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The Benefits of Pilates Exercise in Orthopaedic Rehabilitation

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Summary: Pilates exercise has been introduced to the physical therapy community in recent years to enhance rehabilitation programs by focusing on spinal or core stabilization. This particular method can be incorporated into a patient's treatment plan to improve strength, range of motion, coordination, balance, muscular symmetry, flexibility, and proprioception. It is a method of exercise performed on the floor, known as mat work, or on a spring-resistant apparatus. The patient, with the guidance of a physical therapist, performs efficient functional movement patterns, closed-chain and open-chain patterns, as well as multiple planes and positions provide for varied rehabilitation programming with many different orthopaedic diagnoses. Plyometric work can be incorporated with an attachment to the apparatus. There is very little research available relating to Pilates exercise for rehabilitation. A case study of a 48-year-old man with chronic low back pain reveals an 85.1% improvement on the visual analog scale for pain intensity and an 87.7% improvement in Oswestry score for functional disability after six physical therapy visits during which Pilates exercises were incorporated into patient programming. **Key Words:** Pilates—Physical therapy—Chronic low back pain.

J. H. PILATES

Joseph Humbertus Pilates was born in 1880 near Dusseldorf, Germany. He was a frail child, having multiple medical problems including rickets and asthma. Inspired with the desire to better his body as a young boy, Pilates began to make his body stronger with exercise. He became very interested in bodybuilding throughout his teenage years, and started investigating other forms of exercise, which incorporated both eastern and western philosophies. He was intrigued by the cooperation of the body and mind. Pilates became a boxer, gymnast, and circus performer. He studied yoga and karate. Gradually, Pilates began to develop an exercise system he called "the art of contrology." He lived by the slogan, "the mind guides the body."

Pilates' system of conditioning grew in popularity as word of contrology spread through Germany. Pilates made a decision to move to England and work as a circus performer just before the outbreak of World War I. During the war, he was interned on the Isle of Mann in a prison camp. Pilates, being a resourceful man, and still very involved in his physical health, began teaching his exercise to other internees, prison guards, and injured men. He removed springs from under the hospital beds and attached them to the bed to encourage injured soldiers to exercise back to health (the idea which led him to create his spring-resistant apparatus). He attributes his system of conditioning to the good health that those that he instructed kept as an influenza epidemic spread through much of Europe during the war. The British military recognized Pilates' exercise and asked him to train their troops, which he did.

An opportunity for Pilates to immigrate to the United States came in the early 1920s, when a well-known boxer in England was asked to fight in New York City. As a perk to Pilates, the boxer agreed to finance an exercise studio in the city for Pilates if he moved to New York. Pilates agreed, met his wife Clara while on the boat to the United States, and together they opened their first studio

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in America in 1926. As his method became known, Pilates' studio became the place for many athletes and performers to keep fit and rehabilitate when injured. Socialites, famous choreographers, and a variety of influential and interesting people worked with "Uncle Joe" in his 8th Avenue studio, which he shared with the New York City Ballet. The popularity of his method in the dance community flourished and he was instrumental in keeping dancers on stage and injury free. Joseph Pilates died in 1967. Many of Pilates' closest apprentices and clients felt that he was 50 years ahead of his time with the development of his system of exercise.

PILATES TODAY

Today, Pilates exercise has grown in popularity as a result of the profound effects that it has had on both healthy and injured bodies. Results have not been measured by any research study, but simply by testimonials from those who have done the method for years, or their therapists who document marked objective change in physical therapy rehabilitation programs. Celebrities advertise their new Pilates bodies in magazines and on TV. Olympic athletes swear by its ability to improve strength, flexibility, and endurance, and return more quickly after an injury. At this time, it is not so far-fetched to introduce Pilates exercise more formally into rehabilitation from a more medical perspective. There is a need for research. It is important to note that Pilates training today is somewhat varied. There are many different "schools" of practice and many practitioners. Most practitioners are not licensed physical therapists, but ex-dancers and fitness professionals who have combined their exercise programming strengths into a hodgepodge or hybrid delivery of what they call Pilates. It is very important to know that there is clear differentiation between exercise that is called "traditional" and "Pilates-based." Most traditional practitioners use only Pilates' originally designed spring apparatus and few accessories. They teach a series of exercises with minimum of movement, low repetitions, and a dynamic pace. The Pilates-based teachers add other exercises and accessories that are nontraditional. The physical therapist uses Pilates adjunctively with other methods of exercise and accessories, as they feel fit for the patient's program. There have been many instances when a patient has reported doing Pilates to their physician or physical therapist with a fitness instructor just to learn that in fact the exercises were not Pilates techniques at all, but a Pilates-inspired program created to capitalize on the popularity of the method. This is confusing to the community and may also lead to greater injury if a practitioner is not familiar with the exercises and apparatus. As with any specific method, proper training is essential for effective delivery and ensuring optimum results.

PHYSICAL THERAPY

The physical therapy community has had the unique opportunity to integrate Pilates exercise into orthopaedic rehabilitation with traditional and alternative physical therapy modalities and procedures since the early 1990s. Before this time, Pilates was available only through a handful of teachers in the United States who had studied with Joseph Pilates and his wife, Clara, and the few people they had taught. SUNY Purchase in New York had a studio, which incorporated the method into its dance department, and New York University has Pilates coursework as part of its dance degree curriculum. Only several health care centers and hospitals in the United States integrated the use of a few pieces of Pilates apparatus into dance rehabilitation in the 1980s and 1990s with the assistance of dancers trained in the practice of Pilates. It was virtually an unknown method of exercise, and most were unfamiliar with the equipment that Joseph Pilates designed.

The function of physical therapy as defined by the American Physical Therapy Association is to "prevent, identify, assess, correct or alleviate acute or prolonged movement dysfunction."[1] An orthopaedic physical therapist will perform a comprehensive neuromusculoskeletal evaluation after the orthopaedic physician identifies the underlying pathology and establishes a diagnosis. The evaluation assesses the patient's medical history, subjective complaints and symptoms, and objective measures of pain, strength, range of motion, joint play, posture, soft-tissue integrity, signs of neurologic involvement, and functional capacity. The physical therapist relies on a body of knowledge including anatomy, neurology, physiology, and kinesiology. Next, a rehabilitation program is planned detailing both short-term and long-term goals. A combination of modalities (ultrasound, electrical stimulation, heat, ice, mechanical traction) and procedures (joint mobilization, soft-tissue mobilization, therapeutic exercise, neuromuscular reeducation) are performed to meet the goals.

Traditionally, the orthopaedic physical therapist focuses on decreasing pain, improving range of motion and strength, and guiding the patient to full functional restoration of movement. The fine-tuning of movement restoration involves another area of physical therapy that engages the patient in a more complex way. The understanding of the body from an internal perspective, having an awareness or kinesthetic sense of where your body or

FIG. 1. The "teaser" mat exercise.

a joint is in space. This is also referred to as *proprioception*, and is known more globally as the study of somatics. Somatics, or somatic reeducation, refers to the ability humans have to be consciously aware of their movements, internal feelings, and sensations.[2] In a rehabilitation program, the physical therapist not only directs the course of treatment, administering modalities and performing procedures, but also teaches the patient to move more effectively and efficiently. Poor habitual patterns of moving that may have led to a current disability or created dysfunction must be addressed in order for the patient to recover fully. Somatic reeducation and its principles can be used to enhance physical therapy programming further. It is a less medical model of rehabilitation. The most familiar practices of somatic reeducation include Alexander technique, Feldenkrais awareness through movement and functional integration, Aston patterning, and craniosacral therapy.

PILATES AND PHYSICAL THERAPY

Pilates exercise can be introduced into a physical therapy program as a procedure incorporating both the traditional application of physical therapy principles and goals, affecting strength, flexibility, and pain, while enhancing it with a reeducation approach using somatic principles and theory. There are two primary ways to experience Pilates work today. One is the "mat work," or exercises done on a mat on the floor (Fig. 1). The other is with spring-resistant apparatus or barrels. The most popular pieces of equipment include the Universal Reformer (Fig. 2), the Cadillac, the Wunda Chair (Fig. 3), the Electric Chair, the Ladder Barrel (Fig. 4), and the Spine Corrector. Through a series or routine of exercises on the mat or apparatus, Pilates encourages neuromuscular reeducation to occur in functional positions and planes with focus on spinal stabilization. Strength, flexibility, proprioception, postural reeducation, and the challenges of functional activity in multiple planes are achieved. A strong core allows for more efficient movement of the extremities. Pilates-based training, or exercises developed from the primary principles of Pilates using spring-resistant equipment, has been shown to result in less body sway and improved body alignment in a study on dancer's dynamic posture.[3] An attachment to the spring-resistant reformer, called a *jumpboard*, allows for supine, or nonweight-bearing, plyometric work as well.

With the attention to core or spinal stabilization, an introduction to Pilates work starts with visualizing a corset wrapped around your midsection. This corset is made up of core muscles: the transverses abdominus, the internal and external obliques, and the multifidi. Next, the hip rotators, extensors, adductors, pelvic floor muscles, and diaphragm are added when the therapist teaches "navel to spine" or the key words to describe abdominal bracing—an abdominal contraction in neutral spine. Breathing patterns are incorporated and the entire body is

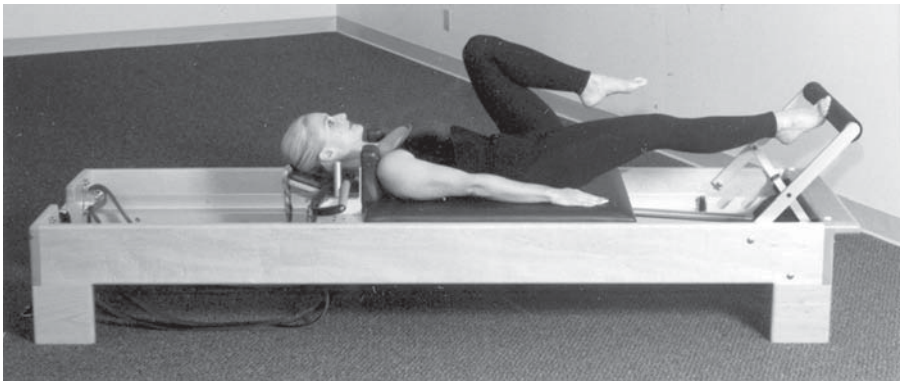

FIG. 2. Footwork-closed chain exercise on the Reformer.

FIG. 3. "Going up" on the Wunda chair.

FIG. 4. Hamstring stretching on the Ladder Barrel.

engaged. Functional patterns of movement are performed with the guidance of the therapist. Positions include supine, prone, sitting, kneeling, quadruped, standing, and a variety of other postures that require balance and control. The exercise involves muscles working concentrically with the spring resistance on the apparatus, eccentrically to control the return of the spring, and cocontracting and stabilizing using other major muscle groups. Both closed- and open-chain exercises can be accomplished—a full-body experience, working the body as a whole, as we do in our activities of daily living.

There are a number of goals that therapists work to achieve with their patients. Physical therapy procedures for which Pilates exercise is used include therapeutic exercise, neuromuscular reeducation, and functional activities. Postural reeducation, muscle balance and symmetry, balance, control, strength, flexibility or improved range of motion in muscles and joints, joint proprioception, and coordination are a few of these goals for which Pilates exercise can be used. Orthopaedic patients have benefited by achieving their goals with the integration of Pilates exercises. A wide range of diagnoses can be treated with very little limitation. Modifications of exercises and equipment can be made as appropriate for the client, such as lessening spring resistance or altering the range of motion through which the machine glides. Diagnoses typically seen by physical therapists in which spinal or core stabilization is necessary and in which Pilates exercise is used may include disc herniations, spondylolisthesis, low back pain, and scoliosis. Extremity stabilization, including the shoulder girdle or scapular areas, knee, and ankle are also common. Pilates exercise following an ACL repair, meniscectomy, or joint replacement can facilitate range of motion and strength in a safe, nonweight-bearing, closed, kinetic chain environment. Overall, physical therapists now have another tool in their practice to encourage a faster functional recovery with effective and efficient exercise principles.

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