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# Benefits of practicing pilates in people with diabetes

**D**iabetes is a chronic disease that requires a comprehensive approach in which nutrition, pharmacological treatment, and physical activity are fundamental pillars of management (1). In recent years, increasing attention has been paid to forms of low-impact exercise that can be adapted to different ages and conditions, such as Pilates, which may facilitate adherence in people with diabetes.

Pilates combines strength training, flexibility, breathing, and postural control, making it an attractive option for many people with diabetes, especially those with type 2 diabetes, and also as a complement in type 1 diabetes because of its functional and well-being benefits. Beyond general well-being, several studies point to benefits for glucose metabolism, lipid profile, and quality of life, particularly when it is integrated into a comprehensive plan of physical activity and healthy habits (2, 3).

### WHAT IS PILATES AND WHY CAN IT HELP IN DIABETES?

Pilates is a low-impact exercise method that primarily works the deep muscles of the trunk (the central area or “core”), flexibility, and postural alignment through controlled movements coordinated with breathing. Unlike more intense workouts, it is performed slowly and mindfully, which allows sessions to be adapted to different physical levels and medical conditions.

For people with diabetes, this is particularly relevant: those living with this condition often present comorbidities such as osteoarthritis, cardiovascular disease, or peripheral neuropathy, which may limit participation in other high-impact sports.

Pilates offers a safer way to incorporate resistance exercise and toning, which can help improve **insulin sensitivity**, muscular function, and body control, with a moderate and controllable level of intensity (2).

### EFFECTS OF PILATES ON GLUCOSE AND METABOLISM

#### *Improvement of insulin sensitivity and glycemic control*

Physical exercise, especially that involving muscular strength and resistance work, increases glucose uptake by muscle and improves insulin sensitivity both in the short and long term. Pilates, by focusing on toning and the active use of large muscle groups, shares these mechanisms and can help stabilize blood glucose levels.

In people with type 2 diabetes mellitus, Pilates programs lasting 8–12 weeks (sessions of 45–60 minutes, 2–3 days per week) have been associated with improved glucose control, particularly after meals. In the largest meta-analysis, individuals who practiced Pilates achieved, on average, **a reduction in HbA1c of approximately 0.8%** and a decrease in postprandial glucose of about 22 mg/dL compared with control groups. A key

point is that the benefit is seen more clearly in postprandial glucose than in fasting glucose, where results are less consistent (3).

In addition, several studies describe a “same-day” effect: after each session, glucose levels tend to decrease immediately, with reductions measured before and after exercise. Repeated week after week, this acute effect may contribute to improving overall glycemic control over time (4, 5).

In type 1 diabetes mellitus, the evidence is more limited: available studies mainly describe improvements in physical condition and functional performance but without clear changes in HbA1c in the short term. Therefore, in this group Pilates is particularly valuable as a complement for improving strength, posture, mobility, and well-being, although glycemic control depends primarily on insulin adjustment and other factors (6).

### IMPACT ON LIPIDS AND CARDIOMETABOLIC HEALTH

In addition to glucose, some studies in people with type 2 diabetes have observed improvements in lipid profile—reductions in total cholesterol and LDL and, in some cases, also triglycerides—»

AREA	MAIN BENEFIT	NOTES
Glycemic control (T2DM)	Improvement in glycemic control, especially postprandial glucose levels.	Effect is more consistent for postprandial glucose than for fasting glucose; the impact depends on the regularity and duration of the program.
Insulin sensitivity	Increased muscular glucose uptake and improved utilization.	Mechanism shared with strength/resistance exercise; useful as a complement within a comprehensive physical activity plan.
Lipid profile	Modest changes in total cholesterol and LDL.	Results are variable; usually smaller than those seen with aerobic exercise and depend on diet, weight loss, and pharmacological treatment.
Functional capacity	Improvement in strength, posture, and balance; lower risk of falls.	Particularly useful in older adults or people with osteoarticular limitations; promotes independence in daily activities.
Psychological well-being	Reduction in stress and improvement in quality of life.	Includes conscious breathing and concentration components; may improve sleep and adherence to self-care.
Safety and adaptability	Low-impact, progressive, and adaptable exercise.	Useful when joint pain or comorbidities are present; requires individualization if complications exist (retinopathy, advanced neuropathy, heart disease).

TABLE 1. Benefits of Pilates in people with diabetes

» after Pilates programs. However, these results are not uniform: in general, lipid changes tend to be modest and depend on the context (diet, weight loss, duration of the program, and concomitant pharmacological treatment) (3, 7).

Rather than speaking of a strict “cardiovascular improvement”, it is more accurate to state that Pilates may contribute to optimizing certain **cardiometabolic risk** factors, especially when combined with aerobic activity and lifestyle changes. Since cardiovascular risk control is a central goal in diabetes management, incorporating a well-tolerated exercise such as Pilates can be a useful complementary strategy, particularly for people who cannot perform other higher-impact activities.

## MUSCULOSKELETAL, POSTURAL, AND FUNCTIONAL BENEFITS

Many people with diabetes, particularly those with type 2 diabetes and older age, present joint pain, muscular weakness, and postural alterations that limit daily activity. Pilates works the deep musculature, improves spinal alignment, and strengthens stabilizing muscles, which may be associated with less pain and a greater sense of stability.

These benefits can translate into better **functional capacity**: standing up from a chair, climbing stairs, maintaining balance, or walking with less fatigue. This is particularly valuable in older individuals and in those with mild to moderate peripheral neuropathy, as the goal is to improve mobility and postural control without subjecting the body to excessive impacts. Improved balance also contributes to fall prevention, which is especially relevant in this population group (5).

*The American College of Sports Medicine* recognizes that mind–body modalities such as Pilates may be useful in people with type 2 diabetes, especially in those with lower physical fitness or balance deficits (2).

## EFFECTS ON BODY WEIGHT AND BODY COMPOSITION

Pilates is not a high-intensity aerobic exercise, but by increasing muscle tone and promoting sustained activation of the core musculature it can contribute to energy expenditure and weight control, particularly if combined with healthy nutrition and aerobic activity when possible.

In some studies it has been associated with improvements in body composition

(more lean mass and less fat), which is relevant in insulin resistance and metabolic syndrome. Even so, when performed as the only form of physical activity, changes may be modest: its main strength is usually long-term adherence and improvement in functionality (8).

## PSYCHOLOGICAL BENEFITS: STRESS, SLEEP, AND QUALITY OF LIFE

Living with diabetes involves an emotional burden: concern about hypoglycemia, complications, and, for many people, anxiety or low mood. Pilates integrates conscious breathing, concentration, and movement control, which may promote relaxation and reduce perceived stress.

By reducing stress and improving mood, it may improve sleep, motivation for self-care, and overall perception of **quality of life**. In addition, chronic stress is associated with poorer glycemic control through hormones such as cortisol, so this component may indirectly contribute to metabolic control (8, 9).

## FOR WHICH PEOPLE WITH DIABETES IS PILATES APPROPRIATE?

Pilates can be adapted to people with »

ASPECT	RECOMMENDATION	OBSERVATIONS
Prior consultation	Assessment with the healthcare team (physician, nursing staff, diabetes education).	Especially important if complications are present (advanced neuropathy, proliferative retinopathy, heart disease).
Instructor	Seek a professional with training in Pilates and experience in chronic conditions.	Allows adjustment of postures, progression, and individualized adaptations.
Frequency	Start with 1–2 sessions/week → progress to 2–3 sessions/week.	According to individual tolerance.
Session duration	45–60 minutes per session.	Low–moderate intensity.
Program duration	Minimum of 8–12 weeks.	Necessary to observe significant improvements in glycemic control.
Glucose monitoring	Measure before and after each session.	Especially in people treated with insulin or sulfonylureas; use CGM if available.
Supervision	Prefer supervised programs (in-person or remote).	Better adherence and glycemic outcomes than unsupervised programs.
General precautions	Comfortable clothing, adequate hydration, avoid acute pain/dizziness.	Suspender si aparece visión borrosa o malestar importante.

TABLE 2. Practical recommendations for starting Pilates in people with diabetes.



**FIGURE 1.** Basic Pilates exercises adapted for people with diabetes. Low-impact exercises suitable for starting practice: (1) Diaphragmatic breathing: the basis of all exercises, reduces stress; (2) Bridge: strengthens glutes and core; (3) Cat-cow: improves spinal mobility; (4) Ankle circles: promotes circulation; (5) Modified hundred: strengthens the abdomen; (6) Leg stretch: works coordination and balance. Note: perform under supervision at the beginning and adapt according to complications.

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diabetes of very different profiles and ages, provided that intensity and type of exercise are adjusted. In clinical practice, it may be particularly useful for the following groups:

- People with type 2 diabetes mellitus who are overweight, have low physical fitness, or have joint pain, and who need a low-impact and adaptable form of exercise.
- Older people with diabetes, in whom Pilates may improve balance, muscular strength, and reduce the risk of falls.
- People with type 1 diabetes mellitus, as a complement for working on strength, posture, mobility, and well-being (6).
- People experiencing stress, insomnia, or anxiety related to diabetes, who may benefit from the breathing, concentration, and relaxation components.
- People with prediabetes, where recent evidence suggests

that Pilates may help improve glycemic control, lipid profile, and physical fitness parameters, contributing to preventing or delaying progression to type 2 diabetes (10).

## HOW TO START PRACTICING PILATES IF I HAVE DIABETES

For a person with diabetes who has never practiced Pilates, it is advisable to start in a **planned and progressive way** (Table 2). Before starting, it is recommended to consult the healthcare team to assess the clinical situation and possible adaptations. Choosing an instructor with training in Pilates and experience with chronic conditions facilitates a practice tailored to each person. In general, it is advisable to begin with low-to-moderate-intensity sessions, progress gradually, and pay special attention to glucose monitoring, especially in people treated with insulin or sulfonylureas. Professional supervision, comfortable clothing, adequate hydration, and attention to warning signs (dizziness, blurred vision, hypoglycemia) contribute to safer practice and better long-term adherence.

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**FIGURE 2.** Comprehensive Pilates approach in diabetes. Regular supervised practice, support from the healthcare team, and consistency over time (8–12 weeks) are key to consolidating the metabolic, functional, and well-being benefits that Pilates offers people with diabetes.

COMPLICATION	SPECIFIC PRECAUTIONS	RECOMMENDED ADAPTATIONS
Peripheral neuropathy	Inspect the feet before and after each session; use appropriate footwear.	Prioritize mat-based exercises; avoid prolonged pressure on areas with reduced sensitivity; perform balance training with stable support.
Proliferative retinopathy	Avoid the Valsalva maneuver, intense isometric efforts, and inverted positions (head below the heart).	Prioritize gentle and controlled movements; avoid exercises that increase intraocular pressure.
Autonomic neuropathy	Carefully monitor blood glucose levels; exercise caution with sudden changes in blood pressure.	Maintain adequate hydration; avoid rapid changes in position; monitor cardiovascular responses during exercise.
Cardiovascular disease	Monitor for the onset of chest pain, dyspnea, or palpitations.	Begin with low-intensity exercise; include frequent rest periods; progress exercise intensity very gradually.
Uncontrolled hypertension	Avoid vigorous exercise; evaluate and adjust antihypertensive treatment if necessary.	Prioritize low-intensity exercise and regular blood pressure monitoring.
Joint pain or arthropathy	Avoid sustained positions that provoke pain.	Adapt the range of motion; use supportive equipment (thicker mats, cushions).

**TABLE 3.** Safety and adaptation recommendations according to complications

## » SAFETY AND ADAPTATION RECOMMENDATIONS ACCORDING TO COMPLICATIONS

Pilates, being a moderate-intensity activity, generally does not require prior stress testing in people without symptoms. However, it is important to adapt practice according to existing complications (*Table 3*).

**Practical contraindications:** exercise should not be started if glucose is  $> 250$  mg/dL with moderate or high ketones (in blood or urine). In the case of glucose levels  $> 300$  mg/dL without ketones, caution is recommended: preferably postpone the session or, if exercise is performed, limit it to gentle low-intensity activity (mobility/basic exercises) after ensuring adequate hydration and absence of symptoms, with frequent monitoring during the session. Uncontrolled hypertension contraindicates vigorous exercise and requires prior evaluation and adjustment. These adaptations allow practice to be safe and help the person gain confidence, promoting continuity (1).

## PILATES IN THE CONTEXT OF COMPREHENSIVE TREATMENT

Pilates should not be considered a substitute for other recommended forms of exercise, but rather a valuable complement within a varied physical activity program. The American Diabetes Association recommends **combining aerobic and resistance exercise** to obtain additive benefits in reducing HbA1c (1).

The accessibility of Pilates has improved with the availability of online programs, which allow participation from home with greater flexibility; however, in the presence of diabetic complications, in-person supervision is usually preferable to reduce the risk of injury. The benefits of Pilates require continuous and regular practice: the effects on insulin sensitivity and glycemic control decrease rapidly when exercise is discontinued, so it is important to maintain activity over time. **D**

## CONCLUSIONS

Pilates is a low-impact and adaptable exercise, especially useful for many people with type 2 diabetes mellitus and as a functional complement in type 1 diabetes mellitus.

In type 2 diabetes mellitus, regular practice may improve glycemic control, especially postprandial glucose, and in some cases reduce HbA1c; the effect on fasting glucose is less consistent.

It also helps increase strength, improve posture, reduce pain, and enhance functional capacity in daily life.

Its conscious breathing and concentration component may help reduce stress and improve quality of life, aspects that are relevant for self-care.

Integrated within a comprehensive plan (nutrition, treatment, and exercise), and with health-care supervision and a trained instructor, Pilates can be a valuable tool in the comprehensive management of diabetes.

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