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THE EFFECT OF MAT PILATES IN CORE STRENGTHENING AT COLLEGE LEVEL STUDENTS WITH POOR POSTURE: AN EXPRIMENTAL STUDY

PAREKH D[1], SHAH P[2*] AND PATEL G[3]

1: 2nd year, Master in Physiotherapy, Department of Musculoskeletal and Sports Science, Ahmedabad Physiotherapy College, Parul University, Gujarat, India

2: Assistant Professor, Master's in Musculoskeletal and Sports Science, Ahmedabad Physiotherapy College, Parul University, Gujarat, India; Orchid Id: 0009-0002-1300- 322

3: Principal, Master in Neuroscience, Ahmedabad Physiotherapy College, Parul University, Gujarat, India; Orchid Id: 0000-0002-7741-1786

***Corresponding Author: Dr. Prachi Shah: E Mail: prachi.choksi28194@paruluniversity.ac.in**

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ABSTRACT

Introduction: Poor posture is common among college students due to prolonged sitting and sedentary habits, often linked to weak core musculature. Core stability plays a key role in maintaining spinal alignment and postural control. Mat Pilates, a mind–body exercise method, emphasizes controlled movements, breathing, and deep trunk muscle activation, making it a promising intervention for postural correction and core strength improvement.

Material and methodology: A pre–post experimental study was conducted on college students identified with poor posture. Participants underwent a structured mat Pilates program, three sessions per week for4 weeks. Core strength was assessed using the 60° curl-up test (for abdominal endurance) and the prone bridge test (for trunk stability). Measurements were taken at baseline and after the intervention.

Results: Post-intervention analysis showed significant improvement in both outcome measures. Participants demonstrated greater holding time in the prone bridge test and increased repetitions in the 60° curl-up test, indicating enhanced trunk endurance and stability. Subjective feedback also suggested better awareness of posture and reduced fatigue during academic activities.

Conclusion: Mat Pilates is an effective intervention to improve core strength and postural stability in college students with poor posture. Incorporating Pilates-based core training into regular fitness or academic wellness programs may prevent postural deviations and enhance musculoskeletal health in young adults.

Keywords: Mat Pilates, Core strengthening, Poor posture, 60° curl-up test, Prone bridge test

INTRODUCTION

Poor posture is a common musculoskeletal concern among young adults, especially college-level students, due to prolonged sitting, sedentary lifestyles, and excessive use of electronic devices. Forward head posture, rounded shoulders, and increased thoracic kyphosis are frequently observed, leading to muscular imbalance, back pain, and reduced functional performance **[1]**. Postural problems in young adulthood, if left uncorrected, may predispose individuals to chronic musculoskeletal disorders in later life **[2]**.

Core stability, defined as the ability to control the trunk over the pelvis and legs to allow optimal production, transfer, and control of force and motion, plays a vital role in maintaining correct posture and spinal alignment **[3]**. Weakness of the core musculature is directly linked to poor postural control, decreased balance, and an increased risk of musculoskeletal strain **[4]**.

Pilates, developed by Joseph Pilates, is a form of exercise that emphasizes core strengthening, postural alignment, breathing control, flexibility, and body awareness **[5]**. Mat Pilates, which utilizes body weight without specialized equipment, is a cost-effective and widely accessible method of improving core strength and posture [6]. Previous studies have demonstrated that Pilates interventions improve muscular endurance, trunk stability, and overall postural alignment in both clinical and non-clinical populations **[7, 8]**. However, limited evidence is available focusing specifically on college-level students with poor posture, a population highly vulnerable due to academic demands and lifestyle behaviors.

Core strength assessment is often conducted using the 60° curl-up test, which evaluates

abdominal muscle endurance, and the prone bridge (plank) test, which assesses trunk stability and endurance of anterior core muscles **[9, 10]**. These functional outcome measures are reliable, valid, and widely used in postural and strengthening interventions. Need of the Study is college student population spends prolonged hours in static postures during academic and recreational activities, predisposing them to musculoskeletal dysfunction and poor postural habits. Early intervention strategies focusing on core strengthening and posture correction may prevent the development of chronic pain syndromes and spinal deformities in adulthood.

Mat Pilates is a safe, non-invasive, and cost-effective intervention that can be incorporated into physical education programs for preventive and therapeutic purposes. While studies have reported the general benefits of Pilates, there is a paucity of research examining its direct impact on core strength and postural correction in college students specifically identified with poor posture.

This study is, therefore, needed to provide evidence on the effectiveness of a mat Pilates program in improving core strength and postural alignment, using standardized outcome measures.

MATERIALS AND METHODOLOGY

Study Design: experimental design

Participants

A total of 20 college-level students aged 18–25 years will be recruited using convenient sampling **[11]**.

Inclusion criteria **[12-14]**:

Clinically observable poor posture such as forward head posture, rounded shoulders, or increased thoracic kyphosis, assessed using a standardized postural assessment grid. Students with no prior exposure to structured Pilates training in the past 6 months. Willingness to participate and availability for the 4-week intervention program.

Exclusion criteria **[15-18]**:

History of neurological or musculoskeletal disorders such as scoliosis, severe kyphosis, or lumbar disc herniation. Any previous spinal surgery or acute injury within the last 6 months. Individuals currently undergoing structured exercise or physiotherapy intervention for posture correction.

All participants will provide written informed consent before enrollment, and ethical approval will be obtained from the institutional review board.

Outcome Measures

1. 60° Curl-Up Test **[19-22]**

The 60° curl-up test is widely used to assess abdominal muscle endurance, which is an

essential component of core strength. In this test, the subject lies supine with hips and knees flexed at 90°, feet stabilized, and the trunk supported at a 60° angle from the floor. The participant is asked to maintain the 60° trunk position for as long as possible while keeping arms across the chest. The duration for which the position can be held (measured in seconds) is recorded. This test has been shown to have high reliability and validity for assessing abdominal muscle endurance in both healthy and clinical populations.

Fitness category	Female	Male
Excellent	>25	>32
Satisfactory	15-25	25-35
Needs improvement	<15	<25

2. Prone Bridge (Plank) Test [23-27]

The prone bridge, also known as the plank test, measures anterior core stability and trunk muscle endurance. The participant assumes a prone position with forearms and toes on the ground, maintaining the body in a straight line from head to heels. The subject is instructed to hold the position as long as possible without sagging or lifting the hips. The test ends when the participant can no longer maintain correct alignment. The time (in seconds) is recorded as the endurance score. This test is widely used in sports and rehabilitation due to its simplicity, reliability, and correlation with trunk stability.

Rating	Time
Excellent	>6 mins
Very good	4-6 min
Above average	2-4 min
Average	1-2 min
Below average	30-60 seconds
Poor	15-30 seconds
Very poor	<15 seconds

Intervention [28-37]

A mat Pilates program will be administered to all participants for 4 weeks, with sessions conducted three times per week, each lasting approximately 45 minutes. All sessions will be supervised by a certified Pilates instructor.

- Warm-up (5 minutes): Gentle stretching, breathing awareness, and postural alignment exercises.
- Core strengthening exercises (30 minutes):
- The Hundred – focusing on breathing and abdominal activation.

- Single Leg Stretch and Double Leg Stretch – targeting rectus abdominis and transverse abdominis.
- Spine Stretch Forward – improving spinal mobility and hamstring flexibility.
- Leg Circles – enhancing hip mobility and pelvic control.
- Plank and Side Plank Variations – strengthening anterior and lateral core stabilizers.
- Roll-Up and Roll-Over – improving trunk articulation and spinal control.
- Cool-down (10 minutes): Relaxation, stretching, and controlled breathing to promote recovery.

Progression will be applied by gradually increasing repetitions, hold times, and exercise complexity across the 4 weeks.

Procedure

1. Baseline Assessment: Participants will undergo pre-intervention testing of core strength using the 60° curl-up test and prone bridge test

2. Intervention Phase: Participants will attend 12 supervised mat Pilates sessions (3 times per week for 4 weeks)

3. Post-intervention Assessment: The same outcome measures will be repeated at the end of 6 weeks to evaluate improvements.

STATISTICAL ANALYSIS

Statistical analysis is done using SPSS version 26.

Normality of pre- and post-intervention scores for 60˚ curl up test and prone bridge plank test was assessed using the Shapiro–Wilk test.

Since the data met normality i.e. ($p > 0.05$), paired t-tests were applied to compare pre- and post-intervention values within the group.

Effect sizes were calculated using Cohen's d.

The level of significance was set at $p < 0.05$.

Normality Test Results

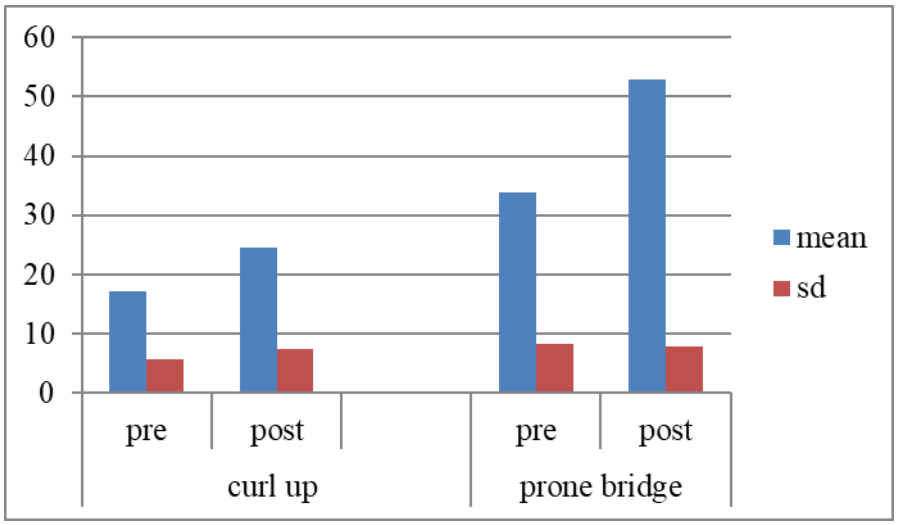
The Shapiro-Wilk test was performed on the difference between the post and pre-training scores. The p-value indicates the probability that the data is normally distributed.

Variable	Shapiro-wilk test	p- value
Curl up test	**0.92**	**0.07**
Prone bridge plank test	**0.96**	**0.45**

For both variables, the p-value is greater than 0.05, which means we cannot reject the null hypothesis that the data is normally distributed. This confirms that it was appropriate to use a paired t-test for the analysis.

The paired t-test was conducted to compare the mean scores before and after the training period.

Variable	Group	Mean ± SD	t-statistics	p-value	Cohen's d
60° curl up test	pre	17.21 ± 5.69	-11.04	<0.001	2.53
	post	24.53 ± 7.34			
Prone bridge plank test	pre	33.95 ± 8.26	-16.01	<0.001	3.67
	post	52.89 ± 7.87			



Graph 1: the above graph represents the values of mean and standard deviation

Curl Up: The paired t-test shows a statistically significant increase in the number of curl ups performed after the training ($p < 0.001$). The mean increase was 10.53 curl ups, with a very large effect size ($d = 2.89$). This suggests the training had a substantial positive impact on the subjects' curl up performance.

Prone Bridge: Similarly, there was a statistically significant increase in the time held for the prone bridge ($p < 0.001$). The mean increase was 18.42 seconds, with a very large effect size ($d = 2.50$). This indicates the training was highly effective in improving core strength endurance.

DISCUSSION

This study aimed to investigate the effect of a mat Pilates intervention on core strengthening and postural improvement, as measured by the 60° curl-up and prone bridge tests, in college-level students with poor posture. The findings demonstrate a statistically significant and substantial improvement in both measures following the training program. The mean number of curl-ups increased from 17.21 to 24.53, while the mean prone bridge hold time increased from 33.95 to 52.89 seconds.

The results of the paired t-test indicate that the improvements were not due to chance

($p<0.001$). Furthermore, the effect sizes, as measured by Cohen's d, were remarkably large for both the curl-up test ($d=2.53$) and the prone bridge test ($d=3.67$). These large effect sizes suggest that the mat Pilates intervention had a major impact on the students' core strength and endurance. These findings are consistent with previous studies that have also reported significant improvements in core muscle function after Pilates-based training programs in young adults **[38, 39]**. The observed improvements likely stem from the core-centric nature of Pilates, which specifically targets deep abdominal and back muscles critical for core stability and posture **[40]**.

A secondary analysis of the data by gender revealed that, on average, male participants had higher pre and post-training scores than female participants for both exercises. However, both groups showed a marked improvement in their scores, suggesting that the training was effective regardless of gender. These findings align with existing literature that often reports baseline performance differences between genders in physical fitness tests **[41]**.

While this study provides strong evidence for the effectiveness of mat Pilates, it is important to acknowledge its limitations. The sample size was relatively small, and the absence of a control group makes it difficult to definitively isolate the effects of the intervention from other variables. Future research should include a larger, more diverse sample and a control group to strengthen the validity and generalizability of the findings. Additionally, a detailed follow-up could be conducted to assess the long-term retention of the strength and postural improvements.

CONCLUSION

The analysis of both the curl-up test and the prone bridge test showed a statistically significant improvement in performance ($p<0.001$). The large effect sizes (Cohen's d) of 2.53 and 3.67 for the curl-up and prone bridge tests, respectively, indicate that the training program had a very substantial positive impact on the participants. While there were baseline and post-training differences between genders, the intervention was effective for all participants. The findings support the hypothesis that mat Pilates can be a valuable tool for core strengthening in this population.

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