

Pilates Training in the ElderlyEmir İbrahim Işık¹, Selda Başar²¹ Abdi Sutcu Vocational School of Health Services, Cukurova University, Adana, Turkey² Faculty of Health Sciences, Gazi University, Ankara, Turkey

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Abstract: Aging brings along a series of musculoskeletal problems due to physiological changes. Many elderly people experience functional loss due to musculoskeletal problems. The demand for complementary, clinically effective, safe, patient-acceptable and, cost-effective therapeutic methods to reduce or partially prevent these losses is increasing day by day. Pilates is an exercise method that has beneficial effects on some health factors that are lost with aging. It is stated that it can strengthen the body against the difficulties it may encounter by strengthening the core stabilizing muscles around the pelvis and spine and improving the breathing pattern. It has been reported that Pilates has positive effects on posture, balance and fall risk, flexibility, strength, body composition and functional autonomy indicators for the advanced age group. In this review, the evidence of these most frequently studied effects of Pilates training in the elderly group is summarized in the light of the current literature.

INTRODUCTION

Pilates has become one of today's fashion words thanks to the influence of media and social media. Hundreds of new exercise videos added to the internet every day, including elite athletes and famous people, have made pilates even more popular¹. Pilates is not an exercise approach that includes pre-determined standard positions and movements, on the contrary, it is a physical and spiritual training method that anyone can do and increases physical strength, flexibility and balance-coordination, reduces stress and anxiety, improves well-being and mental focus². The basis of the method is a body and mind centering technique based on providing and maintaining lumbopelvic stability³.

Pilates, which was put into rehabilitation by medical units dealing with dance, has been the preferred exercise method of the dance world for a long time⁴. It is not uncommon for healthcare clinics today to have Pilates equipment⁵. Pilates training is used as part of rehabilitation programs for orthopedic injuries, patients with neurological disorders, postpartum, chronic pain, arthritis, and many other movement dysfunctions. It is also preferred in special groups such as children and the elderly, as well as in adults, for the protection and improvement of general health^{6,7}. The purpose of this review is to explain the historical context of Pilates training and present the results of Pilates programs implemented in the elderly population.

History of Pilates Training

Joseph Hubertus Pilates, the founder of the Pilates concept, was born in 1880 in Düsseldorf, Germany. His childhood passed with diseases such as asthma and rickets. He trained in gymnastics, boxing, yoga and karate to improve his health. He was a circus performer and self-defense arts instructor when he was young. Combining Eastern and Western philosophies, he began to develop his own exercise system called Contrology. His method soon gained popularity in Germany. He immigrated to the United States in 1926 and quickly became popular while continuing his studies⁴.

Joseph Pilates died in 1967 at the age of 87. Since his death, his work has been continued by many students^{7,8}. The principles outlined by Joseph Pilates in his book *Return to Life through Contrology* are still valid today, and there are two more principles in the modified forms of Pilates training. These eight principles adopted today are concentration, control, centering, fluency, precision, breathing, relaxation and stamina⁷.

Principles of Pilates Training

Concentration: Pilates training requires a mental focus on the target area of one's own body. Concentration draws attention to the working body segment, potentially improving neuromuscular functioning and ultimately improving the quality of movement⁹.

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Control: Pilates training aims at contracting the right muscle at the right moment so that proper movement can occur. Every stage from the beginning to the end of the movement continues and ends under control. Controlled movement also reduces the risk of injury¹⁰.

Centering: There are many muscles in the abdomen, lumbar region and hip complex, which is accepted as the center of our body and called the core region. Muscles such as the multifidus, quadratus lumborum, iliopsoas, transversus abdominus, and diaphragm in this region are mainly involved in the protection of the lumbar region. A strong and active core is an indication of a strong center. With centering, movements of the head, shoulders, thorax, pelvis and extremities are organized around a central base^{9, 10}.

Fluency: In Pilates training, the flow of movements is continued with a body-mind interaction. Movements and transitions must occur in a slow and fluid harmony to achieve the effects of training better. Breathing and concentration are also included in this adaptation process¹¹.

Precision: Pilates training is concerned with quality, not quantity. Performing the movements correctly instead of repeating a certain number of times increases the quality of the movement. The activation and contraction of the targeted muscles at the targeted moment depend on this. In cases where this principle is not sufficient, training moves away from the integrity within itself².

Breathing: It is important to breathe properly during exercise. Respiration is thought to be a catalyst for core stability⁸. Compared to other exercise methods, diaphragmatic breathing is used less in Pilates training. The reason for this is the view that increased intra-abdominal pressure during diaphragmatic breathing reduces the activation of the transversus abdominis muscle⁹.

Integrated Isolation: In order to learn the correct posture and maximize the benefit to be gained from movements, daily activities should be continued within the framework of centering and other principles⁸.

Stamina-Routine: Pilates training provides muscular endurance in the core and other small stabilizing muscles. Muscle endurance is more important in spine training than pure muscle strength because the deep stabilizers of the spine are constantly working². At the same time, it facilitates the formation of continuous functioning muscle memory, which has become routine^{9, 10}.

Use of Pilates Training in Rehabilitation

Pilates training is used more and more frequently by clinicians and is preferred as one of the therapeutic exercise interventions. This is due to the presence of more than 500 types of devices and exercises that can be used in training to aid or resist movement¹². In addition, the short movement patterns required for various activities allow clinicians to further evaluate patients for movement deficiencies⁴. It has been used in orthopedic rehabilitation, neurological rehabilitation, obstetric-gynecological rehabilitation, pediatric rehabilitation and geriatric rehabilitation^{6, 7, 13-17}.

Pilates Training for the Elderly

With aging, there is a decrease in the level of physical activity¹⁸. In addition to the decrease in the activity level, it is known that the elderly have inability to continue the exercise program when they are included in an exercise program planned for them¹⁹. Factors affecting older people's exercise participation patterns include concerns about

fitness for physical exercise in old age, the belief that exercise can be harmful or at least not beneficial in preventing disease, and a perceived lack of physical ability^{20, 21}.

Modified forms of Pilates training are used for the elderly²². Modifications such as reducing the number of repetitions in movements, extending the progression time of training, reduced position change and selection of suitable devices for the movement are also preferred^{22, 23}. The device to be used and the exercise intensity are adjusted to assist or resist movement, depending on the physical level of the individual²⁴.

In the literature, it has been reported that the Pilates method has positive effects on posture, balance and fall risk, flexibility, strength, body composition and functional autonomy indicators for the elderly population^{13, 25, 26}. In addition to all these, it has been shown to improve the general health of the elderly²⁷. In line with these indicators, a brief description of the health benefits of Pilates training in the elderly is presented below:

Posture: Aging causes some postural changes in the human body. Old age causes postural changes such as head displacement²⁸, decrease in lumbar lordosis²⁹, tendency to flexion in the whole body and thoracic kyphosis³⁰. Posture training and corrective exercises are generally recommended in cases of deviation from the perception of correct posture^{29, 31}. Pilates training is an exercise program that can serve this purpose. It is stated that it improves posture by increasing body awareness^{7, 11}. Some exercises used in Pilates training improve trunk muscle stability to achieve and maintain an erect position³². It also includes exercises aimed at strengthening weak and elongated muscles and stretching strong and shortened muscles. In this way, it contributes to the prevention of postural disorders caused by adaptation³³.

Muscle Strength: A decrease in muscle strength is observed with neuromuscular losses that occur in the later stages of the aging process³⁴. In addition, the decrease in balance and the increase in the risk of falling also restricts the movement and increases the speed of the loss in muscle mass¹⁹. It is known that Pilates training provides a good trunk stabilization by strengthening the core muscles and the muscles around the spine in the elderly^{6, 11}. It is said to improve synchronization between respiratory muscles and trunk stabilizers by increasing muscle control³⁵. Although it focuses on the core muscles, it was determined that the strength of the exercises with the participation of the lower and upper extremities was adjusted and the strength of the extremity muscles increased at the end of the Pilates training thanks to the exercises performed with the loads created by the body weight^{25, 36, 37}.

Flexibility: With aging, joint range of motion decreases. The elderly who are inflexible have increased muscle tone and a lower flexural tolerance compared to the elderly who have normal flexibility³⁴. Because even simple tasks such as bathing require a lot of range of motion, flexibility is associated with independence and quality of life, especially for the elderly³⁸. Pilates training is known to improve flexibility. Training includes dynamic type stretching rather than static stretching. It is thought that improvements in flexibility after Pilates training may be a result of the gentle and regular stretching movements that the exercises included^{39, 40}. Regular stretches can also contribute to flexibility by creating new contraction units or sarcomeres on muscle fibers⁴¹. There are also studies suggesting that improvements in flexibility may be related to a reduction in body fat. This view is supported by the fact that the reductions in range of motion are mainly due to the inhibition of inter-segment movements caused by excess fat⁴².

Balance and Risk of Falling: Elderly falls are the main source of disability, death, and healthcare benefits¹⁹. Thirty percent of falls have been reported to cause serious injuries, reduce independence and increase the risk of premature death⁴³. Loss of balance is an important modifiable risk factor for falls. For this reason, exercises aiming to improve balance emerge as an important component of fall prevention programs both in clinical practice and research literature³⁰. Pilates training consists of exercises that use resources such as gravity and the resistance of the springs on the devices used to help maintain the smooth movement⁴⁴. It aims to prevent automatic movements responsible for unwanted muscle activities that can cause injury⁴⁵. It has been determined that the effects such as strengthening the core muscles, motor learning and the development of proprioceptive sense, as well as the movements aimed directly at balance within the Pilates training in the elderly, increase balance and reduce falls^{33,36}. In addition, it has been argued that the postural improvement, muscle strength and flexibility gained by training have a positive effect on balance⁶. The aim of Pilates training is to fuse the mind and body. In this way, the body uses the mechanical advantage at the highest level to achieve optimum balance, strength and health⁴⁶. From a clinical point of view, Pilates consists of synergistic movement patterns that include isometric, eccentric and concentric muscle contractions. These movement patterns can easily be transformed into functional activities. The lumbo-pelvic stability gained by Pilates training during functional activities contributes to the prevention of falls by supporting movement sensitivity, segmental mobility, coordination and balance of the spine^{26,47}.

Body Composition: It is known that changing body composition has an effect on the age-related decline in physical functions. Understanding that body composition is particularly associated with chronic disease morbidity and mortality risk has increased the importance of studies on measurement and evaluation and regulation of body composition⁴⁸. Although there are many exercise methods to regulate body composition in the elderly, Pilates training is one of the exercises used for this purpose³⁴.

Pilates training provides a gradual increase in exercise intensity through exercise variety and difficulty when practiced both on the mat without equipment and with equipment. Although this increase provides significant benefits to the physical condition and trainable physical abilities of the elderly individual, it improves muscle strength and can affect the results of body composition^{23,49}. Although Pilates training was not originally designed to achieve weight control, it is seen as an alternative strategy that can be used in weight loss and body composition regulation, especially in the elderly who do not like traditional physical exercise models^{5,11}. It is stated that this training can be preferred in the elderly who cannot do other aerobic exercises that are more effective in reducing body weight^{13,34}.

Functional Autonomy: Functional autonomy depends on variables such as strength, flexibility, coordination, balance, interpretation of sensory stimuli, and cognitive capacity. Some or all of these variables may be lost during the aging process³⁸. Preserving or improving autonomy requires work involving these variables. It is known that physical activity can improve strength, endurance, flexibility, balance, and motor skills^{18,41}. It is argued that Pilates training also improves the abilities developed by physical activity in the elderly in a similar way and enables the development of motor control by increasing body-mind awareness^{10,24,31,50}. With the development of functional autonomy, improvement in self-care skills and a reduction in injury risk are achieved⁵⁰.

Conclusion

As a result, Pilates training is a "multi-model" exercise approach that includes the basic components of modern exercise training such as balance, strength, and flexibility. Based on the available literature, it can be concluded that Pilates training can be considered an effective method for physical functions involving these components in the elderly. At the same time, care should be taken to avoid unwanted effects while performing Pilates training practices. For this, more research is needed for specific protocol recommendations of Pilates training interventions targeting the elderly. Individual benefits and potential risks for the elderly should be discussed and the form of Pilates training should be decided and applied carefully.

Authors' note

This review is based on the general information section of the doctoral thesis entitled "Comparison of the Effects of Clinical Pilates and Aerobic Exercise Training on Physical Performance, Mood State and Social Status in the Elderly with Mild Cognitive Impairment.". None of the authors has conflict of interest.

REFERENCES

1. Thompson WR. Worldwide survey of fitness trends for 2018: the CREP edition. *ACSM's Health & Fitness Journal*. 2017;21:10-19.
2. Ungaro A. *Pilates Practice Companion*: Dorling Kindersley Ltd; 2011.
3. Adams M, Caldwell K, Atkins L, Quin R. Pilates and mindfulness: a qualitative study. *Journal of Dance Education*. 2012;12:123-130.
4. Owsley A. An introduction to clinical Pilates. *International Journal of Athletic Therapy and Training*. 2005;10:19-25.
5. Geweniger V, Bohlander A. *Pilates—A teachers' manual: Exercises with mats and equipment for prevention and rehabilitation*: Springer; 2014.
6. Byrnes K, Wu P-J, Whillier S. Is Pilates an effective rehabilitation tool? A systematic review. *Journal of bodywork and movement therapies*. 2018;22:192-202.
7. Wood S. *Pilates for Rehabilitation*: Human Kinetics; 2018.
8. Latey P. The Pilates method: history and philosophy. *Journal of bodywork and movement therapies*. 2001;5:275-282.
9. Muscolino JE, Cipriani S. Pilates and the "powerhouse"—I. *Journal of bodywork and movement therapies*. 2004;8:15-24.
10. Iulian-Doru T, Vasilica G, Maria T, Claudia-Camelia B. Pilates Principles -Psychological Resources for Efficiency Increase of Fitness Programs for Adults. *Procedia-Social and Behavioral Sciences*. 2013;84:658-662.
11. Siler B. *The Pilates body: the ultimate at home guide to strengthening, lengthening, and toning your body--without machines*: Harmony; 2000.
12. Lemos AQ, Brasil CA, Valverde D, dos Santos Ferreira J, Lordêlo P, Sá KN. The pilates method in the function of pelvic floor muscles: Systematic review and meta-analysis. *Journal of bodywork and movement therapies*. 2019;23:270-277.
13. Miranda S, Marques A. Pilates in noncommunicable diseases: A systematic review of its effects. *Complementary therapies in medicine*. 2018;39:114-130.
14. Mazloum V, Sahebozamani M, Barati A, Nakhaee N, Rabiei P. The effects of selective Pilates versus extension-based exercises on rehabilitation of low back pain. *Journal of bodywork and movement therapies*. 2018;22:999-1003.
15. Marques KAP, Trindade CBB, Almeida MCV, Bento-Torres NVO. Pilates for rehabilitation in patients with multiple sclerosis: A systematic review of effects on cognition, health-related physical fitness, general symptoms and quality of life. *Journal of Bodywork and Movement Therapies*. 2020;24:26-36.
16. Perfeito RS, Allevato L, da Silva Silveira D. Effects of the practice of Pilates in pregnancy: a literature review. *Revista Saúde Física & Mental-ISSN 2317-1790*. 2020;7:30-44.
17. Walter AA, Van Puymbroeck M, Bosch P, Schmid AA. Complementary and integrative health interventions in post-stroke rehabilitation: a systematic PRISMA review. *Disability and Rehabilitation*. 2020:1-10.

18. Zubala A, MacGillivray S, Frost H, et al. Promotion of physical activity interventions for community dwelling older adults: A systematic review of reviews. *PLoS one*. 2017;12:e0180902.
19. Means KM, Rodell DE, O'Sullivan PS. Balance, mobility, and falls among community-dwelling elderly persons: effects of a rehabilitation exercise program. *American Journal of Physical Medicine & Rehabilitation*. 2005;84:238-250.
20. Schutzer KA, Graves BS. Barriers and motivations to exercise in older adults. *Preventive medicine*. 2004;39:1056-1061.
21. Hickey ME, Mason SE. Age and gender differences in participation rates, motivators for, and barriers to exercise. *Modern Psychological Studies*. 2017;22:3.
22. Fleming KM, Herring MP. The effects of pilates on mental health outcomes: A meta-analysis of controlled trials. *Complementary therapies in medicine*. 2018;37:80-95.
23. Rodrigues BGdS, Cader SA, Torres NVOB, Oliveira EMd, Dantas EHM. Functional autonomy of elderly women practicing Pilates. *Fisioterapia e Pesquisa*. 2010;17:300-305.
24. Anderson BD, Spector A. Introduction to Pilates-based rehabilitation. *Orthopaedic Physical Therapy Clinics of North America*. 2000;9:395-410.
25. Engers PB, Rombaldi AJ, Portella EG, da Silva MC. The effects of the Pilates method in the elderly: a systematic review. *Revista Brasileira De Reumatologia (English Edition)*. 2016;56:352-365.
26. Moreno-Segura N, Igual-Camacho C, Ballester-Gil Y, Blasco-Igual MC, Blasco JM. The effects of the pilates training method on balance and falls of older adults: a systematic review and meta-analysis of randomized controlled trials. *Journal of aging and physical activity*. 2018;26:327-344.
27. Pourvaghari M, Bahram M, Sharif M, Sayyah M. Effects of eight weeks of pilates exercise on general health condition of aged male adults. *International Journal of Sport Studies*. 2014;4:895-900.
28. Kim D-H, Kim C-J, Son S-M. Neck pain in adults with forward head posture: effects of craniocervical angle and cervical range of motion. *Osong public health and research perspectives*. 2018;9:309.
29. Arshad R, Pan F, Reitmaier S, Schmidt H. Effect of age and sex on lumbar lordosis and the range of motion. A systematic review and meta-analysis. *Journal of biomechanics*. 2019;82:1-19.
30. McDaniels-Davidson C, Nichols J, Vaida F, Marshall L, Kado D. Kyphosis and 3-year fall risk in community-dwelling older men. *Osteoporosis international*. 2020:1-8.
31. Kuo Y-L, Tully EA, Galea MP. Sagittal spinal posture after Pilates-based exercise in healthy older adults. *Spine*. 2009;34:1046-1051.
32. Barker AL, Bird M-L, Talevski J. Effect of pilates exercise for improving balance in older adults: a systematic review with meta-analysis. *Archives of physical medicine and rehabilitation*. 2015;96:715-723.
33. Casonatto J, Yamacita CM. Pilates exercise and postural balance in older adults: A systematic review and meta-analysis of randomized controlled trials. *Complementary therapies in medicine*. 2020;48:102232.
34. Bezerra EdS, Orssatto LB, Oliveira SN, et al. One-year cessation following resistance training differently affects neuromuscular, body composition, and functional capacity in older adults. *Sport Sciences for Health*. 2020:1-9.
35. Tozim BM, Navega MT. Effect of pilates method on inspiratory and expiratory muscle strength in the elderly. *Revista Brasileira de Cineantropometria & Desempenho Humano*. 2018;20:1-9.
36. Yu J-H, Lee G-C. Effect of core stability training using pilates on lower extremity muscle strength and postural stability in healthy subjects. *Isokinetics and exercise science*. 2012;20:141-146.
37. Işık Eİ. *Comparison of the Effects of Clinical Pilates and Aerobic Exercise Training on Physical Performance, Mood State and Social Status in the Elderly with Mild Cognitive Impairment* [Doctoral Thesis]. Ankara, Gazi University; 2021.
38. Colón-Emeric CS, Whitson HE, Pavon J, Hoenig H. Functional decline in older adults. *American family physician*. 2013;88:388.
39. Fourie M, Gildenhuys GM, Shaw I, Shaw BS, Toriola AL, Goon D. Effects of a mat pilates program on flexibility in elderly women. *Med Sport*. 2013;66:545-553.
40. Tozim BM, de Aquino Nava GT, Marques AEZS, Navega MT. Efficacy of the Pilates versus general exercises versus educational workshops on neuromuscular parameters: A randomized controlled trial. *Journal of Bodywork and Movement Therapies*. 2021;26:420-427.
41. Fahey T, Insel P, Roth W. *Fit and well: Core concepts and labs in physical fitness and wellness*: McGraw-Hill Education; 2014.
42. Park W, Ramachandran J, Weisman P, Jung ES. Obesity effect on male active joint range of motion. *Ergonomics*. 2010;53:102-108.
43. Ambrose AF, Paul G, Hausdorff JM. Risk factors for falls among older adults: a review of the literature. *Maturitas*. 2013;75:51-61.
44. Gagnon LH. Efficacy of Pilates exercises as therapeutic intervention in treating patients with low back pain. 2005.
45. Petrofsky JS, Morris A, Bonacci J, Hanson A, Jorritsma R, Hill J. Muscle use during exercise: a comparison of conventional weight equipment to Pilates with and without a resistive exercise device. *J Appl Res*. 2005;5:160-173.
46. Pilates JH, Miller WJ. *Return to life through controllogy*: Ravenio Books; 1945.
47. Smith K, Smith E. Integrating Pilates-based core strengthening into older adult fitness programs: implications for practice. *Topics in Geriatric Rehabilitation*. 2005;21:57-67.
48. Santanasto AJ, Goodpaster BH, Kritchevsky SB, et al. Body composition remodeling and mortality: the health aging and body composition study. *The Journals of Gerontology: Series A*. 2017;72:513-519.
49. Pucci GCMF, Neves EB, Saavedra FJF. Effect of pilates method on physical fitness related to health in the elderly: a systematic review. *Revista Brasileira de Medicina do Esporte*. 2019;25:76-87.
50. Curi VS, Haas AN, Alves-Vilaça J, Fernandes HM. Effects of 16-weeks of Pilates on functional autonomy and life satisfaction among elderly women. *Journal of bodywork and movement therapies*. 2018;22:424-429.