

# An Introduction to Clinical Pilates

ANNA OWSLEY, MS, ATC, LAT • Dance Kaleidoscope, Butler University,  
and St. Vincent's Sports Performance Center

**P**ilates is one of today's buzzwords, thanks to publicity associated with celebrity endorsements. Elite athletes and dancers highly endorse it, and hundreds of exercise videos tout the benefits of Pilates. Pilates exercises are theorized to develop a strong core, create a balance of strength and flexibility, train

efficient movement patterns, create a long and lean appearance, and emphasize the mind-body connection. There has been little scientific research, however, pertinent to the efficacy of Pilates.

Pilates, introduced into rehabilitation by dance medicine, has long been the exercise choice of the dance world. In the 1980s therapists and athletic trainers specializing in dance medicine began using Pilates to attract dancers.<sup>1</sup> Today, it is

not uncommon for sports-medicine clinics to have Pilates equipment. The purpose of this article is to present Pilates from its historical context and the implications of including it in rehabilitation and conditioning programs.

## History of Pilates

Joseph Hubertus Pilates was born in Düsseldorf, Germany, in 1880.<sup>2</sup> As a child he suffered from asthma, rickets, and rheumatic fever.<sup>2</sup> He studied gymnastics, boxing, yoga,

and karate, all in an effort to improve his health. As a young man he was a circus performer and a self-defense trainer. He started to develop his own system of exercise that combined both Eastern and Western philosophies that he called *contrology*. His method soon gained popularity in Germany, and Pilates was asked to train the German kaiser's elite troops, but he was a pacifist and refused. He eventually left Germany and moved to England in 1912 to become a circus performer.<sup>2</sup>

When World War I broke out, Pilates was interned with fellow Germans in a prison camp in England for the duration of the war.<sup>3</sup> While he was at the camp, he continued to refine his exercise regime, eventually teaching his fellow prisoners and guards. His exercises became a mandatory activity for everyone at the camp.<sup>3</sup> During this time Pilates began to use mattress springs to help his bedridden comrades exercise. He rigged the springs to the bedposts, and this allowed the internees to exercise against resistance or with assistance as needed.<sup>4</sup> This experience eventually led him to the creation of his spring-resistance apparatus. After the war the Spanish influenza broke out, but not a single prisoner or guard from the prison camp died during the pandemic. Joseph Pilates credited this to his mind and body workout and was soon asked by England to train elite British troops.<sup>3</sup>

In 1926, Pilates emigrated to the United States, following Max Schmelling, a boxer whom he had been training. Schmelling's manager agreed to finance a studio in New York as an incentive for Pilates to continue to train his client. Pilates's studio was located near the New York City Ballet studios, and

## KEY POINTS

Joseph Pilates developed his exercise philosophy and program in the early 1900s, and the program has become a popular fitness activity today.

Pilates offers numerous potential benefits to individuals requiring core stability for health and performance.

Incorporating the principles of Pilates into rehabilitation programs can help facilitate a completely new approach to the way exercises are taught.

**Key Words:** body core, neutral spine, rehabilitation

contrology soon gained a following in the dance community because dancers are prone to injuries. The Pilates method benefited dancers by improving fitness and performance and by also reducing injury-recovery time. The name contrology did not stick, but Pilates' method did, and the dance community and Pilates have been intertwined since.<sup>5</sup>

There are two types of Pilates exercises: mat and apparatus work. Mat work might be the most recognizable, thanks to numerous articles, videos, and infomercials. It is the design of the apparatus, however, with its spring resistance, that enables practitioners to assist or resist an exercise. The apparatuses are the Trapeze Table, or "Cadillac" (Figure 1); the Chair, or Wunda Chair (Figure 2); the Reformer (Figure 3); the

Barrel (Figure 4); and the Spine Corrector. Mat and apparatus work can be incorporated into a clinical Pilates repertoire. Joseph Pilates invented many other pieces in his lifetime, including chairs that function as exercise machines and his "V" beds.<sup>5</sup>

Joseph Pilates died in 1967 at the age of 87.<sup>6</sup> Since his death, his work has been carried on by many disciples. There are now thousands of Pilates teachers and educators from many different "schools" of practice.<sup>1</sup> In 2000 an existing trademark on Pilates exercises was ruled invalid.<sup>7</sup> The Pilates Method Alliance, an interna-



**Figure 1** Supine 90/90 on the Trapeze Table demonstrates hip disassociation from a stable spine in an assistive environment (photo courtesy of Polestar® Education, Miami, FL).



**Figure 3** Supine hamstring arcs on the Clinical Reformer demonstrate dynamic stabilization with disassociation at the hip joint (photo courtesy of Polestar® Education, Miami, FL).



**Figure 2** Spring-assisted spine extension on the Chair demonstrates spinal mobilization with spring assistance (photo courtesy of Polestar® Education, Miami, FL).



**Figure 4** Lateral flexion on the Ladder Barrel demonstrates advance dynamic stabilization and abdominal work (photo courtesy of Polestar® Education, Miami, FL).

tional, nonprofit organization, was formed in response to concerns that anyone could call themselves a Pilates teacher, regardless of their education and background. The alliance's mission is to establish certification and education standards for Pilates professionals, and it will have a national certification exam established by August 2005.<sup>8</sup>

## Principles of Pilates

The principles outlined by Joseph Pilates in his book *Return to Life Through Contrology*<sup>5</sup> are still relevant today. These principles apply to traditional rehabilitation exercises and should be consistently used when working with athletes, patients, and clients. The eight principles are concentration, control, centering, flow, precision, breath, relaxation, and stamina.

### Concentration

Pilates exercises require one to mentally focus on the specific body area being targeted. Concentration, by drawing attention to the working body segment, potentially improves neuromuscular recruitment, which ultimately increases movement quality.<sup>3</sup> Instead of just going through the motions, one actively engages one's mind during movement and visualizes the next step.<sup>2</sup> The more attention paid to the movement, the better the quality of movement produced. It is very helpful for clinicians to provide visual, as well as tactile, cues to their clients to help facilitate this concentration.

### Control

Pilates exercises teach an individual to control his or her body, rather than "throwing it around." When performed correctly, Pilates exercises demand absolute control of the body in order to decrease forces that lead to injury and increase the mind-body connection. The exercises are performed while breathing, concentrating, and stretching.<sup>3</sup> New clients often feel awkward at first when performing the exercises. As the body learns to move in different ways, this will decrease. The movements will become smooth and graceful once the exercises are mastered at the conscious and the subconscious level.<sup>5</sup>

### Centering

Joseph Pilates described the "core" as the powerhouse. He believed that control of the core was the essence of

all human movement.<sup>5</sup> Learning to correctly use the powerhouse will improve one's posture, stabilize the spine, and improve quality of movement and is thought to lead to a trimmer and flatter stomach.<sup>3</sup>

The core consists of the lumbopelvic hip complex. The muscles traditionally associated with the core are the transverse abdominis, the internal and external obliques, multifidus, quadratus lumborum, iliopsoas, deep erector spinae, the diaphragm, and the muscles of the pelvic floor.<sup>9-14</sup> These muscles, along with the fascial systems of the trunk (thoracolumbar and abdominal fascia), provide spinal stability in the frontal, horizontal, and sagittal planes.<sup>9</sup>

The abdominal-hollowing maneuver ("navel to spine" in the Pilates world) is thought to be the best way to recruit the deep abdominal muscles (transverse abdominis and internal obliques).<sup>15</sup> The maneuver can be very difficult to perform. Vezina and Hubley-Kozey found that 20 out of 28 participants had difficulty performing navel to spine.<sup>16</sup> This suggests a need for practitioners to provide feedback via verbal and tactile cues.<sup>9</sup>

A great way to get clients to feel their deep abdominals contract and to teach them the abdominal-hollowing maneuver is to have them lie supine, knees bent with the feet flat. As they exhale, have them hiss like a snake. Most people usually feel a fluttering in their deep abdominals. Next, have them use these same muscles, which most of them have just discovered, to draw their navel into their spine as they exhale. This prevents them from "just sucking it in." They should feel their own personal "seat belt" tightening around their waist.

### Flow

Pilates exercises have a flow to them that can resemble a dance class as one exercise leads into the next. The exercises are performed smoothly, without jerky movements.<sup>17</sup>

### Precision

Pilates exercise is about quality, not quantity. Rather than doing a specific number of repetitions, one performs the exercises for as many times as can be done correctly. For example, if a client's form begins to fade after four repetitions, then he or she needs to stop. One might even need to do a modified version of the exercise until one becomes stronger. The precision of Pilates demands absolute control of the body.<sup>3</sup>

## Breathing

Correct breathing during exercise is essential. Breathing is thought to be a catalyst for core stability.<sup>1</sup> The Pilates approach to breathing might vary among practitioners, but most use a form of diaphragmatic-type breathing. Many people are chest breathers (they expand the top of their chest). A good way to check and see how one breathes is to lie down and place one hand on the sternum and the other over the diaphragm. As inhalation and exhalation occur, notice whether the breath comes from the sternum or the diaphragm. Have the client, while attempting to keep the upper chest as still as possible, place his or her hands on the outside of the lower rib cage, one on each side. The ribs should expand into the hands as inhalation occurs. One should imagine filling the lower lobes of the lungs. As exhalation occurs, the ribs should slide together, “wringing out the lungs.”<sup>3</sup>

## Relaxation

Pilates exercises require working one area of the body while relaxing another. This helps decrease unnecessary tension. For example, a client might work the powerhouse while trying to relax and release tension from the shoulders.

## Stamina

Pilates exercises build muscle endurance in the core and other small stabilizing muscles. Muscle endurance is more important than pure muscle strength in core training because the deep stabilizers of the spine are constantly working.<sup>10</sup> By consistently challenging these muscles throughout all of the exercises, clients will be training for endurance.

## Current Pilates-Evolved Philosophies

Although there is a set of traditional Pilates mat and apparatus exercises that were originally taught by Joseph Pilates, some of these exercises have been modified slightly to bring them into the 21st century. These modifications are responses to current movement theories and scientifically based rehabilitation principles. Several additional concepts have been introduced to the standard repertoire of Pilates exercises. These are often referred to as Pilates-evolved principles and exercises.

## Neutral Spine

The way Joseph Pilates originally taught them, control-logy exercises were performed with a flat back. Pilates believed that a flat spine was natural and that a curve in the spine was not.<sup>5</sup> Current research has shown that a posterior pelvic tilt causes the spine to flex, increasing the load on the annulus and posterior ligaments of the spine.<sup>11</sup> Today, most Pilates instructors teach clients to maintain a neutral spine for almost all of their exercises. In healthy individuals, antagonistic trunk-flexor and -extensor muscles are activated around a neutral spine.<sup>12</sup> In addition, the transverse abdominis and multifidus can achieve a balanced cocontraction in a neutral spine,<sup>13</sup> thus providing mechanical stability to the lumbar spine<sup>18</sup> and decreasing the load on the spine.<sup>19</sup> A neutral spine is biomechanically and functionally correct.<sup>20</sup>

A neutral spine is defined as the point halfway between a posterior pelvic tilt and an anterior pelvic tilt. In a supine position the anterior superior iliac spine (ASIS) should point straight toward the ceiling like a set of headlights and be in a horizontal line with the pubic symphysis.<sup>17</sup> In a prone position, the ASIS and pubic symphysis will be parallel with the floor.<sup>17</sup> Sometimes it is necessary to press the pubic symphysis into the floor to avoid lumbar-spine hyperextension. In quadruped, the ASIS and pubic symphysis are again in a straight line and parallel to the floor.<sup>17</sup> In a side-lying position, the ASIS is aligned vertically and the hips are stacked one on top of the other.<sup>17</sup> It is helpful to visualize the back against an imaginary wall. In a seated position, the ischial tuberosities are on the floor and the ASIS and the pubic symphysis form a triangle in the frontal plane.<sup>17</sup>

A neutral spine can be very difficult to learn. Preuss, Grenier, and McGill<sup>21</sup> showed that it was more difficult for individuals to return to a neutral-spine position in quadruped from a flexed position than from standing or sitting. Clinicians must provide constant feedback and reeducation to promote effective movement patterns.<sup>13</sup>

## Spinal Articulation

Segmental movement throughout the spine is often used in Pilates exercises. Joseph Pilates referred to this as “rolling.”<sup>5</sup> In Pilates exercise one must roll and unroll the spine like the spokes of a wheel. When clients articulate their spine in flexion, they distribute loads

among spinal segments. This is thought to decrease the stresses incurred by a hypermobile segment.<sup>1</sup> Clients need to learn to stabilize the spine, not just in a static position but in all planes of movement. Spinal articulation is a great way for clients to learn their own current limits on spinal mobility. It is very easy to feel if they are not articulating vertebrae by vertebrae but instead moving in chunks. In my personal practice, I have found that most clients, especially those with hyperextended lumbar spines, have great difficulty at first with lumbar-spine articulation in flexion. Their ability to articulate the spine improves as they continue the exercise and become more aware of their faulty movement patterns.

## Using Pilates in Rehabilitation

Pilates exercises are a great tool to add to an athletic trainer's inventory of therapeutic exercise interventions. There are over 500 Pilates apparatus and mat exercises, and incorporating spring resistance enables the clinician to assist or resist movement.<sup>22</sup> The concise movement that is required for the various activities allows clinicians to further evaluate clients for movement deficiencies. Body positions for performing clinical Pilates allow for multiplanar movements in supine, side lying, prone, sitting, and standing. Pilates exercises have been used as part of rehabilitation programs for orthopedic injuries (chronic and acute), clients with neurological impairments, postpartum women, chronic pain, arthritis, and many other diagnoses with movement dysfunctions.<sup>1</sup> The possibilities for the use of Pilates in rehabilitation are endless.

Polestar® Education (Miami, FL) is a Pilates education company that focuses on using Pilates in the rehabilitation environment. Polestar classifies Pilates-based rehabilitation into three phases based on the work of Porterfield and DeRosa: assistive movement, dynamic stabilization, and functional reeducation.<sup>9,23,24</sup> Exercises in the Pilates repertoire often overlap within these phases of rehabilitation. Clinicians can progress activities in later phases by reducing the assistance from a Phase 1 exercise and modifying it to challenge the body differently. This overlap affords clinicians endless choices of exercises for their clients.

### The Polestar Approach, Phase I: Assistive Movement

Using springs, towels, and hands to assist movement allows clients to begin movement or stabilization of

the affected muscle or joint without muscle guarding or pain. Assistive movement can enable clients to begin reeducation of proper motor patterns. There are three stages that can coexist in the first phase of rehabilitation: disassociation, stabilization, and mobilization.<sup>23,24</sup>

**Disassociation.** “Disassociation is the isolation of movement at a desired joint proximal or distal to the site of the lesion.”<sup>23</sup> ■ Usually, disassociation refers to moving the shoulder or hip joint without the associated spine or pelvic movement. In Phase I, disassociation occurs with a large base of support (usually supine on the mat or the apparatus). Assistance, usually in the form of springs, can be provided to help with the joint movement.

**Stabilization.** Phase I rehabilitation focuses on recruiting the spine-stabilizing muscles (the powerhouse). These muscles control unwanted movement of the spinal column.<sup>25</sup> An example of a Phase I exercise from a current lumbar-stabilization repertoire would be the “dead bug” exercise. The client stabilizes around a neutral spine while moving the leg into a 90/90 position. According to the principles of Pilates, there should be no movement in the trunk—only movement at the hips, and it should occur with control and precision while incorporating proper breathing technique. The dead bug exercise disassociates the hip from a stable spine. A variation could be performed on the Trapeze Table with springs on the legs for assistance (Figure 1).

Using the deep stabilizers of the spine requires learning the abdominal-hollowing maneuver (navel to spine) with the subsequent transverse abdominis contraction. Hodges et al.<sup>12</sup> showed that the transverse abdominis contracts before upper extremity movement in healthy individuals. Contraction of the transverse abdominis was significantly delayed in patients with low back pain, suggesting a dysfunction of the motor control of the transverse abdominis.<sup>12</sup> It is believed that using the principles of disassociation and stabilization can help retrain this motor-control pattern.

**Mobilization.** Mobilization is the ability to articulate in all desired planes of motion appropriate for the joint or joint complex.<sup>25</sup> Restoring mobility to the injured joints and muscles should be one of the primary goals of rehabilitation. Nondestructive movement begins during Phase I. By using springs, clinicians can help

their clients restore motion to a joint while minimizing injurious forces.<sup>24</sup>

### The Polestar Approach, Phase II: Dynamic Stabilization

Once a client has safely regained motion and stability during Phase I, it is appropriate to challenge him or her with an increased level of difficulty. Dynamic stabilization should also challenge the newly acquired control of the static trunk. This can be accomplished by changing the client position (supine to quadruped or side lying), by decreasing the assistance, or by increasing the resistance. The stages of disassociation, stabilization, and mobilization continue during Phase II.<sup>23,24</sup> The hamstring arc series is an example of dynamic stabilization (Figure 3).

### The Polestar Approach, Phase III: Functional Reeducation

Returning clients to their preinjury functional status is the end goal of most rehabilitation programs. Movement or lifting restrictions often have to be set, but it is up to the clinician to teach clients how to recognize their own limits.<sup>9</sup> Functional reeducation can be broken down into two stages: foreign environment and familiar environment.

**Foreign Environment.** If clients return to a familiar environment too quickly, they often return to their habitual patterns of movement.<sup>24</sup> Training an individual to perform specific tasks in a foreign environment has many benefits. In the foreign environment, one can perform the biomechanically correct exercise in a gravity-reduced situation. For example, a client who demonstrates abnormal internal femoral rotation during squatting motions would correct his or her muscle imbalances during horizontal leg-press activities on the Reformer and can then relearn the correct movement pattern before adding gravity and proprioceptive challenges.

**Familiar Environment.** In the last stage of rehabilitation clients are given exercises to return them to the task identified as their functional goal.<sup>23</sup> After the task has been relearned correctly in the foreign environment, they are then returned to a familiar environment with a normal orientation to gravity. Each client, with verbal and tactile cues, will continue to build endurance and movement efficiency in the specific task.<sup>24</sup> The client should be able to perform the final goal correctly on a conscious and subconscious level. At this point, proprioceptive challenges and resistance can be

added to further challenge the reacquired functional movement.

## Conclusion

Pilates exercises are an effective way to reeducate faulty movement patterns and teach clients how to exercise properly by starting at their core, or powerhouse. Subjectively, Pilates has shown significant promise in the field of rehabilitation, but there is still a need for further scientific research to support these observations. In a Pilates rehabilitation environment, clients are taught the importance of moving with strength and purpose. They learn the consequences of their faulty movement patterns and how to correct them. Incorporating the principles of Pilates into rehabilitation programs could facilitate a whole new approach to the way exercises are taught.

As a clinician, I use the principles of Pilates in my rehabilitation of all levels of athletes, regardless of the setting and whether or not I have access to the apparatus. Furthermore, my education and training in Pilates have changed the way I evaluate injuries because Pilates has taught me the importance of looking at the whole person and not just the specific area injured. Pilates exercises allow clinicians to continue to further evaluate clients on a daily basis and to see their faulty movement patterns, immobility of spinal segments, and lack of core stability. In addition, clients will be able to feel these deficiencies for themselves. I strongly feel that the use of Pilates in a rehabilitation environment is worth further investigation. Attend a session with a certified Pilates instructor and experience the benefits for yourself.

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**Anna Owsley** graduated from Indiana University with bachelor's and master's degrees in athletic training. She is a Pilates instructor certified from Polestar Education and PowerHouse Pilates and works with Dance Kaleidoscope, Butler University's Ballet Department, and St. Vincent's Sports Performance Center. She has also worked with Richmond Ballet, Cincinnati Ballet, University of Cincinnati's Dance Department, and various Broadway Productions (e.g., Rockettes, "Aida," "Stomp," "Phantom of the Opera").