

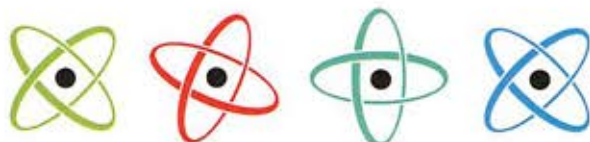


By Shirley Archer, JD, MA

**THIS TIME-TESTED METHOD
CONTINUES TO BE EFFECTIVE
FOR THOSE SEEKING CORE
CONDITIONING, COPING WITH
CHRONIC AILMENTS
OR STRIVING
FOR ATHLETIC
ACHIEVEMENT.**

The Science of Pilates

RESEARCH UPDATE



When Victor Sanakai was playing tennis for the Auburn University Montgomery National Championship team, he thought he was going to need rotator cuff surgery. But first he sought the advice of Michele Olson, PhD, a Pilates researcher who works with student athletes.

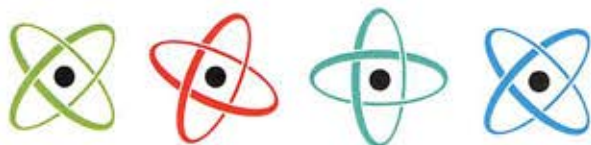
Olson, a senior clinical professor of sport science at Huntingdon College in Montgomery, Alabama, suggested Sanakai try Pilates exercises for the shoulders, upper back and abdominals.

"I was shocked at how weak my core was!" Sanakai says. "I could *not* get through the hundred, yet I could do 60 crunches with no sweat. I could *not* do the 'offering exercise' for the rotator cuff with 3-pound weights! I am 180 pounds with 6% body fat and can max bench-press 160 pounds. My stabilizing muscles were so weak they were nonexistent.

"After barely 4 weeks, I was off the injury list, and I played number one on the tennis team my senior year at the university. My shoulder has never bothered me again. And I actually have abdominal strength. The strength in my abs unloads my shoulder joint, so I don't [strain] it."

Sanakai typifies individuals who seek Pilates for a competitive sports advantage.

While no longer making headlines for runaway growth, Pilates programs are now widely available at fitness facilities, private studios, rehabilitation clinics and sports performance/community centers. These venues serve young and old—from elite athletes to people who are infirm. >>



Joseph Pilates developed his training method, which he called "Contrology," in the mid-20th century for conditioning and therapeutic purposes. "Contrology develops the body uniformly, corrects wrong postures, restores physical vitality, invigorates the mind, and elevates the spirit," he wrote (Pilates & Miller 2000). Laureen DuBeau says educators like those at the Merrithew™ corporate training center in Toronto, where she is a master instructor trainer, "continue to evolve the practice as we learn more about optimal function and movement patterns, integrating advances in anatomy, biomechanics and rehabilitation research."

Read on for a look at Pilates research today and how the training method continues to

serve a diverse range of clientele and patients while being modernized to reflect updated, evidence-based principles that echo and celebrate its creator's original intention.

Core Advances

Modern Pilates is a mind-body exercise approach requiring core stability, strength and flexibility, with attention to muscle control, posture and breathing (Wells, Kolt & Bialocerkowski 2012) (see "Defining Modern Pilates," right). Although Pilates has been with us for almost 100 years, many studies of the method have lacked scientific rigor. This is likely because

it's a complementary, natural therapy for which research funding is limited. While larger or more long-term randomized controlled trials are needed, a growing number of peer-reviewed studies are providing insight into the method's numerous health benefits.

Here is a select overview of findings.

PHYSICAL CONDITIONING

Strong evidence shows that Pilates is an effective conditioning method for healthy individuals, particularly those who want to increase core stability.

Builds muscular strength and endurance.

Multiple studies confirm that, when practiced over time, Pilates develops core muscular strength and endurance. Investigators found that healthy women who did Pilates mat exercise three times per week for 5 weeks saw improvements in abdominal muscle endurance; young, healthy adults who practiced three times per week for 8 weeks gained abdominal and lower-back

muscle endurance; and adults ages 25–65 built abdominal and upper-body muscle endurance with 12 weeks of training, twice a week (Archer 2014). Waist circumference improved in a study lasting 8 weeks but did not improve in a study lasting 4 weeks (Cruz-Ferreira et al. 2011).

In 2015, Brazilian researchers conducted a randomized controlled trial with 32 adults, ages 62–64, who did two Pilates training sessions per week for 12 weeks (Oliveira, Oliveira & Pires-Oliveira 2015). The study showed that equipment-based Pilates is effective progressive resistance training for building lower-limb strength.

Improves body composition. A systematic review of studies found some evidence that Pilates may be effective in reducing body fat and increasing fat-free mass in the short term. Many studies have poor designs that preclude reaching a more conclusive finding (Kamioka et al. 2016). In a recent study of 60 subjects with excess weight or obesity, researchers found that those who did three 60-minute mat and equipment-based Pilates sessions per week for 8 weeks improved their body composition (Rayes et al. 2019).

Increases mobility and flexibility. Joseph Pilates was a firm believer in the importance of flexibility, citing the nimbleness of cats as an example of how bodies should function. Numerous studies show that Pilates training improves flexibility in the hamstrings, shoulders, and upper and lower back among healthy adults (Archer 2014). In a review of studies on older adults, Pilates was found to be effective in improving mobility, particularly in relation to walking, even among patients with Parkinson's (Bullo et al. 2015). One study involving older women compared static stretching with Pilates training (1 hour twice a week for 3 months) and found that Pilates participants saw greater improvements in flexibility (Oliveira, Oliveira & Pires-Oliveira 2016). >>

**"PILATES WILL PREPARE
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MUSCLES, WHILE ALSO
HELPING TO IMPROVE
MOOD AND EASE STRESS."**

—Michele Olson, PhD



DEFINING MODERN PILATES

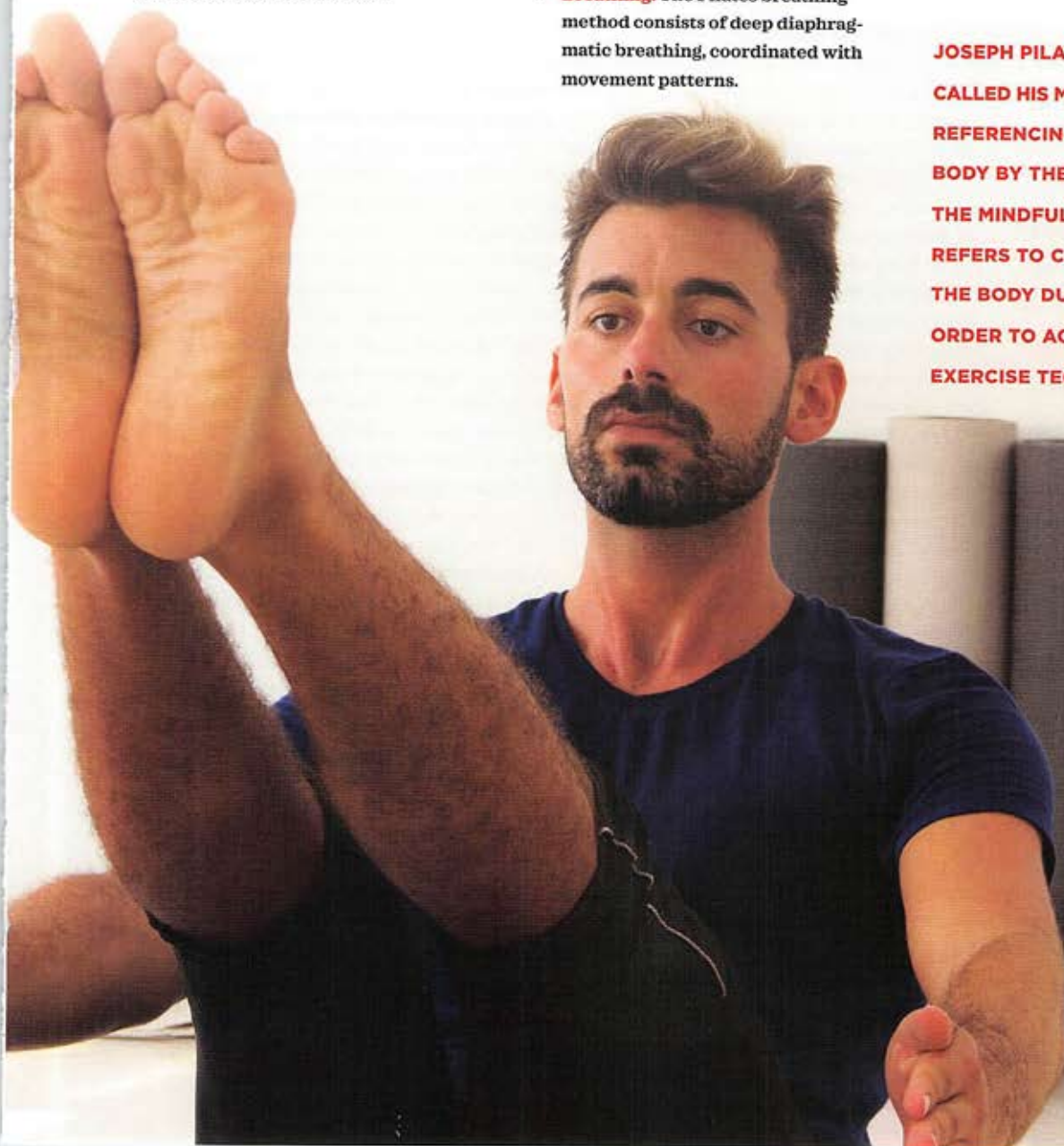
Modern Pilates has evolved to integrate evidence-based principles with traditional training techniques. To replicate benefits confirmed by current research, it's essential for both researchers and teaching professionals to be in consensus regarding what Pilates practice is. In 2012, in an effort to lend uniformity to future studies and to build common understanding, researchers surveyed 119 peer-reviewed studies and identified Pilates as a mind-body exercise with six specific components:

- **Core stability.** Also referred to as "centering" in traditional Pilates, this refers to activation of deep, stabilizing trunk muscles to support the lumbar spine and pelvis. In traditional Pilates, it involved tightening the muscular center of the body—or "power-house"—during exercises.
- **Muscle control.** In studies, this refers to isolated, segmental control of spinal motion, with or without coordination with limb movement.
- **Breathing.** The Pilates breathing method consists of deep diaphragmatic breathing, coordinated with movement patterns.

- **Flexibility.** This refers to moving joints through as full a ROM as possible.
- **Posture.** Pilates practice is characterized by close attention to alignment and positioning of the body.
- **Strength.** This is distinct from endurance and is included because many researchers examined improvements in muscular strength from Pilates practice.

Source: Wells, Kolt & Bialocerkowski 2012.

JOSEPH PILATES ORIGINALLY CALLED HIS METHOD "CONTROLOGY," REFERENCING CONTROL OF THE BODY BY THE MIND. IN GENERAL, THE MINDFUL ASPECT OF PILATES REFERS TO CONCENTRATING ON THE BODY DURING MOVEMENTS IN ORDER TO ACHIEVE ACCURATE EXERCISE TECHNIQUE.



PUT RESEARCH INTO PRACTICE

Lisa Marie Bernardo, PhD, MPH, RN, a certified Pilates instructor in Pittsburgh, has co-authored Pilates research studies. She recommends that Pilates instructors keep up with research findings and suggests the following for putting research into practice:

1. Read original research published in peer-reviewed journals.
2. Discuss research findings with other instructors and clients.
3. Contact the Pilates investigator (study author) and ask specific questions; for example, find out what exercises, sequencing, number of repetitions and equipment were used in the study.

"Investigators are always excited to discuss their research and are usually willing to share their publication if the Pilates instructor is unable to obtain the original study," Bernardo says.

**IDEAL ALIGNMENT IS
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THE EFFICACY OF
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Christine Romani-Ruby, DEd, MPT, owner of PHI Pilates in Pittsburgh and a Pilates master trainer and researcher, confirms the flexibility benefits. "I've been working with physical therapy students at Wheeling Jesuit University," she says. "We're finding that the core stability that Pilates mat work creates directly improves flexibility of the hamstring muscles without performing any hamstring stretching. We compared these effects to static stretching [of] the hamstrings and found there were more significant results with just Pilates mat exercises."

Enhances posture. The Pilates method is widely recognized for its effectiveness in improving postural alignment, but few randomized controlled studies have been conducted. A 2013 study with 74 healthy women (age 34.9 ± 16.4) found that those who did 1-hour Pilates mat sessions twice a week for 6 months significantly improved frontal alignment of the shoulders and sagittal alignment of the head and pelvis (Cruz-Ferreira et al. 2013). Ideal alignment is associated with pain-free movement. The efficacy of Pilates exercises in improving alignment may be a key to its role in pain relief.

AGING ACTIVELY

Research findings reinforce claims that Pilates is effective training for healthy aging, as it addresses specific needs like fostering functional independence, reducing fall risks, and maintaining bone density and cognitive fitness.

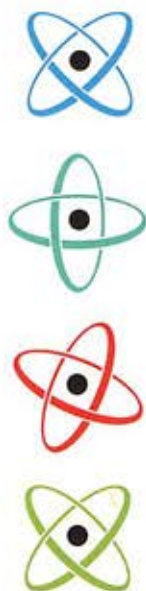
A boon for functional fitness. Joseph Pilates emphasized that the purpose of his exercise

program was to make it possible to earn a living and enjoy leisure time. More than one review of studies suggests that the exercises can improve functional autonomy for adults ages 60–80 (Bueno de Souza et al. 2018; Bullo et al. 2015). Researchers recommend training twice a week at a moderate intensity and adding supplemental cardio exercise for overall conditioning (Bullo et al. 2015).

Better balance, fewer falls. Studies show that Pilates exercise improves balance for older adults. In a study of 30 older adults who participated in a combination of mat and equipment-based Pilates exercises for an hour 2 days per week for 5 weeks, subjects made improvements in dynamic balance, posture and strength—and gains persisted 1 year later (Bird & Fell 2014). A 2018 study of 55 men and women found that those who participated in group reformer classes once a week for 10 weeks significantly improved static and dynamic balance, functional mobility, balance self-efficacy, and lower-extremity active range of motion (Roller et al. 2018).

A method for stronger bones. A 2015 study of 41 postmenopausal women found that those in the Pilates group significantly increased bone mineral density in the lumbar region, significantly decreased pain intensity and enjoyed better quality of life (Angin, Erden & Can 2015). DuBeau says that, last year, the training center where she works launched a new Stott Pilates® program focused on bone health and osteoporosis. The program is "specially designed for instructors working with those who have been diagnosed with osteoporosis to help increase joint mobility, muscular strength and endurance, improve balance and maintain functionality, all while reducing movements that may put the spine at risk," she says.

A potential cognitive boost? Joseph Pilates reminded students to concentrate when performing the method, emphasizing that concentrating would help them to achieve correct movements and to build a sound mind. Preliminary evidence suggests there are brain fitness benefits from the training. In a 2013 study on five subjects, investigators found an increase in the brain's alpha peak power after 10 weeks. Alpha peak power is believed to be related to neural network activity, memory performance and other cognitive functions (Bian et al. 2013). In a 2017 study of 28 older women with mild cognitive impairment, those who practiced Pilates for 8 weeks showed significant improvements in global and specific cognitive domains (Jurakic et al. 2017). More research is needed. >>



GAME-CHANGING BENEFITS FOR ATHLETES

From recreational athletes to Olympians and professionals with million-dollar contracts, competitors rely on Pilates. Christine Romani-Ruby, DEd, MPT, is an athletic trainer and a master Pilates trainer who has worked with football, hockey and baseball pros and more. She notes the following important performance benefits of Pilates training for athletes:

Stability for flexibility.

Studies show that greater core stability leads to improvements in length and flexibility of the hamstrings—critical for increasing speed. Pilates enables athletes to work through dynamic flexibility exercises while simultaneously improving core strength, leading to increases in overall speed.

Explosive power. Spring resistance on the Pilates reformer and jump board are ideal for plyometric training, allowing athletes to practice rebounding and exploding with control—an asset for basketball players and wide receivers.

Precise movement.

Pilates emphasizes mindful, efficient movement, which translates into fewer injuries and improves execution on the playing field. Increasing awareness of overall movement and body position in space improves agility and alignment.

Longevity. Pro athletes experience aging like other adults. At age 30, adults begin to lose connection with hip joints for balance and mobility and start to lose overall muscle mass. Paraspinal muscles are the areas that weaken most. Pilates builds muscle balance and works against postural changes that come with age, resulting in healthy movement patterns that can prevent overuse injuries and keep athletes in the game.

Efficient whole-body workouts. Pro athletes are busy. The Pilates method uses whole-body movements for short, efficient training. A 15-minute workout can challenge all the body's muscle groups for a time-saving addition to an athlete's regular routine.





PHOTO: © MERRITHW CORPORATION

Life enhancement and improved quality of life. In a randomized controlled study of 24 women ages 61–67, researchers found that those who did 30-minute Pilates mat and equipment-based sessions twice a week for 6 months experienced significant improvements in quality of life (Liposcki et al. 2019).

HELP FOR SPECIAL CIRCUMSTANCES

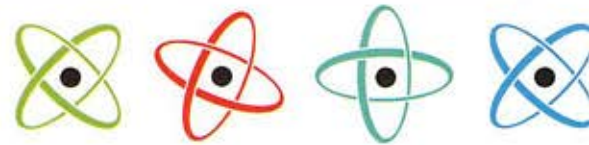
For both younger and older adults, growing evidence is pointing to Pilates' value in helping people with specific medical conditions, particularly individuals who cannot train at high-intensity levels.

A boost for prenatal women. A randomized clinical trial of 105 pregnant women showed

that those who participated in twice-weekly Pilates sessions during pregnancy had significant improvements in blood pressure, hamstring flexibility and spinal curvature, as well as improvements during labor—fewer caesarean births, episiotomies and instances of obstructed labor (Rodríguez-Díaz et al. 2017).

Relief from back pain. Much research on the Pilates method focuses on people with chronic lower-back pain. In a 2015 Cochrane Review of 10 studies, investigators concluded that while "there is some evidence for the effectiveness of Pilates for low back pain, there is no conclusive evidence that it is superior to other forms of exercises" (Yamato et al. 2015).

Reduction in osteoarthritis symptoms. In a 2018 randomized controlled study of 41 subjects



with pain and disability from knee osteoarthritis, investigators found that those who practiced Pilates experienced more significant improvement in pain and disability than those who did conventional therapeutic exercise (Mazloun et al. 2018).

Help for neuromuscular degenerative issues.

For people with multiple sclerosis, Pilates is "a feasible therapy" that can improve physical function and may reduce self-perceived fatigue, according to a 2019 review of 14 studies (Sánchez-Lastra et al. 2019). As with lower-back pain studies, investigators noted that Pilates is not more beneficial than other physical therapies.

"Those with conditions like MS need to challenge their muscles but cannot do HIIT [high-intensity interval training] or high-intensity weight training because of the inflammation that results when you work out vigorously," Olson says. "They need to develop balance, [build] core strength and relieve stress. Pilates appears to be a good fit."

Aid for women with breast cancer. In a 2019 review of studies on breast cancer, researchers noted a lack of high methodological quality but still found it possible to discern valuable conclusions—in particular, that women with breast cancer often *adhered* well to Pilates programs. Again, investigators noted that Pilates is not more beneficial than other physical therapies; however, it did lead to significant improvements in shoulder ROM, perceived pain and quality of life (Pinto-Carral et al. 2018).

Decrease in fibromyalgia symptoms. Emerging research shows that Pilates may be helpful for people coping with fibromyalgia. In a preliminary randomized controlled study of 36 women with the disorder, those who practiced Pilates three times per week for 4 weeks experienced more pain relief and less anxiety than those in a massage group (Ekici et al. 2016). More research is required.

Lifestyle Benefits and Athletic Preparation

Joseph Pilates said: "Physical fitness is the first requisite of happiness." He believed a foundation of fitness and healthy living resulted in a happier life.

More recent studies have tested that hypothesis by examining the qualitative benefits of Pilates practice. In research led by Lynne Gaskell, MS, lecturer at the University of Salford in England, investigators looked at the impact of Pilates practice on the lives of 15 women and men

with chronic musculoskeletal conditions like lower-back pain and osteoarthritis. In addition to finding physical improvements, the study showed such benefits as a more active lifestyle, the ability to manage individual conditions more effectively, increased feelings of self-confidence and improvements in social life (Gaskell & Williams 2018). "Improving function in meaningful daily activities produced psychological and social benefits that increased motivation to adhere to the program and promote a healthier lifestyle," Gaskell says.

These findings confirm an important aspect of Pilates training. While studies comparing Pilates with other exercise interventions show it is not more effective with regard to physical improvements, Pilates has a relatively high adherence rate and people of all levels of ability enjoy the practice.

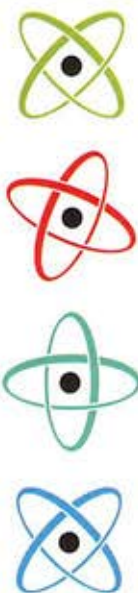
"Pilates is an excellent choice for developing a baseline of muscular fitness and flexibility, which is what is needed to couple one's practice with more vigorous cardio activity," Olson says. "Pilates will prepare virtually anyone for the requirements of more intense exercise by helping to build good balance and strong, spine-saving core muscles, while also helping to improve mood and ease stress."

Although many leading athletes swear by Pilates, there is little high-quality published research related to the method and sports performance. Olson is among researchers who have seen direct evidence of its effectiveness. "My research and others' show the ability of Pilates to recruit the deep core for spinal stabilization," she says. "A distance program I did with former tennis pro Anna Kournikova employed the hundred, rollup, double-leg stretch and variations of the teaser. She reported positive effects for strength and appearance."

Olson adds that "another major benefit of Pilates for athletes is the 'mindfulness' aspect of the method. Athletes undergo formal psychological coaching to 'stay in the moment,' 'focus on the ball, not the opponent' and more."

Romani-Ruby, who also trains elite athletes, says, "Good posture, improvements in flexibility, muscle balance and core stability, and increased confidence [from Pilates training] all correlate with injury prevention, performance enhancement

FOR BOTH YOUNGER AND OLDER ADULTS, GROWING EVIDENCE IS POINTING TO PILATES' VALUE IN HELPING PEOPLE WITH SPECIFIC MEDICAL CONDITIONS, PARTICULARLY INDIVIDUALS WHO CANNOT TRAIN AT HIGH-INTENSITY LEVELS.



and longevity in sport" (see "Game-Changing Benefits for Athletes," page 29).

Of note: In a study of 32 experienced male runners ages 18–28, those who did mat Pilates for an hour twice-weekly for 12 weeks had a significantly faster 5K running time and, according to electromyography activity, had less muscle activation, suggesting better "neuromuscular economy." Study authors believe this was due to control and stabilization of the lumbopelvic region (Finatto et al. 2018).

Return to Life Through Pilates

Experts think that Pilates is positioned for steady growth. "As more research emerges about the myriad benefits of Pilates for different sub-sectors of the population," says DuBeau, "Merrithew has adapted and expanded our programming to suit the specific needs of those individuals, creating education for active aging, rehabilitation, and post- and prenatal clientele." New studies are likely to add to existing support for the Pilates method and its unique blend of mind-body integration, core conditioning and whole-body movement.

Lisa Marie Bernardo, PhD, MPH, RN, a certified Pilates instructor in Pittsburgh, has one caveat. "Instructors need to seek training for the additional knowledge, skills and abilities to effectively adapt Pilates principles and exercise to work with special populations," she says. And education providers need to offer specialized training for the wide array of individuals in those groups—from athletes to people in rehab or prehab to those with chronic conditions.

Joseph Pilates envisioned that his work could help people from all walks of life to "return to life." Strengthened by insight from numerous researchers and practitioners, the Pilates method seems poised to achieve this ambitious goal.

Shirley Archer, JD, MA, was IDEA's 2008 Fitness Instructor of the Year. She's an award-winning author of 16 books, including Pilates Fusion: Well-Being for Body, Mind and Spirit, and is based in Los Angeles and Zürich. Find her (@shirleyarcher) on Twitter, Pinterest and Instagram or at shirleyarcher.com.

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