Effects of Pilate Mat Exercises on Agility and Flexibility of Athletes - A Pilot Study

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Abstract:

Background-Athletes are always looking for ways to get better at what they do and get hurt less frequently. Movement efficiency and total physical capability are influenced by flexibility and agility, which are essential elements of athletic success. Pilates mat movements have a reputation for enhancing body awareness, flexibility, and core strength. Despite its growing popularity, the impact of incorporating Pilates into athletes’ training routines, particularly concerning flexibility and agility, remains largely unexplored.

Objective-The purpose of this study was to evaluate the agility and flexibility of athletes who included Pilates mat movements in their training regimen to a control group who continued with their regular training regimen.

Methods-Two groups, Group A (experimental) and Group B (control), each with fifteen participants, were randomly selected from among the thirty participants. Group B adhered to their regular training program without making any alterations, Group A engaged in Pilates mat exercises three days per week for six weeks, following informed consent obtained from each participant prior to the intervention. Agility and flexibility were assessed using the 4 x 10-meter shuttle run test and the sit and reach test before and after a six-week intervention period.

Results and Conclusion-Compared to Group B, Group A showed noticeably greater flexibility and agility after the intervention. With a standard deviation of improvement of 2.90, the experimental group (Group A) demonstrated an average improvement in the sit and reach test score from 21.5 to 27.7. Group B, the control group, saw very little improvement; mean scores varied greatly, going from 22.18 to 22.20. Group A’s mean time in the 4 x 10-meter shuttle run test increased from 23.3 to 21, while Group B’s mean time only marginally improved from 21.53 to 22.07. These results imply that adding Pilates mat exercises to athletes’ training regimens can increase their flexibility and agility, which may help them perform better on the field and avoid injuries. To confirm these results and investigate the long-term advantages of Pilates for athletes, more studies with bigger sample numbers and longer intervention times are necessary.

Keywords: Pilates exercises; athletes; agility; flexibility; sport performance.
Introduction:

Background: According to Pilates, achieving a state of health and happiness requires a balance between the body and the mind. Pilates asserts that Contrology eases mental tension and increases mental stimulation. The Pilates training method is built on six fundamental principles centering (focusing on engaging the core muscles), concentration (maintaining mental focus during exercises), control (managing posture throughout the exercise), precision (executing techniques accurately), flow (smooth transitions between movements), and synchronized breathing with each exercise. Pilates improves balance, posture, core strength, and peripheral mobility, all of which can contribute to better athletic performance. Pilates’ primary goal is to reorganize the breath, body, and mind to develop lean, powerful abdominal muscles and a flexible, strong back. It builds posture and balance, strengthens the core muscles, increases body awareness, reduces the risk of injury, and makes daily movement more comfortable. Pilates places equal emphasis on mental and physical conditioning. Over the past 20 years, Pilates has been employed for rehabilitation purposes on a growing number of occasions. Pilates uses a combination of over 50 simple, repeated sports movements to induce muscle exertion, while there are notable differences. Proponents of this exercise device claim that workouts may be modified to provide either a mild strength training program for injury recovery or an intense workout that is hard enough to challenge professional athletes.

Need of the Study:

It has been discovered that Pilates significantly improves balance [3]. The authors stressed that Pilates' capacity to strengthen the lower extremities and promote core stability was the reason for this improvement. A 12-week program targeting the core muscles of athletes led to notable enhancements in their long jump, push-up, standing, shuttle, balance, speed, and vertical leap. Players' physical and motor development will benefit from core training since it significantly increases the strength of both major and minor muscles. The goal of this study is to increase athletes’ flexibility and agility by including Pilates mat workouts.

Methodology:

Study Design: Experimental design with a group 30 members, who performed Pilate mat exercise for 6 weeks.

Source of data: Athletes performing in Jaypee pee and Vijay Singh Pathic sports academy

Definition of Study Subjects: Athletes, who are active in sports and practice on regular basis

Selection Criteria: The following points were considered for Including the sample information in the present study.

1. Athletes practicing in Samrat Mihir Bhoj Stadium
2. Age 18-30yrs

Exclusion Criteria: The following points were considered for excluding the sample information in the present study.

1. Athletes who have undergone some surgeries
2. Gymnast
3. Athletes involved in any other flexibility training program like yoga, Zumba etc.
Sample design:
The study's participants were chosen using simple random selection in accordance with the inclusion and exclusion criteria. There will be two stages to data collection. During the initial stage, 4×10-meter shuttle runs, and sit-and-reach tests were used to evaluate the participants' agility and flexibility. The participants engaged in six weeks of exercise during the second phase.

Follow Up:
After six weeks, the participants took another sit-and-run test as well as four shuttle runs of ten meters.

Parameters used for comparison and statistical analysis used:
4×10 meters’ shuttle run test:
4x10 m shuttle run test have test-retest reliability of 0.84.

Sit and reach test
Ayala et al. (2011) demonstrated that the sit and reach test had satisfactory reproducibility, with a coefficient of variation (CV) of 8.74% and an intraclass correlation coefficient (ICC) of 0.92.

Duration of study: 6 weeks

Methodology/Plan of Work:
The study included thirty participants, who were divided into two groups, A and B, with each group consisting of fifteen participants. The experimental group is called Group A who performed Pilate mat exercises along with their training and Group B carried on with their usual training schedule. Before the protocol was implemented, each participant signed an informed consent form. The athletes' agility and flexibility were then evaluated utilizing the sit-and-reach and 4 x 10-meter shuttle run tests. Following an evaluation of their flexibility and agility, group A participants underwent an exercise program. In addition to their training, they did Pilates mat exercises three days a week for six weeks. Group B's training remained unchanged, and they stuck to their prior exercise regimen. Over the next six weeks, the group participated in sit-and-reach tests and 4 x 10-meter shuttle run tests to assess their flexibility and agility. Flexibility and agility were compared before and after the intervention of Pilates mat exercises.

Training Protocol
Each training session lasts for sixty minutes. The Pilates mat exercises consist of three days a week of five-minute warm-ups and cool-downs. A 6-week Pilates mat workout regimen created by research experts is adhered to by the Pilates exercise group. Six to eight weeks of Pilates instruction have been shown to improve both physical and mental health. We recommend a 6-week regimen in this trial to show efficacy as soon as possible. Benefiting from joint support and coordination, the exercises are done in a group setting and under the guidance of a physiotherapist.
Data Analysis:

- Descriptive statistics summarized participant characteristics and baseline measures of agility and flexibility.
- Paired t-tests or their non-parametric equivalents compared pre- and post-intervention outcomes within each group.
- Independent samples t-tests were employed to compare changes in agility and flexibility between Group A and Group B.
- Statistical significance was determined at p < 0.05.

Result:

<table>
<thead>
<tr>
<th>Phase I (I &amp; II week)</th>
<th>Phase II (III &amp; IV week)</th>
<th>Phase III (V &amp; VI week)</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pelvic curl</td>
<td>Pelvic curl</td>
<td>Pelvic curl</td>
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<tr>
<td>Chest lift</td>
<td>Chest lift</td>
<td>Chest lift</td>
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</tr>
<tr>
<td>Leg circles</td>
<td>Leg circles</td>
<td>Leg circles</td>
<td></td>
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<tr>
<td>Single leg stretch</td>
<td>Single leg stretch</td>
<td>Single leg stretch</td>
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</tr>
<tr>
<td>Hundreds Crunches</td>
<td>Hundreds Crunches</td>
<td>Hundreds Crunches</td>
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<tr>
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<tr>
<td>Double-leg stretch</td>
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<tr>
<td>Criss-cross</td>
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</tr>
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</table>

<table>
<thead>
<tr>
<th>CONTROL PRE4SRT2</th>
<th>CONTROL POST4SRT2</th>
<th>EXP PRE 4SRT1</th>
<th>EXP POST 4SRT1</th>
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<tbody>
<tr>
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<td>21.53</td>
<td>22.07</td>
<td>23.3</td>
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<tr>
<td>Standard Deviation:</td>
<td>1.24</td>
<td>2.27</td>
<td>1.431</td>
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**Table 1:** Comparison Between Mean and Standard Deviation of 4x10 Meters Shuttle Run Score of Experimental Group A And Controlled Group B Pertest and Post Test.
**Chart-1** Comparison Between Mean and Standard Deviation of 4 X 10 Meters Shuttle Run Score of Controlled Group B

**Chart-2** Comparison Between Mean and Standard Deviation of 4 X 10 Meters Shuttle Run Score of Controlled Group B
Chart 3: Comparison Between Mean and Standard Deviation of 4 x 10 Meters Shuttle Run Score of Experimental and Controlled Group

<table>
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<th>CONTPOSTSRT</th>
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<th>EXP POST</th>
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<td></td>
<td>RT2</td>
<td>2</td>
<td>SRT1</td>
<td>SRT1</td>
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<tr>
<td>Mean:</td>
<td>22.18</td>
<td>22.20</td>
<td>21.5</td>
<td>27.7</td>
</tr>
<tr>
<td>SD:</td>
<td>3.57</td>
<td>3.14</td>
<td>2.14</td>
<td>1.96</td>
</tr>
</tbody>
</table>

Table 2: Comparison Between Mean and Standard Deviation of Sit and Reach Score of Experimental Group A and Controlled Group B

Chart 4: Comparison Between Mean and Standard Deviation of Sit and Reach Score of Experimental Group A
The Sit and Reach Test is a widely used assessment of flexibility, especially for the lower back and hamstrings. The results for the control (CONT) and experimental (EXP) groups are as follows:

**Interpretation:**

1. **Controlled Group (CONT):** The mean improvement for the controlled group is negligible (0.02), indicating almost no change in flexibility. The standard deviation of the improvement (4.75) is quite high, suggesting a lot of variability in the participants' scores.
2. **Experimental Group (EXP):** The experimental group demonstrated a notable enhancement in flexibility, exhibiting a mean increase of 6.2. A lower standard deviation of 2.90 suggests greater uniformity in the observed improvements among participants.

3. **Comparison:** The experimental group had a much greater improvement in flexibility compared to the controlled group, suggesting that the intervention or training they received was effective.

### 4 x 10 Shuttle Run Test
The 4 x 10 Shuttle Run Test measures agility and speed, which are crucial for many sports and physical activities. The results for the controlled (CONT) and experimental (EXP) groups are as follows:

**Interpretation:**

1. **Controlled Group (CONT):** The mean improvement in the controlled group is 0.54, indicating a slight increase in the shuttle run times, which suggests a slight decrease in agility. The increase in standard deviation (from 1.24 to 2.27) suggests that the results became more varied after the test.

2. **Experimental Group (EXP):** The experimental group showed a significant decrease in shuttle run times, with a mean improvement of -2.3, indicating better agility and speed. The decrease in standard deviation (from 1.431 to 0.98) suggests more consistent improvements across participants.

3. **Comparison:** The experimental group had a marked improvement in agility and speed, as evidenced by the decreased shuttle run times, while the controlled group showed a slight deterioration in performance. This indicates that the intervention or training for the experimental group was effective in enhancing their agility.

**Conclusion:**
In summary, the study sought to determine how athletes' agility and flexibility were affected when they added Pilates mat movements to their training regimen in comparison to a control group. Split into two groups of fifteen, Group A performed Pilates mat exercises along with their usual training regimen, while Group B stuck to their usual training schedule. Both agility and flexibility were assessed using the 4 x 10-meter shuttle run test and the sit and reach test before and after a six-week intervention period. Post-intervention comparisons between the Pilates group and the control group revealed significantly higher levels of flexibility and agility in the Pilates group. These results imply that including Pilates mat exercises in athletes' training regimens can help them become more flexible and agile, which may improve their athletic performance and lower their risk of injury. More studies with bigger sample numbers and longer intervention times may provide more light on the long-term advantages of Pilates for athletes. Sports medicine settings are increasingly using Pilates-based rehabilitation programmes to help athletes heal and recover from injuries. Pilates is a useful supplement to conventional physical treatment techniques because it places a strong emphasis on core strength, flexibility, and functional movement. Pilates can help ensure a safe return to sport after an accident by treating underlying movement dysfunctions and encouraging optimal biomechanics.

**References:**
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