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Opinion

Benefits of Tai Chi for Physical and Mental Health



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Tai Chi is recognized as an “internal” martial art aimed at self-control and self-defense. It prioritizes avoiding conflict but involves fighting when necessary. This art form consists of a series of gentle movements designed to strengthen and relax the body and mind. According to some historians, Tai Chi originated in the ninth century in China thanks to the Taoist philosopher Lao Tzu, who defined the first 37 movements in his book. Centuries later, Zhang San Feng (or Cheung San-Feng), a priest in a Shaolin temple in China, transformed this early philosophy into a system of self-defense, known as Tai Chi Chuan. The famous Tai Chi master Yang Cheng Fu was one of the first teachers to offer Tai Chi classes to the general public. At present, there are at least five different Tai Chi schools: Yang, Chen, Wu/Hao, Wu Ch’una-yu, and Sun. As illustrated in Figure 1, key features of Tai Chi, shared by all these schools, include natural breathing, structural alignment, mindfulness, imagery, flexibility, and relaxation.¹ Published research on the impact of Tai Chi on health encompasses more than 2,000 studies and 350 systematic reviews. Regular practice of Tai Chi offers numerous health benefits.¹ Interestingly, because the movements are adapted to each individual’s age, sex, and abilities,² no studies have reported that Tai Chi worsened a condition.¹ However, a systematic review has described typically minor and primarily musculoskeletal issues related to Tai Chi, with no serious adverse events related to the practice.³ This narrative review describes the current knowledge about the beneficial effects of Tai Chi on physical and mental health (Fig. 1) and discusses the advantages of practicing this art from a sustainable development perspective.

Physical benefits and fitness

At the musculoskeletal level, the posture, stretching, and movement in Tai Chi contribute to the relaxation of large muscle groups.⁴ Some postures help to gently strengthen muscles while others improve balance.⁵ Regular practice develops deep muscle strength, greatly alleviating chronic back problems.^{2,6} These exercises significantly reduce falls in the elderly by strengthening balance, which, in turn, reduces the fear of falling; this fear is known

to aggravate the risk of falling by inducing tension.^{7,8} In addition, slow movements combined with flexed postures increase resistance as the body’s weight is transferred from one leg to the other, which helps to strengthen the skeleton by increasing bone density, thereby countering osteoporosis and reducing fracture risk.^{9,10} Finally, Tai Chi can also improve osteoarthritis, especially in the knee, but also in the hip and hand,^{11,12} reducing pain and stiffness and improving physical function.

Cardiovascular and respiratory benefits

Tai Chi has one thing in common with Yoga, Qigong, relaxation, meditation, sophrology, and other relaxation practices: it involves slowing down the body’s rhythm, paying particular attention to breathing and how the body feels. When practicing these disciplines, we generally observe cardiac coherence or cardiac resonance breathing, characterized by slow, regular breaths (around 5 s each for inhalation and exhalation). This breathing quickly synchronizes respiratory movements with the heartbeat.¹³ Ideally, breathing is abdominal, *i.e.* involving significant mobilization of the diaphragm, rather than thoracic, thus providing an internal massage to the organs. Individuals who practice Tai Chi often report improved digestion and warmer hands and feet, attributable to improved blood circulation, ventilation, and tissue oxygenation.¹⁴ Cardiac coherence breathing also activates the parasympathetic system,¹⁵ reducing stress and increasing inner calm. Overall, practicing Tai Chi reduces cardiovascular risk,¹⁶ and it can be used for cardiac and stroke rehabilitation.¹⁷ Tai Chi can also improve the condition of patients with chronic obstructive pulmonary diseases and asthma by improving aerobic capacity.¹⁸ It has also been shown to reduce hypertension and improve blood lipid metabolism.^{19,20}

Central nervous system and cognitive benefits

The improved blood flow resulting from Tai Chi practice also induces better brain oxygenation and nutrient supply (glucose), correlated to a feeling of being more awake, an improvement in attention, memory and learning, and reduced feelings of fatigue.²¹ During Tai Chi practice, neuronal activity is increased in many cerebral areas and not just motor areas. These include sensory areas, areas involved in the processing of balance and movement, and associative areas. Brain cells (neurons and glia) produce more growth factors when they are activated, enabling them to develop better. As a result, communication between brain cells improves, resulting in increased mental acuity, balance, motor skills, and co-

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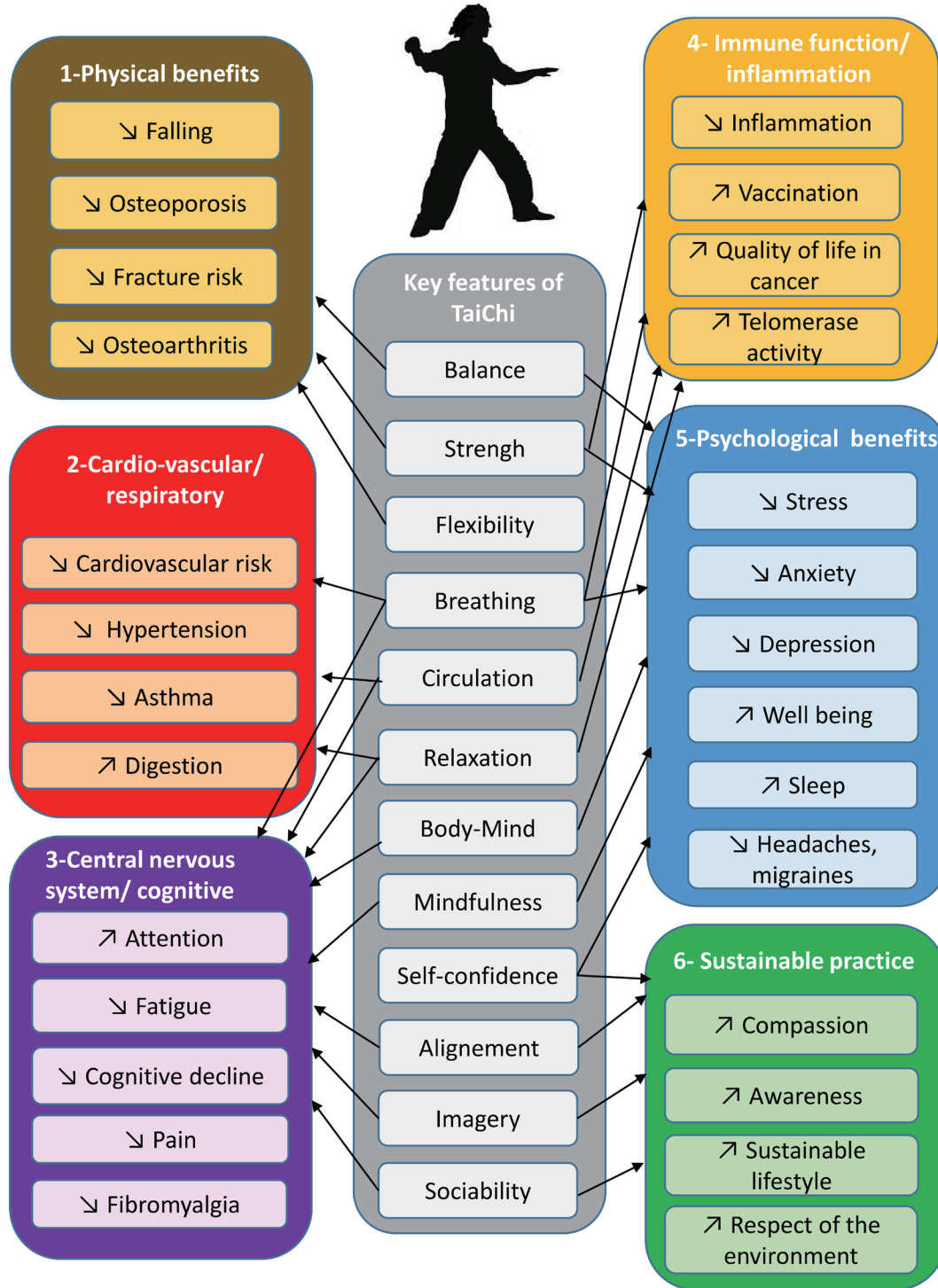


Fig. 1. Key features of Tai Chi and its health benefits for humans and the environment. Arrows represent the causal links between features and benefits that have been scientifically evidenced.

ordination.²²

Moreover, learning and memorizing new movements is a challenge for the brain, which has to form new neural connections as it learns new things. Tai Chi offers a wide range of movement sequences ideal for stimulating memory and improving learning.

Visualizations of Tai Chi movements can also train imagination. This exercise has been shown to improve cognitive functioning, including attention and processing speed.¹⁴ In patients with cognitive impairments and dementia, Tai Chi has been shown to be more effective than physical activity in improving executive

functions.²³ However, achieving these benefits may take time.²⁴ After a period of learning, when the sequences become more automatic, it is beneficial to seek new stimuli. This approach ensures a continuous state of “flow” without venturing into discomfort, maintaining an optimal balance for cognitive and physical stimulation.²⁵

Finally, Tai Chi practice triggers the release of factors such as endorphins and adiponectin into the bloodstream, making practitioners feel happy, joyful, and positive for up to several hours after the end of the exercise, and also aids in reducing pain.^{26,27} At the brain level, the release of endocannabinoids enhances overall well-being and elevates the pain threshold. This makes Tai Chi particularly effective for managing chronic pain,^{2,27} especially for individuals with conditions such as fibromyalgia.²⁸

Immune function and inflammation

Tai Chi practices contribute to a more efficient immune system,^{29,30} notably by increasing the levels of immune cells, reducing markers of inflammation,^{27,31} and influencing virus-specific immune responses during vaccinations.^{29,30} For example, a recent study has shown the benefits of Tai Chi practice for individuals coping with COVID-19, including immune system support, reduced inflammatory responses, assistance in respiratory disease rehabilitation, and improvements in emotional well-being.³² Tai Chi also has psychological benefits.

Psychological benefits

The effects of Tai Chi practice, observed in both the body and the brain, are correlated to psychological benefits. For instance, Tai Chi has been shown to improve the quality of life of patients with cancer and reduce some of their symptoms.^{10,33–35} Moreover, long-term Tai Chi practice can correlate with beneficial epigenetic changes. For example, telomerase activity (an enzyme that protects the integrity of our DNA ends) can be positively altered following sustained practice of Tai Chi.³⁶ Similarly, beneficial methylation modifications of several genes involved in stress response have been observed in Tai Chi practitioners.^{37,38}

Wang *et al.*³⁹ show that Tai Chi practices involve active relaxation of the body and mind, enabling practitioners to become more aware of internal tensions and dynamics and to moderate their effort. During sessions, attention is constantly redirected to the breath and the body, which is a form of meditation, and meditation has numerous science-based benefits such as reducing stress, controlling anxiety, promoting emotional health, enhancing awareness, and lengthening attention span, among others.⁴⁰

Tai Chi helps to reduce stress and anxiety and can even relieve mild depression in some individuals,^{41–44} potentially enabling a reduction or avoidance of medications normally used to treat depression, some of which have side effects that affect memory, focus, and mental acuity. Tai Chi also improves psychological well-being.⁴³ In individuals with post-traumatic stress disorder, Tai Chi has been shown to be effective in improving musculoskeletal pain, emotional well-being, cognition, and physical function.⁴⁵

Regular practice also improves sleep quality and reduces the risk of insomnia.^{46,47} Tai Chi can also help alleviate headaches, including migraines.⁴⁸ Therefore, this martial art exerts holistic benefits on both the body and the mind, contributing to the maintenance of lasting health by simultaneously acting on most of the body's systems.

Notably, Tai Chi is usually practiced in a group, which fosters

a sense of belonging to a community and strengthens social ties, which could help slow cognitive decline during aging. For example, Kuiper *et al.*⁴⁹ observed a reduction in cognitive decline in elderly individuals with a strong social network, regardless of their education level or physical activity.

Tai Chi, a sustainable practice

Tai Chi can be practiced outdoors, offering additional benefits associated with exercising outdoors such as being in contact with nature,⁵⁰ experiencing the antidepressant properties of light,⁵¹ and being in contact with antidepressant mycobacteria.^{52,53} Regular practice, especially outdoors, leads to profound personal changes and a new relationship with the world. This can have long-term repercussions on the environment. Regular Tai Chi practice helps to develop a contemplative outlook, a sense of harmony with the environment, and a greater awareness of environmental issues. By raising awareness of one's own energies, these practices foster a real symbiosis with the environment and emphasize the importance of life's cycles that animate us.⁵⁴ Respect for our own nature and that for the environment overlap, as the challenge lies in bodily feeling both interiority and exteriority, cultivating the sensation of energy circulating along energy paths (meridians) in the form of warmth, tingling, vibrations, and fluidity, enabling us to enter into a vibratory reality other than the organic-materialist one, opening up to a broader awareness of the body and its surroundings. This internal awareness of the external world is experienced in postures such as the “tree posture”, “the white crane spreads its wings”, and “moving your hands like clouds”. This practice invites a sensitive and imaginative connection with the natural elements of the plant and animal world.

Practicing Tai Chi can profoundly transform individuals from the inside out and change their worldview, fostering a profound respect for both nature and oneself, developing the capacities for benevolence and compassion needed to put an end to the spiral of destruction of nature and consumption of superfluous material goods, bringing us back to a life of being rather than of having.

As a martial art, Tai Chi also builds self-confidence, helping to overcome fears. Its “moral code” encompasses values such as respect, humility, courage, uprightness, confidence, and willpower, which could enhance communal living and improve self-esteem. Moreover, practicing Tai Chi can lead to individual and collective awareness of ecological issues, highlighting the urgent need to transform our habits to address these challenges.

Finally, Gould *et al.*⁵⁵ have explored how these practices can help reduce expenditures related to public health, healthcare, and drug consumption, thereby reducing environmental chemical pollution from pharmacological agents.

Overall, Tai Chi promotes environmentally friendly behaviors and sustainable lifestyles.

Extensive evidence-based research is available on the benefits of Tai Chi on physical and mental health, and there is growing interest in understanding the underlying physiological mechanisms of this practice. The strong evidence of the benefits of Tai Chi in different health domains, including physical, cardiorespiratory/pulmonary, central nervous system/cognitive, immune function/inflammation, psychological, and social/sustainable (Fig. 1), should encourage clinicians to offer evidence-based recommendations to their patients. These recommendations can complement medical follow-up in an integrative and sustainable manner, taking into consideration each patient's personal situation and health goals.

While there are some indications for which Tai Chi showed no

effects apart from improvement in the quality of life, such as diabetes, rheumatoid arthritis, and chronic heart failure,¹ a significant advantage of Tai Chi is that it does not induce any serious adverse events. Future research could be carried out in areas where the effects of Tai Chi have not yet been explored.

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Conflict of interest

The author declares having no conflict of interest related to this publication.

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