



EVALUATION OF MAT PILATES TRAINING ON TRUNK & PELVIS POSTURE, QUALITY OF LIFE & FUNCTIONAL DISABILITY IN CHRONIC LOW BACK PAIN PATIENTS: USING POSTURE ANALYZER SOFTWARE

Physiotherapy

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ABSTRACT

This was a single-blind, randomized clinical trial in which 10 physically active subjects aged between 20 to 40 years with nonspecific chronic low back pain for more than six months were recruited. The study employed a pretest-posttest design, with a 6-week follow-up. For six weeks, the intervention group participated in a group-supervised, mat-based Pilates program. The primary outcome was self-perceived health status measured using the EQ-5D-5L questionnaire in a structured form and posture analyzer software. Secondary outcomes included intensity of pain & degree of disability using EQ-VAS & Roland Morris disability index respectively. The purpose of the study was to investigate & analyze the effectiveness of mat Pilates training on improving trunk & pelvis posture, quality of life & functional disability in chronic low back patients. The findings of the study suggest that the Pilates-based core exercise program is an effective therapeutic modality for improving Posture, functional disability, self-perceived health status in patients with chronic low back pain. This finding could interest clinicians of better alternatives when they suggest exercise interventions for chronic low back pain.

KEYWORDS

Mat Pilates, Posture, Chronic low back pain, Core strengthening, Body alignment

1. INTRODUCTION

Lower back pain (LBP) is a global problem with a lifetime prevalence of 84%. [1]. CLBP is associated with a reduced health-related quality of life (HRQOL) due to the accompanying psychosocial stress, pain, and impairment to vitality and functional status (Due-nas et al., 2016; Husky et al., 2018). Therefore, a valid and reliable HRQOL measure should be considered when evaluating a given intervention for CLBP. Treatment options for chronic low back pain (CLBP) include pharmacologic intervention, physical therapy, therapeutic exercises, acupuncture, and psychosocial interventions (Oliveira et al., 2018; Urits et al., 2019). Unlike pharmacologic treatments and other invasive interventions that have potential side effects, exercises. Pilates is considered safe and often recommended by healthcare professionals (Dreisinger, 2014; Eliks et al., 2019; Gordon and Bloxham, 2016). [4]

Pilates was first introduced by Joseph Pilates in the 1920s. The aim of Pilates concentrates on alignment, lumbopelvic muscle strengthening, and postural correction (Rahimimoghadam et al., 2017). Pilates exercise uses principles of rehabilitation methods such as strengthening of deep core muscles (such as transversus abdominis, multifidus, diaphragm, and pelvic floor muscles) and improving motor control (Eliks et al., 2019). by strengthening the spine-stabilizing musculature and building endurance [3]. In populations with LBP there are promising results of pain reduction and improvement of functional status [2,6].

Modern Pilates practitioners perform in a series of approximately 25–50 simple, repetitive, low-impact flexibility and muscular endurance exercises with an emphasis on muscular exertion in the abdominals, lower back, hips, thighs, and buttocks. The exercises require no equipment, are simple enough for a beginner to be able to master in a relatively short period, and fit well with the guidelines set forth by the American College of Sports Medicine (ACSM) [5]. However the effect of Pilates on health related quality of life (HRQOL) & Posture correction in people living with CLBP has remained poorly elucidated & till date there is lack of both Quantitative and Qualitative reporting of the posture correction by mat Pilates training. Thus in the current study a consolidate outcome measure will be formulated for improvement in posture, quality of life (QOL) & functional disability using posture analyzer software that analyses the standing posture of the patient. Its posture analysis protocol identifies key postural deviations from multiple views & exports all data to a report.

2. MATERIALS AND METHODS

This was a randomized, single-blind, clinical trial, 10 potential candidates for this trial were screened from the Ergowork physiotherapy clinic, India. All candidates visited the outpatient clinics and had been diagnosed with low back pain. A total of 50 potential candidates were retrieved through the initial search, and they were sent questionnaires seeking information regarding their sex, age, duration of low back pain, and the presence of ongoing low back pain.

A total of 30 questionnaires were returned via preliminary enrolment. Of these, 20 were excluded based on the following exclusion criteria: (Fig no. 1).

After the screening for eligibility, 10 of 50 candidates were enrolled in this study. Informed consent was obtained from all participants who passed the secondary screening prior to the trial.

In this study only patients age between 20-40 years having chronic low back persisting more than 6 month ,Patients who consented to participate in the study were included. Patient who are unable to participate in a 6-week long Pilates based exercise program & having low back pain lasting less than 3 months, no low back pain at the time of the study & history of spinal surgery, compression fracture, spondylolisthesis, ongoing pregnancy; or experiencing hypertension, cardiovascular disease, diabetes mellitus, liver disease, renal disease, rheumatoid arthritis, or other rheumatologically related pathologies were excluded.

2.1. Intervention Group

The experimental group performed Pilates for 60 min per session, thrice a week. The entire program lasted 6 weeks, resulting in 18 sessions in total. Each session was composed of three parts: 10 min of warm-up, 40 min of main exercise, and 10 min of rest. The exercise followed the six-movement principles of Pilates. Each movement was repeated 10-15 times for 2 to 3 repetitions. The intensity began at a beginner level and gradually increased over time to minimize the risk of unintended injury to the participants. All exercises aimed to improve breathing, core stability, motor control, posture, and mobility of spine in a neutral position. No extra home program was mandated to the participants. The therapist done an ACE & ACSM internationally certified mat Pilates specialist course.

2.2. Primary Outcome

2.2.1 Trunk & Pelvis Posture

Using posture analyzer software Gait on by Auptimo technologies which analyses the standing posture of the patient. It help in comparing postural deviation with the help of Plumb line. In our research it help to analyze whether there is shift of trunk or tilt in pelvis present or not.

2.2.2. Health-related quality of life (HrQoL)

HrQoL measured through EQ-5D-3L questionnaire

2.3. Secondary Outcomes

2.3.1. Pain

Pain intensity was evaluated using a VAS score. this information provides a direct evaluation of the respondent's current state of health and can be used as a quantitative measure of health outcomes (EuroQoL, 1990).

2.3.2. Degree of disability

To measure disability, the Roland Morris Disability Questionnaire in the Chinese version (RMDQ/RMDQ-TW) was used (Chen et al., 2003; Roland and Morris, 1983).

2.6. Statistical Analysis

This study was performed on an intention-to-treat basis. Statistical analysis was performed using Paired sample 't' test. The difference between the pre & post- test values was taken to be the indicator of progress & was obtained from the progress report generated by posture analysis software, through EQ-5D-5L questionnaire score & RMQ scale score.

Mean & standard deviation were used to prepare summary of descriptive statistical analysis. The significance level was calculated and corresponding level of confidence were determined by noting the p-values at 0.05 level of confidence.

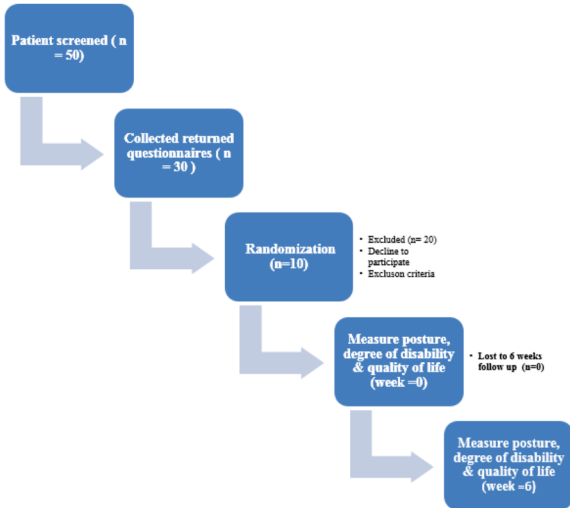


Figure 1 Enrollment Flowchart

3. RESULTS

All 10 patients who fulfilled the eligibility criteria were included in the study. The experimental groups fully completed the study without dropouts throughout 6 weeks of the Pilates program. Table 3.1 displays the social demographic data of the participants.

Demographic data (age, gender & height) of all the subjects was recorded. A between group analysis of mean age, gender & height respectively, shows that there was no significant difference between the group in terms of these variables. There is slight statistical difference in both the groups in terms of weight (p=0.434)

Table 3.1 Demographic Data of Subjects

Variables	GROUP 1 (pre) N = 10	GROUP 2 (post) N = 10
Age (Mean ± SD)	27.70±8.007	27.70±8.007
Gender (female/male)	7/3	7/3
Height (Mean ± SD)	162.04±9.856	162.04±9.85
Weight (Mean ± SD)	57.7± 8.206	57.10± 7.23

The age included a minimum value of 20 years and a maximum value of 40 years which is same in both the group. This analysis show that we are in the inclusion criteria & it also shows that female participants were more in the group regarding to the gender. Thus the baseline characteristics i.e. demographic details of subjects reveals that the two group were similar in terms of age, gender, height but they were not similar with regard to weight. Then the participants were assessed on the basis of posture specifically lateral trunk alignment, horizontal alignment of ASIS, quality of life & functional disability due to chronic back pain.

We analyze the group statistics of pre & post data with its mean, standard deviation and standard mean error with its minimum and maximum values were calculated. (See table 3.2)

Table 3.2 Statistical Analysis of Posture, QOL & Functional Disability within the Group

Variables (Pre-post)	N	Minimum	Maximum	Mean ± SD	Std. error mean
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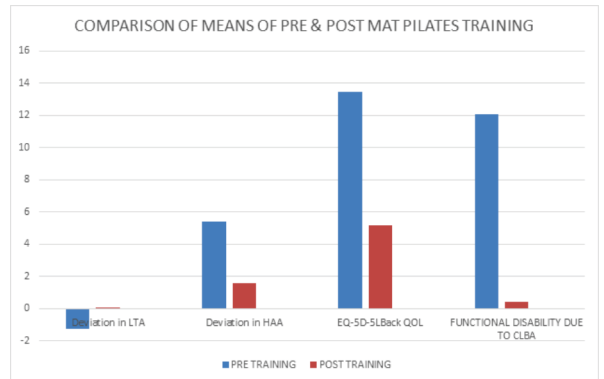
Weight	10	-1.05	2.25	0.60±2.31	0.733
LTA	10	-4.47	1.834	1.32±4.41	1.394
HAA	10	1.77	5.88	3.83±2.87	0.90
RMQ	10	9.61	13.78	11.70±2.90	0.919
EQ-5D-5L	10	6.33	10.267	8.30±2.75	0.869
EQ-VAS	10	-68.2	-49.78	59.0±12.88	4.074

Comparison mean of pre & post data values of posture shows that the posture mean during post training (LTA-0.070±1.643,HAA-1.58±0.921) is higher than pre training in case of LTA(-1.25± 1.576) & lower than pre training in case of HAA(5.41±2.26) after 6 weeks of mat Pilates training. Statistical analysis using related 't' test shows that this difference is statistically highly significant in case of HAA (p=0.002) but not statistically significant in case of LTA (0.369). Comparison mean of pre & post data values of quality of life which was measured by EQ-5D-5L questionnaire shows that the mean value of post- test (5.20±0.421) is lower than pre-test (13.5±2.87) shows that after 6 weeks of mat Pilates training. Statistical analysis using related 't' test shows that this difference is statistically significant (p=0.00). Comparison mean of pre & post data values functional disability which was measured using Roland Morris low back pain & disability questionnaire shows that the mean value of post-test (0.40±0.96) is lower than pre- test (12.10±2.88) after 6 weeks of mat Pilates training. Statistical analysis using related 't' test shows that this difference is statistically significant(p=0.00) (see table 3.3 & Graph 1)

Table 3.3 Comparison of Means of Posture, Disability & QOL of pre & Post Mat Pilates Training

Variable	Pre-training reading Mean ± S.D N=10	Post-training reading Mean ± S.D N=10	Related 't' test	
			t	p
LTA	-1.25± 1.576	0.070±1.643	-0.947	0.369
HAA	5.41±2.26	1.58±0.921	4.219	0.002
RMQ	12.10±2.88	0.40±0.96	12.72	0.00
EQ-5D-5L	13.5±2.87	5.20±0.421	9.542	0.00
EQ-VAS	33.2±14.98	99.2±7.390	-14.4	0.00

Thus, the result of this study shows a significant change in pelvis posture, quality of life & functional disability in individuals having chronic low back pain following 6 weeks mat pilates rehabilitation protocol but did not shows a significant change in trunk posture



Graph 3.1

4. DISCUSSION

This study was conducted in an attempt to know the effectiveness of mat Pilates training on trunk & pelvis posture, quality of life & functional disability. The dependent variables were LTA & HAA on Posture analysis, quality of life on EQ-5D-5L, pain intensity on VAS and functional disability on RMQ.

Our study demonstrated that a 6-week supervised mat Pilates exercise can improve Posture & HRQOL in individuals experiencing CLBP. The finding adds value to the study done by chen-ya yang et.al. Pilates-based core exercise has the potential for broad health implications over other conventional therapeutic exercises when managing CLBP.

Chiarotto et.al reveals that when assessing the trends of pain and HRQOL domains related to physical, mental, emotional, and social functioning by Carlozzi and Tulsy and should not only be integrated as a crucial patient-centered outcome parameter in evaluating treatment efficacy of CLBP treatment (as per Chiarotto et al., Wood-Dauphinee,) but also considered the primary outcome assessment of treatment efficacy Our clinical trial demonstrated the effectiveness of

Pilates exercise in improving trunk & pelvis posture through posture analyser software and HRQOL by assessing EQ-5D -5L & RMQ questionnaire results.

However, only the EQ-5D VAS, and not the EQ-5D value index revealed that Pilates exercise was superior to the usual standard of care. We postulated that the EQ-5D index has a fixed construct defined by the five most common dimensions in healthcare.

The index value is also the result of profiles summarized by the preferences of the general public in a specific country. Conversely, the EQ-5D VAS provides respondents with an opportunity to assess their global health status without being confined to predefined dimensions as per Feng et al., 2014. Focusing on the respondents' values of their health rather than values set by their country of occupancy accommodates the values of everyone.

Our results suggest that Pilates exercise has direct effects on HRQOL & posture in addition to attenuating bodily pain and disability in patients with CLBP.

It is worth noting that the Pilates protocol used in this study did not exacerbate pain or disability or worsen quality of life in the experimental group, demonstrating that this method has no harmful effects on patients. In addition, all of our participants completed the 6-week exercise protocol, thus demonstrating a good adherence rate, which is a paramount factor when considering exercise intervention for CLBP by Argent et al.

Although within each group, the effectiveness of Pilates in improving posture & quality of life occurred in the end of the program. This study demonstrated that in active middle-aged men and women, exposure to Pilates for 6 weeks, three 60-minute sessions per week, was enough to stimulate statistically significant changes in pelvis posture, quality of life & functional disability.

Previous research on Pilates as a way to improve strength, body composition, and flexibility, trunk posture has been somewhat limited. However, studies have shown improvements in pelvis posture, disability & quality of life showing that individuals can engage in simple exercises that require minimal time commitment and equipment and achieve improvements in strength and posture.

Limitations

Blinding of participants and the therapists regarding treatment allocation, participants who chose to volunteer for an exercise treatment, potentially introducing selection bias to the results. We did not observe the patients past 6 weeks; therefore, doesn't know about the long-lasting effects of Pilates-based exercise.

5. CONCLUSION

This clinical trial demonstrated that Pilates-based core exercises effectively improve pelvic posture, functional disability & HRQOL after 6 weeks of mat Pilates training in patients with CLBP but there was no significant patient reported difference in improvement in trunk alignment. Pilates should be considered as a valuable and safe non-pharmacological intervention to improve well-being in those with CLBP & can engage in as simple exercises that require minimal time commitment and equipment and achieve improvements in strength and posture

6. REFERENCES

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