



The Effect of Dynamic Pilaplane Exercises on Cardiorespiratory Fitness and Core Strength in First-Year Female Students at the College of Physical Education and Sports Sciences for Women Aged 19–22 Years

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Abstract

Healthy individuals can play a significant role in society. Good health and fitness boost confidence and supply the vitality and motivation needed to perform. In the past, sports have played an important role and are now recognised as a barometer of national growth and advancement. In today's world, sports are increasingly seen as a basis for reform and development, particularly when sports activities are scientifically oriented. There's general agreement about the positive effects of exercise and its impact on health. This recognition has driven a quest for more effective methods of training to tackle contemporary health issues. The Pilaplane Dynamic exercise regimen, which integrates Pilates and plank exercises, is one such approach to address key fitness parameters such as cardiorespiratory and core muscle strength. Safe and overall physical fitness demands participation in a variety of exercises with physiological benefits to the muscular and cardiovascular systems. The effects of Pilaplane Dynamic exercises on enhancing these fitness variables are investigated in this study. This study is significant because it deals with a common problem, a prevalent problem among young adults: the continuous increase in waist circumference, linked to future health problems. The reduction of abdominal fat is a challenge and requires safe and natural approaches with scientific backing. The combined Pilates-plank approach offers a holistic approach to address this problem. The activation of the core muscles and improvement in cardiorespiratory efficiency result in improved posture, strength, and overall health. A combination of exercises was developed, a variety of compound Pilaplane Dynamic exercises, and tested on female university students between 19 and 22 years of age. The researchers found that these exercises have shown considerable effectiveness in enhancing cardiorespiratory function as well as strengthening the core muscle area, and this is a practical solution for young people's health and fitness. and this finding is in line with Sustainable Development Goal 3 (Good Health and Well-Being) of United Nations in Iraq.

Keywords: Pilaplane Dynamic exercises, components of cardiorespiratory fitness, core area.

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Introduction

Bodyweight exercises are one of the most popular types of exercise. These exercises are a basic option, despite their long history, because of their many benefits. They do not require equipment - a small area is needed to carry them out - and can therefore be done anywhere.

These exercises are based on the combination of different strength exercises that require body weight as an alternative to free weights, thus offering resistance that's derived from body weight and gravity. They promote basic movement patterns and comprise a variety of movements with multiple joint actions, leading to gains in muscular strength, flexibility, and endurance.

These exercises are commonly used because of their effectiveness, adaptability, and suitability for all levels of fitness. Notable examples include Pilates, as well as static, dynamic, low, or high plank exercises.

So, does the muscle-building potential of these exercises also have a positive influence on fat reduction, physical conditioning, and body shaping to achieve the perfect measurements? A previous study has shown a relationship between waist and hip circumference, so this is a problem.

The idea for the current study was inspired by a review of the literature, and the question was:

Is it possible to modify and organize these exercises to establish new applications and benefits that have been less investigated in the literature?

As health consciousness increases and health sciences develop in the areas of health and physical fitness, fitness today is defined as the capacity of a person to perform everyday tasks functionally and physically. Samia Khalil highlighted that physical education is a science of health and should be practised within the natural limits of health to promote health and increase physical capacity (Mohammed, 2006).

There have been significant advances in health and fitness over the last few years, from using mobile apps for basic exercises and healthy meal plans to new classes and modalities. Over the years, new and exciting trends continue to emerge that are becoming more integrated into everyday living, which has led to quality of life improvements and influences individuals through the participation and choices they make to enhance their health.

Cardiorespiratory fitness is among the key components that make up an individual's physical activity capacity. This is one of the key goals of sports training interventions (Ahmed, 2021).

The ACSM developed a classification for physical fitness components based on two principles:

1. Health-related components: body conformation, cardiorespiratory fitness, muscular fitness, and flexibility.
2. Performance- or skill-related components: such as speed, agility, coordination, balance, accuracy, etc. To maintain general health, emphasis should be placed on the development of health-related components (Mossa, 2015).

Pilates is considered a type of passive resistance exercise, which typically does not involve special equipment, although the use of some basic tools may be required (Podstawski, 2019).

At times, it might be necessary to add difficulty to the exercise, which leads to increased physical, physiological, and functional adaptations. This is where the importance of an integration



of Pilates with other types of exercise having the same goal but different performance increases, such as dynamic planks.

This combination of both types of exercise results in a newer form of exercise which has been little applied in practice, enabling the merging of the benefits of both types of exercise and achieving more holistic and effective outcomes. According to Moriabadi, the plank exercise is performed with the arms extended in front of the body, inhale, then exhale, and twist the head and upper part of the body to the right. She stressed the need to maintain a flat stomach and to pull the pelvic floor muscles towards the center of the body and upwards (Wahib, Saeed & Shaib, 2016).

Combining dynamic plank exercises and Pilates exercises at their crossroads may offer new insights into physical and health-related adaptations.

This concept formed the basis of the current study after reviewing the literature and recognizing the opportunity of scientifically designed and targeted exercises that may introduce new benefits.

One of the main issues young people are confronted with today, due to lifestyle changes, is a larger circumference of the waist (core) area, which is linked to possible short- and long-term health complications. The challenge is to find a natural and safe method to progressively eliminate fat from this region while keeping a normal relationship between height, weight, waist circumference, and hip circumference. Therefore, the creation of a type of exercise regime incorporating both kinds of exercise may provide a holistic approach. This may improve posture and strengthen the muscles while increasing overall health by scientifically addressing the parts of the body on which fat is likely to accumulate.

The present research also looks at a scientific component that has been overlooked, as it hasn't been considered an independent variable and has not been the subject of detailed research, yet it is highly significant.

When diagnosing and focusing on negative aspects to address them clearly and precisely, it is evident that a problem requiring suitable solutions. Through observation and review of similar previous studies, the researcher raises several questions, these questions guided the structure of the investigation:

- Are dynamic Pilaplane exercises suitable for the study's target group?
- Will these new exercises be effective in reducing core fat and creating noticeable changes?
- Will the time frame allotted for applying these exercises be sufficient to produce statistically significant and observable effects?

The study seeks to design compound Pilaplane Dynamic exercises and to inspect their influence on cardiorespiratory fitness and core endurance among female students aged 19–22.

The researchers hypothesized that statistically important variances would exist between pre-test and post-test outcomes in cardiorespiratory fitness and core muscle endurance for the study sample, which consisted of 16 female students.

The research was carried out from December 11, 2024, to March 25, 2025, in fitness hall of College of Physical Education and Sports Sciences for Women at the University of Baghdad.

Study Scope



- **Human Scope:** Female first-year students at the College of Physical Education and Sport Sciences for Women, University of Baghdad, aged 19-24 years.
- **Spatial Scope:** The fitness facility within the College of Physical Education and Sport Sciences for Women, University of Baghdad.
- **Temporal Scope:** The research period extended from December 11, 2024, to March 25, 2025.

Research Methodology

The research methodology refers to the approach adopted by the researchers to systematically implement the study techniques and obtain objective results. According to Jawad (2011, p. 140), it "relies on experimentation and field testing, guided by tools of observation and experimentation, and based on contemporary scientific methods." Accordingly, the researchers adopted the investigational technique based on a single-collection design, which was considered appropriate for the study's objectives and conditions. Al-Saadaawi (2013, p. 13) indicated that "the sample is the model upon which the researcher bases and focuses the entirety of their work." Thus, research residents were first-year female college students aged 19-22 years with central obesity (fat storage in the abdominal region) at College of Physical Education and Sports Sciences for Women. A sample of 16 pupils was selected, all of whom were centrally obese. All 16 students participated throughout the entire experiment, resulting in a 100% response rate.

Data Collection Tools

The study adopted the following data collection tools: Arabic and international texts, Internet sources, observation, testing and measurement steps, and data extraction forms. In addition, the following equipment was used: a stopwatch, a whistle, a measuring tape, an Acer laptop computer, and a Citizen electronic calculator.

Field Research Procedures

When choosing the variables and tests for the research, it's important to make sure they achieve the research objectives and can be used to measure the variables needed in the sample group. Therefore, researchers designed tests and measurements based on theoretical studies, relevant scientific literature, and expert views. The selected tests are standardized and recognized as reliable instruments in scientific research. Only those tests that achieved an expert agreement rate of 80% or above among the experts were approved for use, while the others were not included.

International Beep Push-Up Test (Podstawski, 2019).

Purpose of the Test: To evaluate core muscular endurance.

Applicable Age Range: 18–25 years.

Performance Procedure and Scoring: The test begins in a standing position with arms extended forward. The participant does a squat, moves into a push-up position, and then returns to initial



location. This sequence is recurrent continuously for three minutes. The total number of completed replications total number of completed repetitions is recorded as the test score.

Queen's College Step Test (Radwan, 1998)

Purpose of the Test: This test is used to measure cardiorespiratory fitness under submaximal conditions using a step exercise.

Required Equipment:

- A step box 15–17 inches in height.
- A stopwatch to measure test duration and pulse rate.
- A metronome to control the stepping pace.

Performance Procedure

Prior to administering test, the examiner demonstrates the correct execution of the step test in front of students. Every student is provided with a single 15-second trial to practice the procedure.

The pupil stands in front of stage box and, after the start signal, begins walking up and down continuously for a total duration of three minutes. At the end of the three-minute period, the examiner signals the end of the test, and the student immediately ceases the activity and remains standing on both feet. Then, a researcher counts the student's pulse for 15 seconds following a short rest period.

Scoring Method: The number of pulses counted in 15 seconds is multiplied by four to give the heart rate.

Pilot Study

The pilot research was carried out by researchers on November 24, 2024, with three female students from study population. The pilot study was conducted to evaluate testing methods and verify them. The purpose of pilot research was to:

1. To calculate appropriateness of exercises for specimen.
2. To determine the suitability and validity of tests for specimen.
3. To ensure suitability of environment for chief study.

The field research was carried out in fitness hall of College of Physical Education and Sport Sciences for Women, which was equipped with all the necessary facilities and resources. The researchers implemented the necessary procedures to ensure the smooth execution of the study. The pre-tests, which were approved by a panel of seven experts in the field, were then carried out. The selection of tests was depended on consensus of the experts, with only those obtaining an agreement rate of 80% or higher being selected (See Appendix 2), as detailed in Table (1). These pre-tests were carried out on November 25, 2024, at 10:00 a.m. in the fitness hall.

Subsequently, researchers conducted the chief field experiment from December 1, 2024, to March 2, 2025. The sessions were conducted twice a week—on Sundays and Mondays—at 11:30 a.m., following the scheduled lecture.



Table 1. Shows the percentage of agreement among experts regarding the identification of health-related fitness components, with those components that received an agreement rate of 75% or higher being adopted by the researcher.

Seq.	Cardiac fitness	Agreement Ratio
1	Cooper Test (9 sec Walking Run)	50%
2	Queens Step Test	87.5%
3	800m running test	25%
4	Systolic and diastolic blood pressure	12.5%
5	Heart rate	12.5%
Strength tolerance for core middle muscles		
6	International Burpee Test (3 minutes)	100%
7	Trunk dynamometer test	12.5%

The proposed Pilates-Plank exercises (see Appendix (1)) were particular by the researchers and designed depended on relevant scientific and academic sources in the field of physical fitness. These exercises were submitted to a panel of experts, whose feedback was taken into account to evaluate the difficulty level and progression of the exercises according to the load mechanism. The exercises considered suitable for the level of the study sample were then selected and approved.

The researchers followed to the following basic principles in implementing the training program :

- Specialized “Pilabblank” exercises were designed specifically for study specimen.
- The training program began on Sunday, December 11, 2024, at 10:00 a.m., and continued until, March 25, 2025.
- The total period of the Pilabblank training program was 12 weeks, with two sessions per week, for a total of 24 training units.
- The Pilabblank exercises were performed during the main part of each training session.
- The duration of each session ranged from 25 to 30 minutes, with the main section approximately 15 and 20 minutes.
- Training sessions were conducted every Sunday and Monday at 10:00 a.m.
- The continuous exercise technique was utilized, with intensity levels ranging from 55% to 75%.
- Looking at Table 2, the training load is fully apparent to us.

Table 2. Load Mechanism

Weeks	Warm Up	Section Main	Section Final	Total Time	Intensity	Determination Of Intensity by Pulse	Rest Between Repetitions
First week	10-7min	Dynamic Pilates-Plank Exercises-15 12min	Relaxation Exercises 5 minutes	25-30min	55%	1-Measurement of resting heart rate 2- Maximum heart rate = 220 – age	Training in a continuous way So, there's no comfort between the repetitions.
Second week	10-7min	15-12min	5min	20-30min	55%		
Third week	10-7min	15-10min	5min	20-30min	60%		
Fourth week	10-7min	15-10min	5min	20-30min	60%		
Fifth week	10-5min	12-8min	5min	20-30min	65%		
Sixth week	10-5min	12-8min	5min	20-30min	65%		
Seventh week	10-5min	12-7min	5min	20-30min	65%		
Eighth week	10-5min	10-7min	5min	20-25min	70%		
Ninth week	10-5min	10-7min	5min	20-25min	70%		
Tenth week	10-5min	8-5min	5min	20-25min	75%		
Eleventh week	10-5min	8-5min	5min	20-25min	75%		
Twelfth week	10-5min	10-7min	5min	20-25min	65%		

The post-tests were carried out on March 25, 2025 in the same fitness hall, below the similar situations as the pre-tests.

Results

Table 3. presents the mean, standard deviation, determined t-value, level of significance, and the variances between pre-test and post-test outcomes for study variables.

Research variables	N	Measurem ent Unit	Pre-test		Post-Test		Value Differe nce	Mean Differe nce	T- Val ue	Statisti cs	Significa nce
			Me an	Standar d Deviati on	Me an	SD ±					
The Bierbauer Test (Core Muscle Strength Endurance)	16	number	30.46	8.1667	34.13	8.219	3.666	1.175	12.08	.000	Significa nt
Queen's Step Test (Cardiorespiratory Fitness)		Pulse	130.2	22.68	125.8	21.45	4.466	7.809	2.215	.044	Significa nt

Discussion

Table (3) displays statistically important variances amid pre-and post-tests in cardiorespiratory fitness and core muscular strength, these improvements may be attributed these improvements to the Pilaplane exercises. These trainings contributed to improving particular study variables. Al-Busati (1998) indicates that "guided sports and physical activities contribute to improving health-related physical fitness and reduce body fat percentage" (p. 361).



This indicates that Pilaplane exercises involve moderate contractions resulting from the work of specific muscle groups over a prolonged period. Their aim is to enhance the efficiency of the respiratory and circulatory systems and to develop aerobic endurance, which in turn improves the heart and cardiorespiratory system's ability to deliver oxygen and nutrients to working cells and tissues, while simultaneously removing waste products resulting from muscular effort (Mohamed, 1997). This indicates the effectiveness of Pilaplane exercises in improving core muscle strength and endurance (Ibraheem, 2022).

In addition, regular and structured exercise improves functional efficiency of body organizations, permitting them to adapt to various physical loads while maintaining energy efficiency (Mohamed, 1997). The adherence of the study specimen to exercise package also may have contributed to improvements in cardiorespiratory fitness, as measured by Queen's Stage Test, and in core muscular endurance.

Guyton also suggests that "the strength of respiratory muscles plays a major role in refilling oxygen stores through inhaling additional amounts of oxygen exceeding the body's needs under normal conditions. "Enjoying good health and high physical fitness means having limitless potential." (Nawaf & Al-Badry. 2024) " Additionally, efforts to reduce fat in certain areas led to an improvement in lung capacity, which enhances cardiorespiratory activity (Podstawski, 2019), although this is also due to the exercises designed by the researchers. The structured training load, the use of time-specific repetitions, and reliance on scientific sources also contributed to these improvements (Radwan, 1998).

Conclusions

Based on presentation, examination and discussion of the pre- and post-test results, researchers concluded following :

1. Dynamic Pilaplane exercises effectively improve cardiorespiratory fitness and strengthen the core muscle region.
2. Training over a reasonable period contributed to muscle balance in the trainees' bodies by varying the involvement of different muscle groups, which activated dormant and weak muscles.

Recommendations

The researchers recommend the following :

1. Applying the dynamic Pilaplane exercises used in this study in physical training centers.
2. Gradual progression in training intensity, starting from light intensity and increasing gradually based on the objective and purpose of the exercise.
3. The necessity of using dynamic Pila Planck exercises in future studies on other samples, including different age groups and both sexes.
4. Developing new exercises that combine two or more types of training in a way that serves the intended goal .

Appendix (1): Pila Planck Exercises



1. Plank to Prone Alternating Arm and Leg Raise

Begin in a traditional plank position. Alternately raise the right arm, then the left, inhaling and exhaling with each repetition. Transition directly into a prone position without pausing. From there, lift the opposite arm and leg, alternating sides continuously.

2. Spider Plank with Prone Transition

From a plank position, bring one knee to the opposite elbow, then extend it back. Alternate knees. Rotate the body into a prone position. Lift and lower the torso using the arms—inhale when lifting, exhale when lowering (10 repetitions). Hold the raised position for 30 seconds.

3. Shoulder Tap Plank with Arm Extension

From the plank position, alternately bend one arm and tap the opposite shoulder (2 repetitions each arm). Without resting, transition to kneeling on all fours, then bend and extend both arms (2 repetitions).

4. Knee Drive Plank with Seated Forward Fold

From a plank with arms shoulder-width apart, drive the left knee toward the chest while inhaling, then return with an exhale. Alternate knees (2 repetitions each). Transition to a cross-legged seated position. Lean the torso forward three times, holding the third lean for 30 seconds.

5. Side Plank Hold with Contralateral Extension

Begin in a plank. Rotate into a right-side plank, supporting with the right hand. Hold for several seconds while inhaling. Return to plank with an exhale, then switch sides. From a kneeling plank, extend the right leg and left arm, maintaining a flat lower back. Hold for 5 seconds and alternate sides.

6. Hip Dip Plank and Supine Trunk Twist

In a forearm plank, tilt the hips to the right until the hip touches the ground. Alternate sides (2 repetitions each) while breathing steadily. Transition to lying on your back, shoulders and head grounded. Rotate the torso right then left (2 repetitions).

7. Reverse Plank with Leg Circles

Sit upright with legs extended, hands on the floor behind you. Lift hips until the body forms a straight line. Hold for several seconds. Transition to lying down, lift the left leg straight and rotate it counterclockwise. Repeat with the right leg.



8. Side Plank with Knee to Elbow and Supine Crunch

From a side plank, bring the left knee toward the right elbow, then switch. Alternate sides (3 repetitions), breathing with each. Lie on your back with hands behind the head and legs raised. Alternately bend and extend the legs, bringing the opposite elbow toward the bent knee.

9. Hip and Leg Lift from Modified Side Plank

Lie on your side with elbow under shoulder and knees bent. Raise the hips, placing the top hand on the waist. Then lie flat with arms and legs extended. Lift the legs straight toward the head, then slowly return to start.

10. Plank with Opposite Arm and Leg Raise and Supine Arm Curl

From a plank, raise one arm and the opposite leg simultaneously. Transition to lying down, arms extended. Inhale and lift the shoulders while rotating arms outward with palms facing in. Exhale, then bend arms to return to start.

11. Leg Raise Plank with Coordinated Breathing

From a plank, alternate leg lifts (3 repetitions). Transition to lying down with head and shoulders lifted, legs held at a 45° angle. Pulse the arms up and down rapidly—inhale for 5 beats, exhale for 5 beats.

12. Rotational Plank with Hip Bridge

From a plank, place heels together and rotate to the left, raising the right arm toward the ceiling to balance. Transition to lying down with knees bent. Slowly lift and lower the hips, inhaling on the way up and exhaling on the way down (2 repetitions).

13. Straight-Leg Lift Plank and Alternating Knee Pull

From a plank, raise the right leg straight, then alternate. Transition to lying down with legs at 45°, head and shoulders lifted. Alternately pull each extended leg toward the chest using both hands.

14. Pike (V) Plank with Leg Raise

From a plank, lift the hips and lower the torso to form an inverted "V." Hold for a few seconds. Lie on your side and lift and lower the top leg, flexing and extending the ankle. Inhale when lifting, exhale when lowering.

15. Kneeling Plank to Seated V-Hold



From a plank, drop the knees to the ground, keeping the torso tight. Hold for several seconds. Sit and lift the legs to a 45° angle, lean the torso back at the same angle, extend arms forward, and hold while breathing deeply from the abdomen.

16. **Jumping Plank and Fast Arm Movement**

From a plank, jump the legs in and out quickly while keeping hips stable. Transition to lying down, head and shoulders lifted, knees bent. Pulse the arms up and down rapidly. Inhale every 5 beats, exhale every 5 beats.

17. **Side Jump Plank to Seated V-Hold**

From a plank, keep the legs together and jump side to side. Transition to seated with legs raised at 45°, torso leaned back at the same angle. Extend arms forward and hold for 20 seconds, breathing deeply from the abdomen.

18. **Spider Plank with Hand Walkout**

From a plank, alternately bring the knee to the opposite elbow. Transition to standing, bend forward, place hands on the ground, and walk them forward into a plank. Perform three arm bands and extensions, then return to standing.

19. **Plank with Upper Body Lift and Side Knee Raise**

From a prone position, place hands under shoulders and lift the upper body, then the lower body, supporting on the toes. Lie on your right side with head resting on right arm, knees bent. Raise the left knee while keeping heels touching, then return to start.

20. **Crossed-Arm Forearm Plank and Foot Lift**

Lie prone and prop up on forearms with hands crossed under the chest. Lift the body. Transition to all fours, lift one foot high, then bend and extend the arms. Inhale on the extension, and exhale slowly on the flexion.

Appendix 2

A list of academic titles, names, specializations, and workplaces of the professors and experts who were contacted or interviewed in person.

Seq	Names	Title	Specialization	Workplace
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1	Prof. Dr. Falih Hashim Finjan	Professor	Sports Training + Weights	College of Physical Education and Sports Sciences / University of Baghdad
2	Prof. Dr. Wassan Hanoon Ali	Professor	Sports Training / Physiology	Physical Education and Sports Sciences / University of Baghdad
3	Prof. Dr. Wasan Saeed Rasheed	Professor	Fitness / Physiology	College of Physical Education and Sports Sciences / University of Baghdad
4	Prof. Dr. Raad Khanjar	Professor	Sports Training / Handball	College of Physical Education and Sports Sciences / University of Baghdad
5	Asst.Prof. Saeed Ahmad Saeed	Assistant Professor	+Fitness	College of Physical Education and Sports Sciences / University of Baghdad
6	Asst.Prof. Dr. Lamiaa Abdulsattar Khalil	Assistant Professor	Sports Injury/Fitness Rehabilitation	University of Baghdad / College of Physical Education and Sports Sciences for Girls
7	Asst.Prof. Dr.Lisa Rustum Yaacoob	Assistant Professor	Sports Training/Judo	University of Baghdad / College of Physical Education and Sports Sciences for Girls

Appendix 2

In the Name of Allah, the Most Gracious, the Most Merciful

Subject: Expert Opinion Survey Form on Identifying the Tests Related to the Research Variables

To the esteemed professor

The researcher intends to conduct a study in the field of Physical Education and Sports Sciences for Women, titled: *"The Effect of Dynamic Pilaplane Exercises on Some Components of Health-Related Fitness in First-Year Female Students with Central Obesity"*—an experimental study involving first-year students at the College of Physical Education and Sports Sciences for Women.

As you are an expert in this field, we kindly request your assistance in selecting the appropriate tests for the study.

With sincere thanks and appreciation.



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Notes:

Please place a (✓) mark next to the option you consider appropriate.

Please place an (X) mark next to the option you believe does not serve the objective.

Kindly provide your observations and anything you consider worth adding to the study variables.

Expert's Name:

Academic Title:

Place of Work:

Date:

Researcher:

Aya Dhafer Fawzi

Research variables	Test	Fit	Unfit	Observations
Cardiac fitness	Cooper Test (9min Walking Run)			
	Queens Step Test			
	800m running test			
	Systolic and diastolic blood pressure			
	Heart rate			
Strength tolerance for core middle muscles	International Burpee Test 3 minutes			
	Trunk dynamometer test			



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