” (MF and TA) is usually present in patients with chronic low back pain. However, more recently it has been proposed that this is caused by impaired motor control rather than lack of use leading to abnormal spine movements caused by decreased proprioception and a decrease in precision of muscle coordination.

Exercise therapy in most cases has been shown to have a positive therapeutic effect and is recommended by United Kingdom Department of Health, although no specific guidelines are given to what type of exercise should be used. Some studies recommend that a general exercise class is beneficial, whereas others suggest that additional resistance training using body weight is most appropriate, whereas others recommend more specific static strengthening of “core muscles” and spinal stabilization. As Pilates encompasses core stabilization exercises that are not only static but also involve dynamic functional strengthening movements, this type of activity was proposed as a mode of intervention in the present study.

Adherence to classes and home-based exercises was comparable with other trials. In the Pilates group, out of 25 individuals who started the study, 20 completed all aspects of it, including pre- and post-testing, attendance of Pilates classes, Pilates sessions at home, and completion of diaries. Three participants were removed at the start of the study as they were unable to attend Pilates classes due to other commitments at the times the Pilates classes were being

Table 5  Physiological Performance Data Before and After the Intervention Period

<table>
<thead>
<tr>
<th></th>
<th>Control group</th>
<th>Pilates group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before</td>
<td>After</td>
</tr>
<tr>
<td>Flexibility (cm)</td>
<td>10.3 (9.7)</td>
<td>11.1 (9.6)</td>
</tr>
<tr>
<td>Proprioception (s)</td>
<td>22.1 (22.8)</td>
<td>23.1 (27.7)</td>
</tr>
</tbody>
</table>

Values are given as Mean(Stdev)

* indicates significant difference (P < 0.05) within the Pilates group before and after intervention.

* indicates significant difference (P < 0.05) between groups for the change post-intervention.

Comments

This is the first study to evaluate Pilates as a specific functional exercise therapy for back pain. The findings from the present study indicate that a program of modified Pilates exercises can help to decrease pain (daily pain and pain on day of administration of questionnaires) in individuals with long standing low back pain to a greater extent than those individuals with no intervention. Furthermore, Pilates exercises can improve overall general health and increase proprioceptive balance and flexibility in participants with chronic non-specific low back pain. Additionally, sports functioning was improved. These improvements are observed despite the study being performed on already active individuals, indicating that the specificity of Pilates is important.

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Exercise therapy in most cases has been shown to have a positive therapeutic effect and is recommended by United Kingdom Department of Health, although no specific guidelines are given to what type of exercise should be used. Some studies recommend that a general exercise class is beneficial, whereas others suggest that additional resistance training using body weight is most appropriate, whereas others recommend more specific static strengthening of “core muscles” and spinal stabilization. As Pilates encompasses core stabilization exercises that are not only static but also involve dynamic functional strengthening movements, this type of activity was proposed as a mode of intervention in the present study.

Adherence to classes and home-based exercises was comparable with other trials. In the Pilates group, out of 25 individuals who started the study, 20 completed all aspects of it, including pre- and post-testing, attendance of Pilates classes, Pilates sessions at home, and completion of diaries. Three participants were removed at the start of the study as they were unable to attend Pilates classes due to other commitments at the times the Pilates classes were being
run. Additionally, two further participants were removed as they only attended 4 out of the six sessions. In the control group, who needed to attend only the two testing sessions pre- and post- intervention, the drop-out rate was higher with 10 individuals not returning for post- testing.

Despite all the participants suffering with back pain for years rather than months, they all only reported moderate functional disability as indicated by baseline Oswestry scores and moderate pain levels. Nevertheless, pain levels were significantly decreased in the Pilates group following intervention. However, no significant decrease was seen using a bodily pain scale (SF-12) possibly due to differences in the scaling of the question. The participants in the current study were self-referred to the study and it may be more appropriate to describe them with functional limitations rather than disability. Oswestry is one of the most common tool for assessing functional disability and has good reliability scores. Despite it being accepted by van Tulder and colleagues as an appropriate measure for back pain patients, in our group of participants, it may not be sensitive enough to determine changes in those individuals with very mild disability or slight functional limitations. Although functional disability was low in our two groups, our participants did significantly improve in several functional measures and in pain scores. Certainly in future studies, patients with a higher level of functional disability should be used. Evidence that participants in the present study had low levels of disability despite their back pain was that 62% of the participants participated in regular physical activity.

The age between groups was statistically significant; however, both groups dominantly contained participants within the age group that has the highest prevalence of low back pain. Although the control group suffered with back pain for two years longer than the Pilates group, this finding was not statistically significant. Furthermore, this study involved individuals with long-standing back pain with an average length of pain duration of 10 years and other studies have shown that in back pain after three months of pain, disability, levels of pain, and return to work remained constant.

In our study, it is difficult to determine if the positive gains were solely dependent on Pilates rather than other aspects of the intervention. The control group members were still active during this time, and therefore it appears that therapeutic exercise needs to be more specific than general physical activity.

The main aim of the study was to investigate if individuals improved due to the intervention, and as individuals improve at different rates, a within group analysis was performed to determine the significant differences after the intervention period compared to baseline values. However, findings from the present study should be interpreted with caution as individuals respond to differing extents to the Pilates intervention, but this will be typical of any back pain population and any intervention. Nevertheless, despite the large variation in data for each individual, the data for each group at the start of the study were found to be similar. The study is limited by the modest number of participants who completed the study and the imbalance of the number of participants in the two groups due to higher drop out rate from the control group.

In conclusion, the current study is 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. Additionally, Pilates can improve general health, pain level, flexibility, and proprioception and sports functioning in individuals with chronic low back pain.

The Pilates used in the current study is likely to be beneficial for back pain as it uses functional static-dynamic resistance exercise to aid “core muscle” strengthening and endurance and to improve sensory motor control of the trunk and additional limb movement. Pilates is a whole body exercise that seems to encompass biological, educational, and psychological aspects including coping strategies and social components, all of which are important factors in improving back pain.

References


