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Effects of a Yogilates Program on Selected Physical Fitness, Health Indicator and Interoceptive Awareness in Women

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Abstract

Study purpose. Yogilates is classified as a mind-body exercise that combines the principles of hatha yoga and Pilates, integrating conscious physical movement, mental focus, and breathing. In contrast, most traditional fitness programs in fitness centers still focus on the physical aspects, with relative neglect of psychological and cognitive aspects related to overall health. Based on this concept, this study aimed to investigate the effect of a 12-week Yogilates program among 10 apparently healthy women aged 35-45 on selected fitness components (flexibility, core muscular endurance, balance), waist-to-height ratio, and interoceptive awareness.

Materials and method. A single-group pilot experimental design with pre- and post-tests was used. Participants completed 36 training sessions. A paired-samples t-test was used to examine the differences between the tests.

Results. The results showed significant improvements in all study variables ($p < 0.05$). Specifically, significant improvements were observed in the selected fitness components. Conversely, there was a significant decrease in WHtR, indicating an improvement in central obesity indicator. Significant differences were also observed in the total score and all dimensions for the (MAIA-2) scale, particularly the dimensions of attention regulation and self-regulation. Furthermore, the results demonstrated large to very large effect sizes, ranging from $d = 2.11$ to 7.46 for physical fitness variables, and from $d = 0.97$ to 8.19 for MAIA-2 dimensions and total score.

Conclusions. Along with t-test results, providing preliminary evidence of the potential effectiveness of the Yogilates program as a comprehensive approach that combines physical, health, and psychological benefits for this population.

Keywords: *Mind-body exercises, Yogilates, Interoceptive awareness, Women, Physical fitness*

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Introduction

Physical activity is one of the four corner-stones to good health and to the prevention of most physical and psychological disorders. Physical activity has been shown to be effective in supporting the functioning of multiple life-sustaining systems, enhance physical function, reduce risk factors for non-communicable diseases, and improve quality of life and mental health (World Health Organization, 2020). Attention has not been limited merely to improving the physical aspects as has been done in the past several years. It has also expanded to the psychological and cognitive issues that are closely related to body awareness and the health of the person. This new view has led to exercise programs increasingly focusing on more than just physical fitness; on more than just physical, physiological, and psychological outcomes.

Yogilates as one of these approach, developed by Pilates instructor (Jonathan Urla) as an integrated training system combining the principles of Hatha Yoga and Pilates. This system is characterized by balanced and time-efficient training sessions that aim to develop physical and mental aspects holistically, contributing to improved muscle strength, flexibility, postural control, balance, movement efficiency, and overall functional performance (Urla, 2002). While yoga primarily emphasises breath control, flexibility, balance, mental relaxation, and body awareness (Herbert, 2021), Pilates emphasise core muscle activation and strengthening, improving trunk stability, motor coordination, and correcting body posture (Li et al., 2024). By integrating these characteristics, Yogilates provides a comprehensive approach for enhancing health-related physical fitness (Kumar, 2017). As recent scientific evidence indicates that mindful movement, regulated breathing, and attentional awareness interventions may enhance different physical fitness components such as strength, muscular endurance, balance, flexibility, and neuromuscular coordination, as well as the positive impact on the psychological and functional state of the individual (Alazawy, 2025; Herbert, 2021; Wallman-Jones et al., 2021). This broader perspective on this type of exercise has directed increasing attention towards psychological concepts related to conscious movement, such as interoceptive awareness, which refers to an individual's ability to perceive, understand and interpret the inside signal coming from the inside of his body such as breathing, heart rate, muscle tension, hunger, satiety, and emotional sensations (Price & Weng, 2021). Serving as an explanatory link between physiological and psychological processes, interoceptive awareness has been associated with emotion regulation, self-awareness and adaptation to different kinds of stressors (Wallman-Jones et al., 2021).

Despite that, some fitness centers still offer traditional programs for their female clients, focusing on cardio, aerobics, and resistance training to achieve goals such as weight loss. In contrast, yoga sessions are offered only as relaxation sessions, not as a complete mind-body exercise. Because of these practices in fitness centers, attention remains limited to improving important psychological concepts for women's mental health related physical fitness and well-being, such as interoceptive awareness. This practical observation highlights the need to investigate holistic exercise approaches, such as Yogilates, that simultaneously target physical fitness, health indicators, and psychological aspects.

Studies have recently found that body-awareness based activities, like mind-body exercises, are positively related to interoceptive awareness. These practices promote interoceptive awareness

by encouraging individuals to focus on their breathing, body movements, and muscular relaxation during exercise. The combination of controlled breathing, mental focus, and mindful movement may lead repeatedly direct attention to internal bodily cues, such as breathing, muscle tension, exertion, and body posture, providing a mechanism through which individuals become more aware of their internal bodily states. Such focused attention enhances awareness of internal bodily sensations and contributes to a greater understanding of one's physical and emotional states (Schillings et al., 2021). Furthermore, findings show that higher levels of interoceptive awareness have been associated with greater psychological well-being, general health, and more effective regulation of emotional responses (Price & Weng, 2021).

Therefore, despite the growing interest in mind-body exercise interventions, limited evidence is available regarding the combined effects of Yogilates on physical fitness, health indicators, and interoceptive awareness among women. Accordingly, the present study aimed to investigate the effects of a Yogilates program on selected components of physical fitness, waist-to-height ratio, and interoceptive awareness in women.

Materials and methods

Study participants

Ten female volunteers were purposively recruited from a fitness center after permission was obtained from its management. The purposive selection was based on predefined eligibility criteria to ensure an appropriate degree of homogeneity among participants. Eligible participants were women aged 35-45 years, regularly participating in traditional exercise programs at the fitness center, apparently healthy, free from chronic diseases or medical conditions that could interfere with participation in the Yogilates program, and committed to completing the training program, and free of any recent musculoskeletal injuries that might hinder their participation in the exercises. The homogeneity of the research sample in the selected variables is presented in Table 1.

Table 1. Homogeneity of the Participants in Selected Variables

Variable	Unit of measurement	Mean	Standard deviation	Median	Skewness coefficient	Coefficient of variation %
Age	years	39.0	3.25	39	0.18	8.33
Height	cm	165.1	2.95	165	-0.27	1.79
Weight	kg	72.2	1.95	72	0.34	2.70
BMI	kg/m ²	26.48	1.11	26.3	0.42	4.19
WHtR	ratio	0.549	0.016	0.55	-0.15	2.91

Table 1 shows the skewness values for all variables were (-0.27- 0.42), within the acceptable statistical limits (± 1), indicating that the data distribution is close to a normal distribution. The coefficient of variation values were (1.79% to 8.33%) both less than 30%, indicating good homogeneity in the basic variables of the sample.

Study organization

A one-group experimental design with pre- and post-measurements was adopted in accordance with the nature and objectives of the study in identifying the effect of the Yogilates program on the variables under investigation (Thomas & Nelson, 2001).

Physical Fitness and Health Measurements

Flexibility Test

The sit-and-reach test was used to measure the flexibility of the lower back and hamstring muscles. The following equipment was required: a sit-and-reach box, a measuring tape marked in centimeters, and a results recorder. Participants sat on the floor with their knees fully extended and the soles of the feet placed against the test box at the 15 cm mark. One palm was then placed on top of the other, facing down. The participant then slowly bent forward without bouncing, reaching as far as possible and holding the final reach position for one to two seconds. Each participant had three attempts, and the highest reading from the three attempts was recorded as the participant's final reading in centimeters (cm) (American College of Sports Medicine, 2021).

Balance Test

The single-legged stand test was used to measure static balance following the standardized procedures described by (Springer et al., 2007). The test requires the following equipment: a digital stopwatch, a flat, non-slip surface, a scoring form. The participant stood upright on their preferred leg, flexing the other knee, and lift the foot off the ground without touching the ground, keeping their arms at their sides and looking straight ahead. The test duration is determined from the moment the foot is lifted off the ground until balance is lost or one of the predefined end criteria is met (Bornemann et al., 2015). Each participant has three attempts, recording the time in seconds, and the best time is used as the final test result.

Core Muscular Endurance Test

The plank or bridge test in a prone position was used to measure core muscular endurance specially the anterior trunk muscles, particularly the abdominal and trunk stabilizing muscles following the procedures as described by (Tong et al., 2014). The following equipment was used: an exercise mat, a digital timer, and a results recorder. participants lay prone on the mat, supported on their forearms with the elbows directly under the shoulders and the forearms nearly parallel to the floor. The head, torso, pelvis, and legs were in a straight line, supported on the toes, with the body raised off the floor. The participant had to maintain this position for as long as possible while maintaining correct anatomical alignment and without raising or lowering the pelvis. Once the correct position was established, time was started. The test ended when the pelvis dropped or rose below the normal level, the body lost its upright position, any part of the body touched the floor except the forearms and toes, or when the participant requested to stop the test. After giving the participant a short introductory trial to ensure they understood the correct position, one trial was conducted. The time for which the correct position was maintained was recorded as the final score by seconds.

Waist-to-Height Ratio

Waist-to-height ratio (WHtR) was used as an anthropometric indicator of central adiposity and obesity-related health risk. Height was measured to the nearest 0.1 cm using a stadiometer while participants stood barefoot in the anatomical position with the head aligned in the Frankfurt plane. Waist circumference was measured to the nearest 0.1 cm using a flexible, non-stretch measuring tape at the midpoint between the lower margin of the last rib and the iliac crest at the end of normal expiration. WHtR was calculated by dividing waist circumference (cm) by height (cm). The obtained values were interpreted according to the classification proposed by (Ashwell et al., 2012; Ashwell & Hsieh, 2005).

$$\text{WHtR} = \text{Waist Circumference (cm)} / \text{Height (cm)}$$

Interoceptive Awareness Scale

The Arabic version of the Multidimensional Assessment of Interoceptive Awareness (MAIA-2), originally developed by (Mehlin et al., 2018) and culturally adapted and validated by (Fekih-Romdhane et al., 2023), was used to assess interoceptive awareness among the study participants. The instrument consists of 37 items distributed across eight dimensions: (Noticing, Not-Distracting, Not-Worrying, Attention Regulation, Emotional Awareness, Self-Regulation, Body Listening, and Trusting). The items of the scale are answered according to a six-point Likert scale ranging from 0 = never to 5 = always. The MAIA-2 scale was scored according to the instructions of the original authors by calculating the arithmetic mean of the items of each dimension independently, and then extracting the total scale score by calculating the arithmetic mean of the sum of the means of the eight dimensions. Accordingly, the scores of each dimension, as well as the total score of the scale, range from 0 to 5. higher scores indicating greater interoceptive awareness. The Arabic version of the scale was used and to confirm its suitability for the current study, face validity was assessed by a panel of experts and the agreement rate was 95%. The scale was then administered to a pilot sample of five women from outside the main study sample, and internal consistency was assessed using Cronbach's alpha coefficient, which reached 0.85, indicating good reliability for application in the present study.

Procedures

Pilot Study

The pilot study was conducted on March 28, 2026, using a sample from outside the experimental group. It aimed to verify the suitability of the proposed exercises for the research sample, the clarity of their performance method, the mechanism for implementing the tests, the recording procedures, and the efficiency of the assistant team in applying them. The results of the pilot study led to some minor modifications to the exercises to make them clearer and easier for the target group, in addition to determining the optimal sequence for applying the tests.

Pre-test

The pre-test was conducted on April 2, 2026, according to the following sequence:

1. Answering the interoceptive awareness scale.
2. Measuring the waist-to-height ratio.
3. Applying the physical tests according to the following sequence: balance, flexibility, and core muscular endurance.

The researcher ensured that all conditions related to the testing procedures were fixed, including the place of implementation, temperature, devices, and instruments used, in addition to standardizing the temporal and spatial sequence to ensure the accuracy of the results.

Yogilates intervention

The researcher selected the appropriate exercises based on the exercises reported by (Alazawy & Salman, 2022; Urla, 2002). The program began on April 4, 2026, and continued for a 12 weeks, comprising 36 training sessions delivered three times per week (Saturday, Monday, and Wednesday), with one rest day between training sessions.

The duration of each training session was 60 minutes, distributed as follows:(Appendix 1).

Warm-up: 10 minutes; main part: 45 minutes; cool-down and relaxation: 5 minutes.

Because Yogilates relied primarily on bodyweight exercises, the principle of progressive overload was adopted in designing the training program by controlling the different load components, represented by holding time, number of repetitions, number of sets, and inter-set rest periods, in addition to gradual progression in exercise difficulty according to the stages of the training program.

The principle of progression was applied throughout the program period as follows:

Weeks 1-4: Focused on learning the movements and mastering motor performance, using low training loads represented by fewer repetitions and sets and relatively short holding times, while adopting simple basic positions.

Weeks 5-8: Gradually increased the training load by increasing the number of repetitions and sets and the holding times, while introducing more difficult positions that require a higher level of motor control and balance.

Weeks 9-12: Focused on higher training loads with increased repetitions, holding times, and number of sets, as well as compound exercises incorporating elements of strength, balance, and flexibility, performed according to the participants' level of progress throughout the training program.

Post-test

The post-test was conducted on June 27, 2026, with the same sequence, procedures, and conditions as in the pre-test.

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Statistical analysis

The data were statistically processed using IBM SPSS Statistics (Version 25), and appropriate statistical methods were used to achieve the research objectives.

Results

The study results are presented according to the study objectives. Tables 2 and 3 summarize the pre-post-intervention comparisons for the physical fitness and health variables and the MAIA-2 dimensions, respectively, while Figures 1 and 2 illustrate the corresponding effect sizes.

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Table 2. Paired-samples t-test of pre-post outcomes for fitness and health variables

Variables	Pre	Post	Mean Differences	t	P value	Effect size (Cohen's d)	
	(Mean±SD)	(Mean±SD)				Cohen's d	CI 95%
Flexibility	19.50±1.581	24.90±2.601	5.400	11.342	.000	3.59	1.84, 5.32
Core Muscular Endurance	39.90±3.665	53.90±7.824	14.000	6.674	.000	2.11	0.95, 3.24
Balance	12.50±1.581	27.60±2.989	15.100	23.582	.000	7.46	4.02, 10.89
WHtR	0.541±0.011	0.515±0.012	0.026	-11.759	.000	-3.72	-5.51, -1.91

*Significant differences, $p < .05$.

Table 2 shows that there were significant differences between the pre-test and post-test measurements ($p < .05$). The post-test values for the selected fitness components (flexibility, core muscular endurance, and balance) increased, while there was a significant decrease in the waist-to-height ratio. This indicates notable improvements as a result of the yogilates intervention, as shown in Figure 1, which illustrates the large effect size, indicating substantial practical improvements.

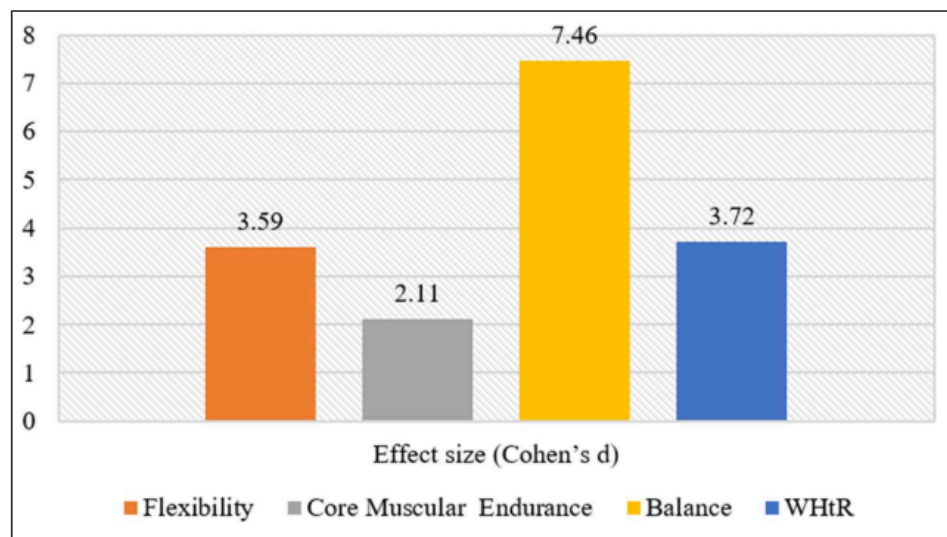


Figure 1. Effect sizes (Cohen's d) for the physical fitness and health variables.

37 Table 3. Paired-samples t-test of pre-post outcomes for the MAIA-2 scale

Variables	Pre	Post	Mean Differences	t	P value	Effect size (Cohen's d)	
	(Mean±SD)	(Mean±SD)				Cohen's d	CI 95%
Noticing	2.62±0.193	2.93±0.271	0.3100	4.715	.001	1.49	0.55, 2.38
Non-Distracting	2.13±0.188	2.33±0.319	0.2000	3.078	.013	0.97	0.19, 1.71
Not Worrying	2.01±0.207	2.40±0.330	0.3900	4.741	.001	1.5	0.56, 2.40
Attention Regulation	2.44±0.171	3.48±0.261	1.0400	14.484	.000	4.58	2.41, 6.74
Emotional Awareness	2.74±0.189	3.53±0.286	0.7900	8.332	.000	2.63	1.27, 3.97
Self-Regulation	2.29±0.213	3.24±0.316	0.9500	13.217	.000	4.18	2.18, 6.17
Body Listening	2.51±0.191	3.33±0.368	0.8200	7.643	.000	2.42	1.14, 3.66

Trusting	2.81±0.223	3.13±0.359	0.3200	4.951	.001	1.57	0.60, 2.49
Total MAIA-2	2.41±0.189	3.02±0.199	0.6173	25.908	.000	8.19	4.43, 11.95

*Significant differences, $p < .05$.

Table 3 shows that there were significant differences between the pre-test and post-test in all dimensions and total score of the MAIA-2 scale ($p < .05$). The highest t-values were observed in the Attention Regulation and Self-Regulation dimensions, While the other dimensions also show significant results. These findings indicate that the yogilates program effectively improved interoceptive awareness across all dimensions. The large effect sizes shown in Figure 2, indicating substantial practical improvements.

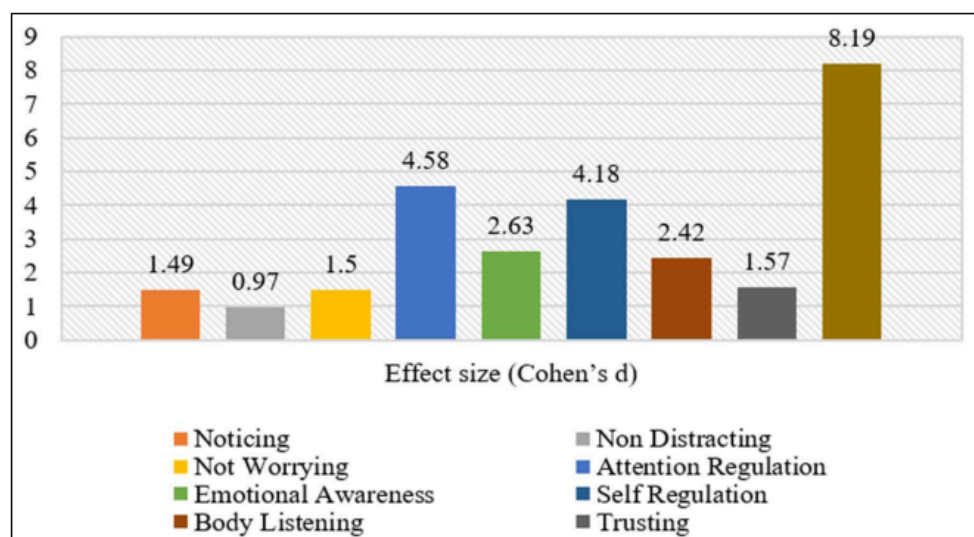


Figure 2. Effect sizes (Cohen's d) for the MAIA-2 dimensions and the total MAIA-2 score.

Discussion

The current study demonstrated statistically significant improvements across all physical, health, and psychological variables examined. Participants showed improvements in selected fitness components (flexibility, core muscular endurance, and balance), a decrease in waist-to-height ratio (WHtR), and total score and all dimensions of the Interoceptive Awareness Scale (MAIA-2) after implementing the Yogilates program. These results indicate that the study achieved its objective of investigate the effect of the Yogilates program on improving these variables in women after a 12-week program of three training sessions per week. Furthermore, these findings support the study's hypothesis that mind-body exercises, represent a holistic training approach capable of producing simultaneous improvements in physical, health, and psychological well-being.

Physical Fitness and Health Outcomes

Previous studies confirm that regular yoga practice improves flexibility (Faridah & Samsuddin Siregar, 2021; Field, 2011). Similarly, the yogilates exercises used in the present study

combined yoga and pilates exercises incorporating static and dynamic stretches with controlled holding positions enhanced muscle and connective tissue elasticity and increased joint range of motion, thereby improved flexibility.

The significant improvement in core muscle endurance can be explained by the fact that the yoga program included a range of exercises and poses that directly targeted the core muscles, along with an emphasis on breath control and neuromuscular coordination between breathing and movement. This contributed to increased core muscle activation and improved stability and endurance throughout the program. This improvement can also be partially explained by the fact that the program included poses and exercises very similar to the requirements of the plank test. This may have led to task-specific adaptations resulting from the continuous repetition of movements similar to the test, in addition to the physiological adaptations associated with improved core muscle endurance. This is supported by previous studies showing that Pilates exercises improve core muscle strength and stability (Kloubec, 2010). Also neuromuscular coordination, and overall motor performance (Li et al., 2024).

The improvement in balance can be explained that yoga poses require maintaining body stability and controlling the center of gravity during performance, which contributes to improved trunk stability, neuromuscular coordination, and body proprioception. Furthermore, the integration of controlled breathing and conscious movement during the exercises helps improve postural control and reduce wobble while standing, which positively impacts the ability to maintain balance, this was confirmed by (Alazawy & Salman, 2022), which showed that 15 weeks of practicing yogilates exercises led to significant results in improving balance.

The significant decrease in waist-to-height ratio (WHtR) indicates an improvement in the central obesity index, which is one of the indicators associated with metabolic health following the implementation of the yogilates program. This improvement can be partly explained by the cumulative effects of regular physical activity, which led to increased energy expenditure and higher muscle engagement during training, helping to reduce abdominal fat accumulation and improve body composition. As the waist-to-height ratio is an indicator of central obesity distribution, these physiological changes probably helped explain the significant decrease in this ratio at the end of the program. Earlier research has demonstrated the beneficial effects of yoga and Pilates based interventions on body composition and health outcomes related to central obesity (Cramer et al., 2017). The present results support this evidence as the structured yogilates program was found to have a significant effect on waist to height ratio, which reflects a better distribution of fat around the waist. These findings also support by (Ross & Thomas, 2010), who showed that mind-body exercise programs help to improve health indicators.

Interoceptive Awareness Outcomes

After implementing the Yogilates program, statistically significant improvements in all dimensions of the MAIA-2 scale and interoceptive awareness total score were found with large effect sizes. This shows that the program is effective in increasing participants' perception, interpretation and regulation of internal body sensations. These results could be attributed to the conscious integration of movement and breathing control with a sustained focus on body awareness that is promoted during Yogilates practice.

Attention regulation and self-regulation showed the greatest improvements among all MAIA-2 dimensions. This may be due to the program's emphasis on coordinating breath with movement and focusing on bodily signals during the exercises. This training method may have helped improve attention regulation and more effective responses to internal bodily and emotional

cues. Previous studies have indicated that meditative training programs can improve these aspects of interoceptive awareness, such as listening to the body, self-regulation, and attention regulation (Bornemann et al., 2015). Other studies have shown that yoga-based interventions improve body awareness, particularly in dimensions related to attention regulation, body confidence, and emotional awareness (Gunnarsen et al., 2022). The current study further revealed that integrating yoga and Pilates into a single training program not only affected specific dimensions but also all dimensions of the MAIA-2 scale, suggesting that the integration of conscious and structured movement may provide a more comprehensive stimulus for developing awareness of internal bodily signals.

The effects of the program on emotional awareness and body listening dimensions further demonstrated the potential impact of the intervention beyond the physical benefits of enhanced benefits to encompass cognitive and emotional mechanisms of understanding and interpreting bodily signals. This is consistent with the theoretical perspective (Mehling et al., 2012), which suggests that body-based movement skills support a relationship between a person and their internal bodily processes.

This study contributes to the literature by revealing comprehensive evidence of the ability of the Yogilates program to produce simultaneous improvements in physical fitness, health indicators, and interoceptive awareness. While most previous studies have focused on the physical or psychological effects of yoga or Pilates separately, the current findings demonstrate the combined benefits of integrating them into a structured training program. Furthermore, the use of the Arabic version of the MAIA-2 scale provides additional evidence of its suitability for assessing changes in interoceptive awareness resulting from mind-body exercise interventions.

Despite these contributions, certain limitations should be taken into account when interpreting the results. The small sample size and the single-group, pre-post study design, without a control group, limit the generalizability of the findings and prevent firm conclusions about the specific effects of the yogilates program. Therefore, the observed improvements should be interpreted as preliminary evidence rather than definitive proof of the program's effectiveness.

Conclusions

The study results indicate that the Yogilates program provides preliminary evidence of its potential effectiveness as a training intervention to produce concurrent improvements in health-related fitness, central obesity index, and interoceptive awareness in women, thus supporting further investigation of its use within training programs aimed at this population.

Based on the findings the study recommends future research that includes larger samples and randomized controlled trials to further verify the observed effects, as well as follow-up measurements after the end of the program to determine the sustainability of the improvements achieved, direct comparisons between Yogilates and both yoga and Pilates separately to determine the differences in the effectiveness of each, and studying the effect of the difference in the duration of the program and the number of weekly training units on the size of the training response, as well as applying the program to other population groups, such as the elderly, people with obesity, or metabolic disorders, or investigate its effect on other psychological concepts related to mental and psychological health to verify the possibility of generalizing the results.

Conflict of interest

The authors declare that there is no conflict of interest.

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Appendix 1: Yogilates Training Unit Template

Total Time: 60 minutes

Unit Objective: To develop fitness components (balance, flexibility, core muscular endurance)

Equipment: Yoga mat

Target Audience: Women aged 35-45
Beginner/Intermediate Level

Section	Time	Exercises								Notes	
Warm-up	10 m	(5 minutes): Gradually increase your pace on a treadmill at 4–6 km/h, aiming to raise your heart rate to 120 bpm while maintaining a low to moderate intensity. This prepares your muscles and joints for the main activity. (5 minutes) Stretching exercises.									
Main Section	45 m	First station: Balance (15 minutes)				Second station: Flexibility (15 minutes)				This section is divided into three stations. The time for each station has been determined approximately, taking into account the time spent performing repetitions and transitioning between exercises.	
		Exercise Name	Hold Time	Repetitions	Rest Time	Exercise Name	Hold Time	Repetitions	Rest Time		
		Toe Raises and Balance	30 s	8 Rep	20s	Cat Back	30 s	4 Rep	15 s		
		Knee Lifts and Tree Pose	30 s	6 Rep 3 for each leg	15 s	Spine Stretch and Hip Hinge	30 s	10 Rep	15 s		
		Chair Pose	30 s	6 Rep	20 s	The Saw	30 s	5 Rep for each side	15 s		
		Triangle Pose	30 s	6 Rep	15 s	Sphinx and Supported Swan	30 s	4 Rep	15 s		
		Station 3: Core Muscular Endurance (15 minutes)									
		Exercise Name	Hold Time	Repetitions				Rest Time			
		Slow Hundred	30 s	8 Rep				30 s			
		Single and Double Toe Touches	30 s	8 Rep				30 s			
Forearm Plank	30 s	4 Rep				30 s					
		Side Plank	30 s	3 Rep for each side				30 s			
Calming and relaxing	5 m	Meditation Pose (Diaphragmatic Breathing) – 2 m, Shavasana: Full Release in Corpse Pose - 3 m									

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