Future Integrative Medicine **2024** vol. 3(1) | 69–73
DOI: 10.14218/FIM.2023.00088

Opinion

Benefits of Tai Chi for Physical and Mental Health

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Received: October 18, 2023 | **Revised:** November 01, 2023 | **Accepted:** December 08, 2023 | **Published online:** January 02, 2024

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-

Keywords: Tai Chi; Health benefits; Mind-body practice; Evidence-based; Sustainable activity.

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How to cite this article: Guyon A. Benefits of Tai Chi for Physical and Mental Health. *Future Integr Med* 2024;3(1):69–73. doi: 10.14218/FIM.2023.00088.

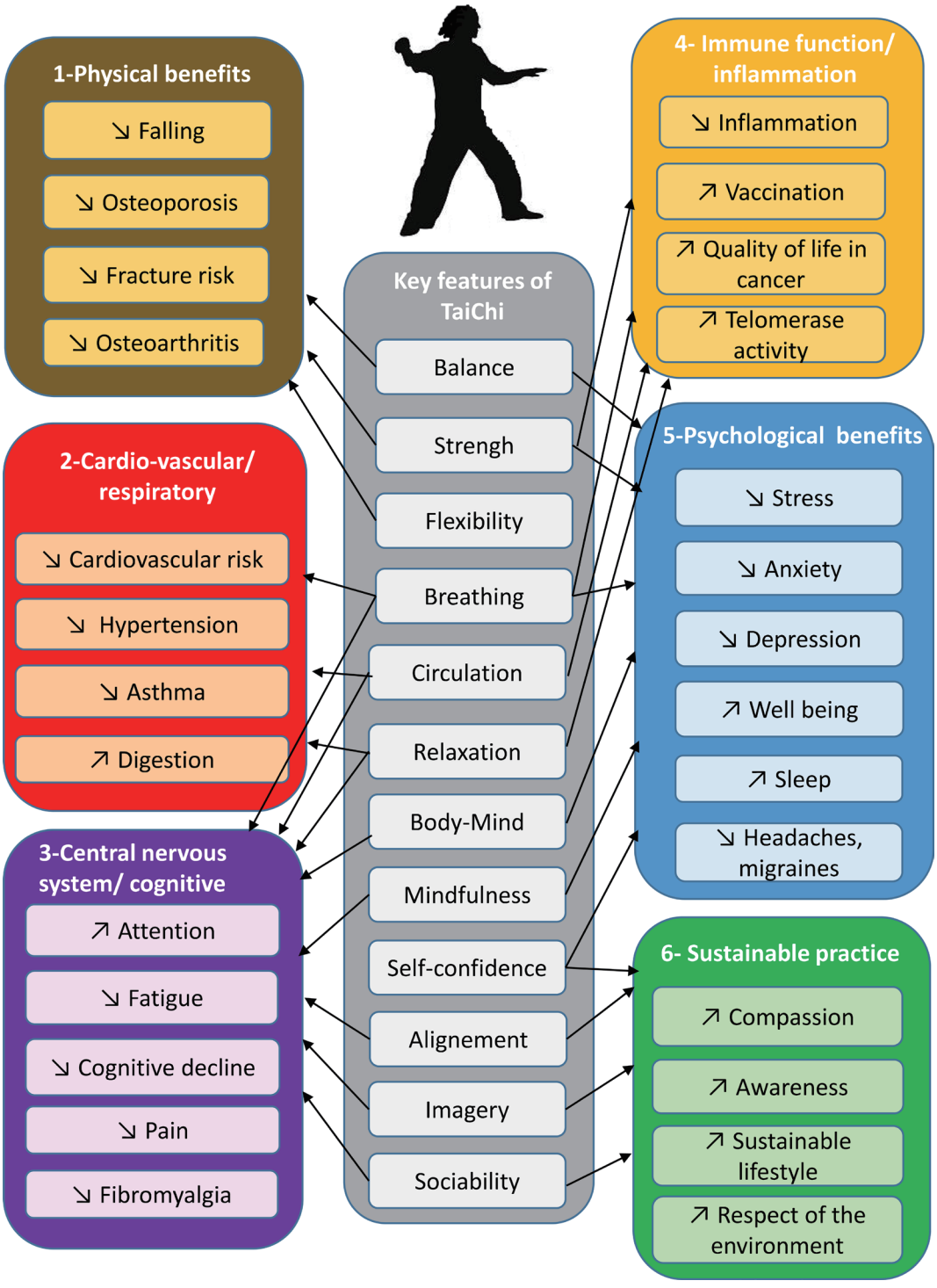

Fig. 1. Key features of Tai Chi and its health benefits for humans and the environment. Arrows represent the causal links between features and benefits that have been scientifically evidenced.

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] 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] 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.[53] 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.*[54] 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.

Acknowledgments

The author extends gratitude to Tai Chi teachers Cedric Leger, Er Yue Yang, Michael Nelson, and Padshima Mossler, as well as Dr. Arnaud Rey, for their careful proofreading of this manuscript.

Funding

Alice Guyon is funded by CNRS.

Conflict of interest

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

References

[1] Huston P, McFarlane B. Health benefits of Tai Chi: What is the evidence? Can Fam Physician 2016;62(11):881–890. PMID:28661865.
[2] Park J, Krause-Parello CA, Barnes CM. A Narrative Review of Movement-Based Mind-Body Interventions: Effects of Yoga, Tai Chi, and Qigong for Back Pain Patients. Holist Nurs Pract 2020;34(1):3–23. doi:10.1097/HNP.0000000000000360, PMID:31725096.
[3] Wayne PM, Berkowitz DL, Litrownik DE, Buring JE, Yeh GY. What do we really know about the safety of Tai Chi?: A systematic review of adverse event reports in randomized trials. Arch Phys Med Rehabil 2014;95(12):2470–2483. doi:10.1016/j.apmr.2014.05.005, PMID:24878398.
[4] Wehner C, Blank C, Arvandi M, Wehner C, Schobersberger W. Effect of Tai Chi on muscle strength, physical endurance, postural balance and flexibility: a systematic review and meta-analysis. BMJ Open Sport Exerc Med 2021;7(1):e000817. doi:10.1136/bmjsem-2020-000817, PMID:33614126.
[5] Song R, Lee EO, Lam P, Bae SC. Effects of Tai Chi exercise on pain, balance, muscle strength, and perceived difficulties in physical functioning in older women with osteoarthritis: a randomized clinical trial. J Rheumatol 2003;30(9):2039–2044. PMID:12966613.
[6] Budhrani-Shani P, Berry DL, Arcari P, Langevin H, Wayne PM. Mind-Body Exercises for Nurses with Chronic Low Back Pain: An Evidence-Based Review. Nurs Res Pract 2016;2016:9018036. doi:10.1155/2016/9018036, PMID:27446610.
[7] Kuo CC, Chen SC, Chen TY, Ho TJ, Lin JG, Lu TW. Effects of long-term Tai-Chi Chuan practice on whole-body balance control during obstacle-crossing in the elderly. Sci Rep 2022;12(1):2660. doi:10.1038/s41598-022-06631-8, PMID:35177707.
[8] Leung DPK, Chan CKL, Tsang HWH, Tsang WWN, Jones AYM. Tai Chi as an Intervention to Improve Balance and Reduce Falls in Older Adults: A Systematic and Meta-analytical Review. Altern Ther Health M 2011;17(1):40–48. PMID:21614943.
[9] Mu WQ, Huang XY, Zhang J, Liu XC, Huang MM. Effect of Tai Chi for the prevention or treatment of osteoporosis in elderly adults: protocol for a systematic review and meta-analysis. BMJ Open 2018;8(4):e020123. doi:10.1136/bmjopen-2017-020123, PMID:29632082.
[10] Wayne PM, editor. The Harvard Medical School guide to Tai Chi. Boulder: Shambhala Publications Inc; 2013.
[11] Wang C, Schmid CH, Hibberd PL, Kalish R, Roubenoff R, Rones R, *et al*. Tai Chi is effective in treating knee osteoarthritis: a randomized controlled trial. Arthritis Rheum 2009;61(11):1545–1553. doi:10.1002/art.24832, PMID:19877092.
[12] Yan JH, Gu WJ, Sun J, Zhang WX, Li BW, Pan L. Efficacy of Tai Chi on pain, stiffness and function in patients with osteoarthritis: a meta-analysis. PLoS One 2013;8(4):e61672. doi:10.1371/journal.pone.0061672, PMID:23620778.
[13] Sevoz-Couche C, Laborde S. Heart rate variability and slow-paced breathing: When coherence meets resonance. Neurosci Biobehav Rev 2022;135:104576. doi:10.1016/j.neubiorev.2022.104576, PMID:35167847.
[14] Wayne PM, Walsh JN, Taylor-Piliae RE, Wells RE, Papp KV, Donovan NJ, *et al*. Effect of Tai Chi on cognitive performance in older adults: systematic review and meta-analysis. J Am Geriatr Soc 2014;62(1):25–39. doi:10.1111/jgs.12611, PMID:24383523.
[15] Gray AL, Johnson TA, Ardell JL, Massari VJ. Parasympathetic control of the heart. II. A novel interganglionic intrinsic cardiac circuit mediates neural control of heart rate. J Appl Physiol (1985) 2004;96(6):2273–2278. doi:10.1152/japplphysiol.00616.2003, PMID:14978001.
[16] Wang XQ, Pi YL, Chen PJ, Liu Y, Wang R, Li X, *et al*. Traditional Chinese Exercise for Cardiovascular Diseases: Systematic Review and Meta-Analysis of Randomized Controlled Trials. J Am Heart Assoc 2016;5(3):e002562. doi:10.1161/JAHA.115.002562, PMID:26961239.
[17] Ma J, Zhang JW, Li H, Zhao LS, Guo AY, Chen ZH, *et al*. Safety and effectiveness of a Tai Chi-based cardiac rehabilitation programme for chronic coronary syndrom patients: study protocol for a randomised controlled trial. BMJ Open 2020;10(7):e036061. doi:10.1136/bmjopen-2019-036061, PMID:32624473.
[18] Yang L, Zhong D, Zhang Y, Li Y, Liu T, Zheng Y, *et al*. Tai Chi for Chronic Obstructive Pulmonary Disease (COPD): An Overview of Systematic Reviews. Int J Gen Med 2021;14:3017–3033. doi:10.2147/IJGM.S308955, PMID:34234531.
[19] Guan Y, Hao Y, Guan Y, Wang H. Effects of Tai Chi on essential hypertension and related risk factors: A meta-analysis of randomized controlled trials. J Rehabil Med 2020;52(5):jrm00057. doi:10.2340/16501977-2683, PMID:32338292.
[20] Yin Y, Yu Z, Wang J, Sun J. Effects of the different Tai Chi exercise cycles on patients with essential hypertension: A systematic review and meta-analysis. Front Cardiovasc Med 2023;10:1016629. doi:10.3389/fcvm.2023.1016629, PMID:36937925.
[21] Zheng G, Zheng X, Li J, Duan T, Ling K, Tao J, *et al*. Effects of Tai Chi on Cerebral Hemodynamics and Health-Related Outcomes in Older Community Adults at Risk of Ischemic Stroke: A Randomized Controlled Trial. J Aging Phys Act 2019;27(5):678–687. doi:10.1123/japa.2018-0232, PMID:30747548.
[22] Maciaszek J, Osinski W. The effects of Tai Chi on body balance in elderly people—a review of studies from the early 21st century. Am J Chin Med 2010;38(2):219–229. doi:10.1142/S0192415X10007798, PMID:20387220.
[23] Chen Y, Qin J, Tao L, Liu Z, Huang J, Liu W, *et al*. Effects of Tai Chi Chuan on Cognitive Function in Adults 60 Years or Older With Type 2 Diabetes and Mild Cognitive Impairment in China: A Randomized Clinical Trial. JAMA Netw Open 2023;6(4):e237004. doi:10.1001/jamanetworkopen.2023.7004, PMID:37022680.
[24] Fogarty JN, Murphy KJ, McFarlane B, Montero-Odasso M, Wells J, Troyer AK, *et al*. Taoist Tai Chi(R) and Memory Intervention for Individuals with Mild Cognitive Impairment. J Aging Phys Act 2016;24(2):169–180. doi:10.1123/japa.2014-0062, PMID:25838271.
[25] Heutte J, Fenouillet F, Martin-Krumm C, Gute G, Raes A, Gute D, *et al*. Optimal Experience in Adult Learning: Conception and Validation of the Flow in Education Scale (EduFlow-2). Front Psychol 2021;12:828027. doi:10.3389/fpsyg.2021.828027, PMID:35069401.
[26] Huang CY, Mayer PK, Wu MY, Liu DH, Wu PC, Yen HR. The effect of Tai Chi in elderly individuals with sarcopenia and frailty: A systematic review and meta-analysis of randomized controlled trials. Ageing Res Rev 2022;82:101747. doi:10.1016/j.arr.2022.101747, PMID:36223875.
[27] You T, Ogawa EF, Thapa S, Cai Y, Yeh GY, Wayne PM, *et al*. Effects of Tai Chi on beta endorphin and inflammatory markers in older adults with chronic pain: an exploratory study. Aging Clin Exp Res 2020;32(7):1389–1392. doi:10.1007/s40520-019-01316-1, PMID:31432432.
[28] Wang C, Schmid CH, Fielding RA, Harvey WF, Reid KF, Price LL, *et al*. Effect of Tai Chi versus aerobic exercise for fibromyalgia: comparative effectiveness randomized controlled trial. BMJ 2018;360:k851. doi:10.1136/bmj.k851, PMID:29563100.
[29] Morgan N, Irwin MR, Chung M, Wang C. The effects of mind-

body therapies on the immune system: meta-analysis. PLoS One 2014;9(7):e100903. doi:10.1371/journal.pone.0100903, PMID:24988414.
[30] Oh B, Bae K, Lamoury G, Eade T, Boyle F, Corless B, *et al*. The Effects of Tai Chi and Qigong on Immune Responses: A Systematic Review and Meta-Analysis. Medicines (Basel) 2020;7(7):39. doi:10.3390/medicines7070039, PMID:32629903.
[31] Bower JE, Irwin MR. Mind-body therapies and control of inflammatory biology: A descriptive review. Brain Behav Immun 2016;51:1–11. doi:10.1016/j.bbi.2015.06.012, PMID:26116436.
[32] Xu S, Baker JS, Ren F. The Positive Role of Tai Chi in Responding to the COVID-19 Pandemic. Int J Environ Res Public Health 2021;18(14):doi:10.3390/ijerph18147479, PMID:34299925.
[33] Lee MS, Choi TY, Ernst E. Tai Chi for breast cancer patients: a systematic review. Breast Cancer Res Treat 2010;120(2):309–316. doi:10.1007/s10549-010-0741-2, PMID:20127280.
[34] Zeng Y, Luo T, Xie H, Huang M, Cheng AS. Health benefits of qigong or Tai Chi for cancer patients: a systematic review and meta-analyses. Complement Ther Med 2014;22(1):173–186. doi:10.1016/j.ctim.2013.11.010, PMID:24559833.
[35] Liu L, Tan H, Yu S, Yin H, Baxter GD. The effectiveness of Tai Chi in breast cancer patients: A systematic review and meta-analysis. Complement Ther Clin Pract 2020;38:101078. doi:10.1016/j.ctcp.2019.101078, PMID:32056814.
[36] Duan GX, Wang K, Su YH, Tang SY, Jia HL, Chen XM, *et al*. Effects of Tai Chi on telomerase activity and gerotranscendence in middle aged and elderly adults in Chinese society. Int J Nurs Sci 2016;3(3):235–241. doi:10.1016/j.ijnss.2016.07.005.
[37] Ren H, Collins V, Clarke SJ, Han JS, Lam P, Clay F, *et al*. Epigenetic changes in response to Tai Chi practice: a pilot investigation of DNA methylation marks. Evid Based Complement Alternat Med 2012;2012:841810. doi:10.1155/2012/841810, PMID:22719790.
[38] Holmes L, Chinaka C, Elmi H, Deepika K, Pelaez L, Enwere M, *et al*. Implication of Spiritual Network Support System in Epigenomic Modulation and Health Trajectory. Int J Environ Res Public Health 2019;16(21):4123. doi:10.3390/ijerph16214123, PMID:31717711.
[39] Wang X, Li P, Pan C, Dai L, Wu Y, Deng Y. The Effect of Mind-Body Therapies on Insomnia: A Systematic Review and Meta-Analysis. Evid Based Complement Alternat Med 2019;2019:9359807. doi:10.1155/2019/9359807, PMID:30894878.
[40] Goleman D, Davidson R. The science of meditation: how to change your brain, mind and body. London: Penguin Random House; 2018.
[41] Yin J, Yue C, Song Z, Sun X, Wen X. The comparative effects of Tai Chi versus non-mindful exercise on measures of anxiety, depression and general mental health: A systematic review and meta-analysis. J Affect Disord 2023;337:202–214. doi:10.1016/j.jad.2023.05.037, PMID:37244543.
[42] Payne P, Crane-Godreau MA. Meditative movement for depression and anxiety. Front Psychiatry 2013;4:71. doi:10.3389/fpsyt.2013.00071, PMID:23898306.
[43] Wang F, Lee EK, Wu T, Benson H, Fricchione G, Wang W, *et al*. The effects of Tai Chi on depression, anxiety, and psychological well-being: a systematic review and meta-analysis. Int J Behav Med 2014;21(4):605–617. doi:10.1007/s12529-013-9351-9, PMID:24078491.
[44] Yeung A, Chan JSM, Cheung JC, Zou L. Qigong and Tai-Chi for Mood Regulation. Focus (Am Psychiatr Publ) 2018;16(1):40–47. doi:10.1176/appi.focus.20170042, PMID:31975898.
[45] Tsai PF, Kitch S, Chang JY, James GA, Dubbert P, Roca JV, *et al*. Tai Chi for Posttraumatic Stress Disorder and Chronic Musculoskeletal Pain: A Pilot Study. J Holist Nurs 2018;36(2):147–158. doi:10.1177/0898010117697617, PMID:29172896.
[46] Raman G, Zhang Y, Minichiello VJ, D'Ambrosio CM, Wang C. Tai Chi Improves Sleep Quality in Healthy Adults and Patients with Chronic Conditions: A Systematic Review and Meta-analysis. J Sleep Disord Ther 2013;2(6):141. doi:10.4172/2167-0277.1000141, PMID:28845367.
[47] Siu PM, Yu AP, Tam BT, Chin EC, Yu DS, Chung KF, *et al*. Effects of Tai Chi or Exercise on Sleep in Older Adults With Insomnia: A Randomized Clinical Trial. JAMA Netw Open 2021;4(2):e2037199. doi:10.1001/jamanetworkopen.2020.37199, PMID:33587135.
[48] Wang S, Tian L, Ma T, Wong YT, Yan LJ, Gao Y, *et al*. Effectiveness of Tai Chi on Blood Pressure, Stress, Fatigue, and Sleep Quality among Chinese Women with Episodic Migraine: A Randomised Controlled Trial. Evid Based Complement Alternat Med 2022;2022:2089139. doi:10.1155/2022/2089139, PMID:36310622.
[49] Kuiper JS, Zuidersma M, Zuidema SU, Burgerhof JG, Stolk RP, Oude Voshaar RC, *et al*. Social relationships and cognitive decline: a systematic review and meta-analysis of longitudinal cohort studies. Int J Epidemiol 2016;45(4):1169–1206. doi:10.1093/ije/dyw089, PMID:27272181.
[50] Antonelli M, Barbieri G, Donelli D. Effects of forest bathing (shinrin-yoku) on levels of cortisol as a stress biomarker: a systematic review and meta-analysis. Int J Biometeorol 2019;63(8):1117–1134. doi:10.1007/s00484-019-01717-x, PMID:31001682.
[51] Li X, Li X. The Antidepressant Effect of Light Therapy from Retinal Projections. Neurosci Bull 2018;34(2):359–368. doi:10.1007/s12264-018-0210-1, PMID:29430586.
[52] Matthews DM, Jenks SM. Ingestion of Mycobacterium vaccae decreases anxiety-related behavior and improves learning in mice. Behav Processes 2013;96:27–35. doi:10.1016/j.beproc.2013.02.007, PMID:23454729.
[53] Guyon A, Ravenet J, Midol N. Energy arts in the dialogue of scientific paradigms: A progress report on the benefits of body-mind disciplines (yoga, Tai Chi, qigong). STAPS 2021;132(2):83–94. doi:10.3917/sta.132.0083.
[54] Gould RL, Coulson MC, Patel N, Highton-Williamson E, Howard RJ. Interventions for reducing benzodiazepine use in older people: meta-analysis of randomised controlled trials. Br J Psychiatry 2014;204(2):98–107. doi:10.1192/bjp.bp.113.126003, PMID:24493654.