POLESTAR PILATES™

EDUCATION

performance

Control | Align | Stabilize | Elongate | Balance | Strengthen | Integrate | Lengthen | Breathe

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    Tarsal & Metatarsal Ligaments
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SECTION II: PROPERTIES OF THE MUSCULOSKELETAL PHYSIOLOGY

Nordin,M. Frankel,V.: Basic Biomechanics of the Musculoskeletal System, Second Edition; Williams and Wilkins, 1989

BONE

1. Bone is a two-phase composite material made of cortical and cancellous bone, which together provide rigidity and resilience.
2. Muscular contraction elicits compressive and tensile forces on bone, affecting stress patterns in bone. Bone remodels in response to the mechanical demands placed on it; it is laid down where needed and reabsorbed where not needed.
3. With aging there is marked reduction in the amount of cancellous bone and a decrease in the thickness of cortical bone. These changes diminish bone strength and stiffness.

ARTICULATING CARTILAGE

1. The function of articular cartilage is to increase the area of load distribution on bone and to provide a smooth, wear-resistant, weight-bearing surface.
2. Biomechanically, articular cartilage is 25% solid matrix and approximately 75% movable interstitial fluid.
3. Articular cartilage has the ability to provide for the diarthrodial joint a self-lubricating feature that operates under normal joint loading conditions.
4. Damage to articular cartilage can disrupt the normal load-carrying ability of the tissue and thus can lead to cartilage breakdown known as osteoarthritis.

TENDONS & LIGAMENTS

1. Tendons and extremity ligaments are composed largely of collagen, which give these structures their characteristic strength and flexibility.
2. The collagen fibers in tendons are nearly parallel, allowing for unidirectional loads. The collagen fibers in ligaments have a less parallel arrangement which allows these structures to sustain large tensile stresses in one direction and smaller stresses in other directions.
3. Tendons and ligaments undergo deformation before failure.
4. Aging results in a decline in the mechanical properties of tendons and ligaments i.e. their strength, stiffness, and ability to withstand deformation.
5. Ligaments and tendons remodel in response to the mechanical demands placed on them.

PERIPHERAL NERVE

1. Peripheral nerves are composed of nerve fibers, layers of connective tissue, and blood vessels.
2. Nerve fibers are extremely susceptible to trauma, but because successive layers of connective tissue surround them, they are somewhat mechanically protected.
3. Stretching of a nerve induces changes in intra-neural blood flow before the nerve fibers actually rupture.
4. Compression of a nerve can cause injury to both nerve fibers and blood vessels in the nerve, mainly at the edges of the compressed nerve segment.
5. Pressure level, duration of compression, and mode of pressure application are significant variables in the development of nerve injury

SKELETAL MUSCLE

1. The motor unit, a single motor neuron and all muscle fibers innervated by it, is the smallest part of the muscle that can contract independently. The stimulation of additional motor units in response to greater stimulation of the motor nerve is known as *recruitment*.
2. Muscles may contract *concentrically, isometrically*, or *eccentrically* depending on the relationship between the muscle tension and the resistance to be overcome. Concentric and eccentric contractions involve dynamic work in which the muscle moves a joint or controls its movement. Isometric contractions involve static work, in which the joint position is maintained.
3. Force production is influenced by the length-tension, load-velocity, and force-time relationships of the muscle. The length-tension relationship in a whole muscle is influenced by both active and passive components.
4. Three main muscle fiber types have been identified: type I, slow-twitch oxidative; type IIA, fast-twitch oxidative-glycolytic; and type IIB, fast-twitch glycolytic fibers. Most muscles contain a mixture of these types.
5. Muscle atrophies in response to disuse and immobilization and hypertrophies when subjected to greater than normal use.

SECTION III: BIOMECHANICS OF THE LOWER EXTREMITY

BIOMECHANICS OF THE KNEE

1. The knee is a two-joint structure that is composed of the tibiofemoral joint and the patellofemoral joint.
2. Movement occurs primarily in the sagittal plane with the tibiofemoral joint and in the frontal plane with the patellofemoral joint.
3. The "screw-home" mechanism of the knee adds stability to the joint in full extension.
4. Although the tibial plateaus are the main load-bearing structures in the knee, the cartilage, menisci, and ligaments also bear loads. The menisci aid in distributing the stresses imposed upon the tibial plateaus.
5. The patella aids knee extension by lengthening the lever arm of the quadriceps muscle throughout the entire range of motion and allowing a wider distribution of compressive stress on the femur.

BIOMECHANICS OF THE HIP

1. The hip joint is a ball-and-socket joint composed of the femoral head and acetabulum.
2. Hip flexion of at least 120 degrees, abduction of at least 20 degrees, and extension of at least 20 degrees are necessary for carrying out daily activities in a normal manner.
3. The hip joint reaction force during gait reaches levels of six or more times body weight in stance phase and is approximately equal to body weight during swing phase.

BIOMECHANICS OF THE ANKLE

1. The ankle joint is composed of the tibiotalar, fibulotalar, and the distal tibiofibular joints.
2. Motion of the talus takes place primarily in the sagittal plane about a transverse axis.
3. The forces acting on the ankle joint during gait can rise to levels exceeding five times body weight.
4. The fibulotalar joint transmits approximately one sixth of the force exerted through the leg.
5. Small anatomic deviations in the tibiotalar and fibulotalar articulations can result in significant changes in the magnitude and direction of the stresses on the talus.

BIOMECHANICS OF THE FOOT

1. The key-like Lisfranc's joint in the midfoot stabilizes the second metatarsal, making it the most rigid forefoot bone and allowing it to carry most of the load during walking.
2. The plantar fascia functions through a complex truss or windlass mechanism that helps to passively stabilize tarsal and metatarsal bones.
3. The extrinsic muscles provide active control of the foot. Anterior leg muscles decelerate the foot at heel strike, whereas posterior calf muscles propel the foot toward toe-off.
4. Forces typically transmit from the talus to the calcaneus and forward to the navicular and cuneiforms, then through the second metatarsal; only minimal force transmitted laterally.
5. Soft tissues of the sole are designed to absorb shock at heel strike and protect the bony structures through the stance phase of gait and during push-off.

SECTION IV: BIOMECHANICS OF THE UPPER EXTREMITY

BIOMECHANICS OF THE SHOULDER

1. The shoulder complex consists of four distinct articulations: the glenohumeral joint, the acromioclavicular joint, the sternoclavicular joint, and the scapulothoracic articulation. The extensive range of motion of the shoulder (exceeding a hemisphere) is the result of synchronous, simultaneous contributions from each.
2. The glenohumeral joint, with its minimally constrained ball-and-socket configuration, contributes greatly to the wide range of motion of the shoulder complex. Because it lacks inherent bony stability, this joint relies on static and dynamic soft tissue stabilizers including the joint capsule, the glenoid labrum, and the rotator cuff muscles. Stability depends on a glenoid of adequate size, a posterior tilted glenoid labrum and a functioning rotator cuff.
3. Surface motion in the glenohumeral joint consists mainly of rotation but may also include some rolling and gliding (translation).
4. Shoulder motion, particularly elevation, is governed by the action of force couples. An important example is the interaction of the deltoid and the oblique rotator cuff muscles in producing shoulder elevation.

BIOMECHANICS OF THE ELBOW

1. The elbow joint complex is essentially three articulations in one: the humeroulnar, the humeroradial, and the proximal radioulnar.
2. This joint complex provides two types of motion, flexion-extension and pronation-supination.
3. The ligamentous apparatus surrounding the joint and the interlocking of the distal humerus, proximal radius, and proximal ulna provide the stability of the elbow joint.
4. The relatively large number of muscles producing the various motions in the elbow complicates an exact force analysis for this joint complex. Estimates suggest that static loads approach, and dynamic loads exceed body weight.

BIOMECHANICS OF THE WRIST AND HAND

1. The wrist is a complicated joint complex consisting of the multiple articulations of the eight carpal bones with the distal radius, the structures within the ulnocarpal space, the metacarpals, and each other. The carpal bones are conventionally divided onto a proximal and a distal row.
2. Motions at the wrist include flexion-extension and radioulnar deviation. Stability during radioulnar deviation is provided by a double-V system formed by the palmar intrinsic ligament and the radiolunate and ulnolunate ligaments.
3. The 19 bones of the hand are arranged in three arches: one longitudinal and two transverse arches. Derangement or collapse of the arch system, as a result of bone injury, rheumatic disease, or paralysis of the intrinsic muscles of the hand, can contribute to severe disability and deformity.

SECTION V: MOTOR LEARNING THEORY

DEFINITIONS

Motor Control: Science of understanding movement

Motor Learning: Science of understanding the acquisition and modification of movement.

Motor learning is applicable in all situations from neurological rehabilitation to elite performance. Motor learning occurs via various feedback mechanisms—visual, tactile, auditory and kinetic. These feedback mechanisms are essential for the individual to become aware of performance. Feedback can be ***intrinsic***, coming from within the patient's own sensory system or it can be ***augmented***, supplemented or added feedback derived from external sources.

Motor learning is highly dependent on the on the patient's attention level. In the beginning or ***cognitive stage*** of learning the level of attention is greatest. As the patient begins to ***associate*** the new material the level of attention decreases. The final and most desirable stage of motor learning is to become ***autonomous***, which requires little to no conscious attention to perform the newly acquired movement.

Processes that aid in the acquisition of new movements consist of perception, cognition and action. First, the patient has to become aware of or gain a perception of current movement strategies. Then the patient must cognitively learn a new strategy. Finally, the patient must practice or take action until efficient with the new strategy of movement.

As rehabilitation practitioners, our primary goals should be as follows:

- Identify the faulty motor strategy that perturbs the lesion.
- Break down the faulty motor strategy that perturbs the lesion.
- Facilitate movement that does not perturb the lesion.
- Practice new strategy until transfer takes place. This can also be defined as efficient movement at a subconscious level.

It is now that we are ready to apply neurological principles that can benefit not only the neurologically impaired but also the orthopaedically involved or performance-based clients. Before proceeding there are two basic assumptions that allow us to explain and justify neuro-rehabilitation, and than also carry over into orthopaedics:

- A damaged or poorly developed nervous system has the ability to learn or undergo neuro-plasticity.
- A certain amount of redundancy exists within the nervous system, thus providing other mechanisms of communication if primary channels are lost.

THREE PRIMARY CAUSES OF FAULTY MOVEMENT

- Congenital defects and anomalies can often be the cause of a variety of faulty motor programs.
- Habitual adaptations can lead to imbalances that are responsible for many faulty motor programs.
- Compensation due to injury is another probable contributor to the pool of faulty motor programs.

These three potential causes of faulty motor programs need to be addressed prior to the application of treatment "band-aids" that are temporary cover-ups, to problems that have deeper roots. For example, the pathology might be in the L4-5 segment, however it could be due to faulty movement patterns in the hips and other lumbar vertebras. The lack of movement in surrounding joints might be the cause of the lesion at L4-5, however 90 percent of treatment is often focused on the sight of the lesion, rather than the cause of the lesion.

One problem often encountered in the process of rehabilitating faulty motor programs is erroneous movement progression. On a spectrum of movement progression, practitioners often jump from ***passive movement*** to ***resistive movement***. The Polestar Approach looks at the steps in-between. By facilitating ***assistive movement*** a pattern can be practiced without agitating the lesion. As the pattern progresses and symptoms decrease, the assistance is decreased to the point that the patient can be progressed through the continuum ***of gravity eliminated movement*** and ***movement with gravity***, eventually moving against ***resistance***. The Pilates-evolved environment provides this continuum of movement.

SECTION VI: INTRODUCTION TO BIOENERGETICS

As the body is comprised of a skeletal system, a vascular system, a muscular system etc., there is also an energetic system. Eastern medical approaches including acupuncture, herbs, acupressure, shiatsu etc are based on energetic flows as the governing force to all other systems. Similarly, Yoga and Ayurvedic medicine are also energy-based. These ancient systems, which have been empirically proven over thousands of years, view the body as a microcosm of the universe. For example, diagnosis might include an imbalance in heat (high blood pressure, headaches, anger), or earth (digestion, swelling, concentration). Body (all anatomical references), mind (mental and emotional), and spirit (sense of well-being, motivation) are considered interrelated and inseparable. Healing of a structural problem can be supported by systemic energetic treatment. Also, a chronic systemic problem can weaken the body's ability to heal a structural problem.

Example: Knee pain

Healing of knee pain may typically be assisted by supporting the energetic system of the kidneys.
Conversely, kidney system depletion may make the knee joints more vulnerable and less responsive to treatment. The emotional imbalance might be excessive fearfulness.

NOTE: Diagnosis and treatment in energetic health systems **REQUIRES** individual diagnosis. There is not a direct cause and effect correlation as seen in Western thought. All references are common examples, which cannot be assumed in all patients. The organ systems referenced such as the "kidney system" is the energetic system and does not necessarily denote dysfunction of the anatomical organ as perceived in Western medicine.

SECTION VII: COMMON PATHOLOGIES

STENOSIS

***Definition*:**
Narrowing of the spinal canal (central stenosis) or nerve root canals (lateral stenosis), compromising the spinal cord or nerve roots.

Cause:
- Spur formation
- Facet joint hypertrophy due to arthritic changes
- Narrowing of the intervertebral discs causing approximation of the pedicles
- Disc protrusion

Symptoms:
Typically aggravated by extension include back pain, tingling, motor deficits (transient) and intermittent pain in one or both legs, which is worsened by standing or walking.

Treatment:
Physical therapy is directed at increasing mobility (extension) above and below the lumbar spine and improving general posture to reduce lordosis, which relatively decreases the size of the spinal canal.
Surgery may be indicated.

HERNIATED DISC

Definition:
The nucleus pulposus bulges or in advanced cases squeezes through a tear in the disc annulus. This can cause local chemical pain as well as radiating or radicular symptoms in the extremities.

Cause:
Multiple micro insults to the annulus or severe shear forces through the annulus(thought to occur with unsupported forward bending and rotation in the lumbar spine or lifting heavy loads without adequate support.)

***Symptoms*:**
Can be assymptomatic, can cause local pain as well as radicular pain, worse cases can apply pressure to the nerve root causing weakness and numbness to the region.

***Disc Composition**:*
Nucleus pulposus (fluid-like central portion); annulus fibrosis (elastic fibers surrounding nucleus)
Age 30-50 years old susceptible to disc injuries: annulus has begun to weaken, nucleus loses volume and narrows
Symptoms: peripheral pain in buttocks, thigh or calf; may present with a lateral shift; in more severe stages may present with neurogenic motor deficits (weakness) and/or loss of deep tendon reflexes.

Stages:
Disc Bulge:
- Posterior annulus tears
- Nucleus may bulge sufficiently to cause pressure on the Posterior Longitudinal Ligament (PLL), causing pain

Prolapsed Disc **:**(extruded nucleus): outer annulus and PLL fibers give way, allowing nucleus to bulge into neural canal
Sequestration: nuclear material has separated from the nucleus allowing it to be free in the neural canal

Treatment:
- Traction
- Manipulation
- Epidural steroid injection
- Biomechanical counseling
- Postural reeducation: maintain lordosis; exaggerate lordosis (McKenzie), lateral shifts.
- Surgery

FACET JOINT SYNDROME

Definition:
Characterized by a segmental hypomobility (facet lock) causing secondary hyper mobile or “facilitated segments” with pain and pain referral.

Cause:
Often occur with or because of disc degeneration.

Symptoms:
Localized Low Back Pain, can cause radicular symptoms, usually pain and not weakness.

Treatment:
Manipulation, mobilization

SPONDYLOLISTHESIS

Definition:
Instability most often at L5-S1 or L4-L5 due to a deficiency in the lamina causing anterior displacement.

Cause:
Attributed to the nature of the sacro-vertebral angle that forces the center of gravity at L-5 to fall anterior to the sacrum, causing a shearing vector.

Symptoms:
Can be assymptomatic, usually localized low back pain, more advanced cases can cause neurological damage affecting the spinal cord, nerve roots and the lower extremities.
Patient often sways at the hips to achieve extension.

Aggravating Factor:
Typically aggravated by extension activity. Minor injury causes acute pain with diffuse radiation into buttocks.

Treatment:
Therapy is directed at determining whether or not the segment has relative ligamentous stability. Then the patient is educated in segmental stabilization exercises in neutral or global stabilization in a posterior pelvic tilt.
Surgery may be indicated.

OSTEOPOROSIS

Definition:
Skeletal disease characterized by low bone mass and deterioration of bone tissue. This leads to bone fragility and increased fracture risks.

Cause:
Demineralization of bone due to multiple risk factors. Greatest risk factors include age, female, Caucasian, smoker, drinker and familial history.

Symptoms:
Often assymptomatic, subject is at high risk of fracture to hips and spine due to fragileness of bones.

Bone Mineral Density Testing:
- Dual Energy X-ray Absorptiometry (DEXA) is the gold standard due to its precision and low radiation dose
- Measures average peak bone mass and scores it relative to a normal
- Osteopenia: mildly reduced bone mass (1 – 2.5 standard deviations below mean)
- Osteoporosis: significantly reduced bone mass (2.5 or more sd below mean)

Treatment:
- Medication
- Pain management
- Exercise: neutral and extension only (may do posterior pelvic tilts to increase abdominal strength)

ROTATOR CUFF IMPINGEMENT

Definition:
Compression most often of the supraspinatus tendon, infraspinatus tendon or subacromial bursa against the acromion of the scapula due to compromise of the subacromial space.

Cause:
Functional instability of the shoulder joint complex with asynchronous firing of the scapular or glenohumeral joint stabilizers due to
- Micro trauma from overuse (age 35 and under)
- Decreased neuromuscular function due to under use (age 35+)
- Trauma
- Result
  Tendon inflammation and scarring
  Bone spurs

Symptoms:
Localized pain in the shoulder, referred pain into the lateral arm and weakness in the upper extremity. Over use of the upper trapezius is another common symptom.

Treatment:
- Differential diagnosis
- Inflammatory treatment
- Identify/correct underlying faulty movement pattern
- Surgery: subacromial decompression or debridement

ADHESIVE CAPSULITIS

Definition:
Capsular tightening of the glenohumeral joint

Cause:
Scar tissue, systemic arthritic conditions, disuse or unrehabilitated post-surgical
- Often there is no known precipitating factors
- Women affected more that men
- Initially complain of restricted mobility and pain at night
- Complain of pain in lateral arm that is worse with movement
- Pattern of restriction: ER, Abd, Flex, IR

Symptoms:
Minimal pain with chronic adhesive capsulitis, restrictive active and passive Range Of Motion

Treatment :*(all must be done together)*
- Pain control: joint mobilization - grade I/II oscillations
- Inferior capsular glides
- Scapular stabilization
- Passive stretch

Concerns:
- Easily flared up
- Patient must be closely monitored and given encouragement
- May take more that 3-5 months to resolve

SECTION VIII: GLOSSARY

Agonist: Muscles that are the prime movers of an action or closely associated with the prime movers.

Antagonist: Muscles that oppose or control the acceleration of the agonist. The antagonist can be responsible for faulty movement if firing out of phase.

Assistive Movement: Movement that is accomplished from a combination of external forces and voluntary contraction.

Closed-Chain Activities: Movement in which the distal segment of the motion (usually an extremity) is fixed (usually against a stable surface), while the proximal segment of the motion is moving.

Coronal Plane: A vertical plane that is at a 90-degree angle dividing the body into a front and back division. Usually associated with abduction and adduction.

Disassociation: The isolation of movement at a desired joint distal or proximal to the site of the lesion. Other names for disassociation are fulcruming or pivoting of a joint.

Dynamic Stabilization: The challenge of newly acquired movement or control against gravity and resistance.

Feedback: response-produced information acquired during or after performance; information is used to make error corrections. There are two main categories of feedback *intrinsic* and *augmented*.

> **Intrinsic Feedback** is naturally occurring or inherent information derived from the patient's own sensory and perceptual systems, such as visual, auditory, proprioceptive, and tactile feedback.
>
> **Augmented Feedback** is supplemental or added feedback derived from external sources such as verbal cues, electromyogram (EMG) biofeedback, and videotaped performance.

Gravity-Eliminated Movement: Movement that is accomplished through voluntary contraction in a position in which the force of gravity is not acting directly against the motion.

Gravity-Resisted Movement: Movement that is volitional and against the normal forces of gravity.

Horizontal Plane: A transverse plane that runs parallel to the ground, usually associated with rotational movements

Hypermobility: Excessive range of movement within a joint but within neuromuscular control.

Hypomobility: Lack of range available to a joint.

Instability: Excessive range of abnormal movements for which there is less than adequate protective muscular control (Maitland, 1986)

Joint Laxity: The degrees of joint play available based on inert and biomechanical properties.

Mobility: The ability to articulate in all desirable planes of movement appropriate to the specified joint or complex of joints.

Motor Control: Science of understanding movement.

Motor Learning: Set of internal processes associated with practice or experience leading to relatively permanent changes in the capability of skill.

Neural Set: Resting level of muscle activity, neurologically based phenomena of muscle tightness.

Oblique Plane: Any plane other than Coronal, Horizontal or Sagittal.

Open-chain Activities: Movement of the extremity on the trunk without fixation of the distal aspect of the extremity.

Pain Excitation: A neurological protective mechanism that recruits large muscle groups surrounding a painful lesion thus splinting surrounding joints.

Pain Inhibition: A neurological protective mechanism that inhibits motor unit recruitment thus decreasing potential muscle contraction.

Passive Movement: Movement from an external force without voluntary contraction.

Psuedo Closed Chain: Movement of the extremity on or through a fixed arc of space (a bicycle)

Resistive Movement: Voluntary contraction against resistive external forces including gravity.

Sagittal Plane: A vertical plane that divides the body into a right and left divisions. Usually associated with flexion and extension.

Splinting: Recruitment of large muscle groups surrounding a painful joint, protecting and limiting potentially harmful movement. Can be destructive if part of a faulty movement pattern.

Stability: A balance between mobility and control.

Stiffness: The decrease in available range of motion due to motor programming or physiological changes in the muscle (thixotrophy).

Synergist: Muscles that work together in force couple to produce a desirable or undesirable movement. Often thought to provide stability for the primary mover to execute its movement efficiently.

Thixotrophy: A physiological phenomena of muscle stiffness, based on the viscosity of the muscle fibers, and not neurological.

Tone: Pathological neuro response ranging from spasticity to flaccidity based on upper motor lesions or lower motor lesions. Often substituted incorrectly for neuro-set in normals.

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16. Anderson B.A, Spector A: Introduction to Pilates-Based Rehabilitation, Orthopaedic Physical Therapy Clinics of North America, Volume 9 (3) 395-410 Sep 2000

Joseph Pilates[1]

Joseph Pilates, who was born in 1880 near Dusseldorf, Germany, created the Pilates method of exercise. Joe was frail as a child, suffering from asthma, rickets and rheumatic fever. He overcame his physical limitations with exercise and bodybuilding, becoming a model for anatomical drawings at the age of 14. He became accomplished in many sports, including skiing, diving and gymnastics. Joe went to England in 1912, where he worked as a self-defense instructor for detectives at Scotland Yard. At the outbreak of World War I, Joe was interned as an "enemy alien" with other German nationals. During his internment, Joe refined his ideas and trained other internees in his system of exercise. He rigged springs to hospital beds, enabling bedridden patients to exercise against resistance, an innovation that led to his later equipment designs. An influenza epidemic struck England in 1918, killing thousands of people, but not a single one of Joe's trainees died. This, he claimed, testified to the effectiveness of his system.

After his release, Joe returned to Germany. His exercise method gained favor in the dance community, primarily through Rudolf von Laban, who created the form of dance notation most widely used today. Hanya Holm adopted many of Joe's exercises in her program, and they are still part of the "Holm Technique." When Joe was asked to teach his fitness system to the German army, he decided to leave Germany for good. In 1923, he emigrated to the United States. During the voyage, he met Clara, whom he later married. Joe and Clara opened a fitness studio in New York, sharing an address with the New York City Ballet.

The Pilates movement gains in popularity

By the early 1960s, Joe and Clara could count among their clients many New York dancers. George Balanchine worked out "at Joe's," as he called it, and invited Pilates to instruct his young ballerinas at the New York City Ballet. In fact, "Pilates" was becoming popular outside of New York as well. As the New York Herald Tribune noted in 1964, "in dance classes around the United States, hundreds of young students limber up daily with an exercise they know as a pilates, without knowing that the word has a capital P, and a living, right-breathing namesake." While Joe was still alive, only two of his students, Carola Trier and Bob Seed, are known to have opened their own studios. Trier, who had an extensive dance background, found her way to the United States after she fled a Nazi holding camp in France by becoming a contortionist in a show. She found Joe Pilates in 1940, when a non-stage injury pre-empted her performing career. Joe Pilates assisted Trier in opening her own studio in the late 1950s. Joe, Clara and Carola remained close friends until their respective deaths. Bob Seed was another story. A former hockey player turned "Pilates" enthusiast, Seed opened a Studio across town from Joe and tried to take away some of Joe’s clients by opening very early in the morning. According to John Steel, one day Joe visited Seed with a gun and warned Seed to get out of town. Seed went.

The second generation of Pilates teachers

When Joe passed away, he left no will and had designated no line of succession for the "Pilates" work to carry on. Nevertheless, his work was to remain. Clara continued to operate what was already known as the "Pilates" Studio on Eighth Avenue in New York where Romana Kryzanowska became the director in around 1970. Kryzanowska had studied with Joe and Clara in the early 1940s and then, after a fifteen-year hiatus due to a move to Peru, re-commenced her studies.

Several students of Joe and Clara went on to open their own studios. Ron Fletcher was a Martha Graham dancer who studied and consulted with Joe from the 1940s on in connection with a chronic

[1] ***History courtesy of Balanced Body Inc.***

knee ailment. Fletcher opened his studio in Los Angeles in 1970, where he attracted many Hollywood stars. Clara was particularly enamored with Ron and she gave her blessing to him to carry on the "Pilates" work and name. Like Carola Trier, Fletcher brought some innovations and advancements to the "Pilates" work. His evolving variations on "Pilates" were inspired both by his years as a Martha Graham dancer and by another mentor, Yeichi Imura. Kathy Grant and Lolita San Miguel were also students of Joe and Clara who went on to become teachers. Grant took over the direction at the Bendel's studio in 1972, while San Miguel went on to teach Pilates at Ballet Concierto de Puerto Rica in San Juan, Puerto Rico. In 1967, just before Joe's death, both Grant and San Miguel were awarded degrees by the State University of New York to teach "Pilates." These two are believed to be the only "Pilates" practitioners ever to be certified officially by Joe.

Other students of Joe and Clara who opened their own studios include: Eve Gentry, Bruce King, Mary Bowen and Robert Fitzgerald. Eve Gentry, a dancer who taught at the Pilates Studio in New York from 1938 through 1968, also taught "Pilates" in the early 60s at New York University in the Theater Department. After she left New York, she opened her own studio in Santa Fe, New Mexico. Gentry was a charter faculty member of the High School for the Performing Arts, as well as a co-founder of the Dance Notation Bureau. In 1979, she was given the "Pioneer of Modern Dance Award" by Bennington College. Bruce King trained for many years with Joseph and Clara Pilates and was a member of the Merce Cunningham Company, Alwyn Nikolais Company, and his own Bruce King Dance Company. In the mid-1970s, King opened his own studio at 160 W. 73rd Street in New York City. Mary Bowen, a Jungian analyst who studied with Joe in the mid-1960s, began teaching Pilates in 1975 and founded "Your Own Gym" in Northampton, Massachusetts. Robert Fitzgerald opened his studio on West 56th Street in the 60s, where he had a large clientele from the dance community.

Joe continued to train clients at his studio until his death in 1967 at the age of 87. In the 1970s, Hollywood celebrities discovered Pilates via Ron Fletcher's studio in Beverly Hills. Where the stars go, the media follows. In the late 1980s, the media began to cover Pilates extensively. The public took note, and the Pilates business boomed. "I'm fifty years ahead of my time," Joe once claimed. He was right. No longer the workout of the elite, Pilates has entered the fitness mainstream. Today, five million Americans practice Pilates, and the numbers continue to grow.