

Evidence-Based Pathways for the Internationalization of Taijiquan

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DOI: 10.57612/JS25.JTS.04.06

Abstract: Taijiquan embodies martial, health-promoting, and cultural values. In recent years, Evidence-Based Medicine (EBM) has provided a scientific framework to validate its health benefits. A growing body of randomized controlled trials (RCTs) and systematic reviews/meta-analyses has demonstrated robust evidence for Taijiquan in fall prevention, balance enhancement, blood pressure regulation, and mental health among older adults, with additional promising signals in Parkinson's disease, stroke rehabilitation, cancer recovery, and chronic disease management. Within the EBM framework, this paper systematically reviews the existing evidence, compares research and dissemination pathways across the United States, Europe, and China, and analyzes methodological limitations, instructor training, data sharing, and policy barriers. Based on this analysis, six major internationalization pathways are proposed: academic institutionalization, educational integration, societal adoption, medical incorporation, and collaborative research communities. Overall, Taijiquan is undergoing a critical transition from cultural heritage to evidence-based intervention. Its scientific and international development holds strong potential to

contribute to **healthy aging** and **global public health goals**.

Keywords: Taijiquan, Evidence-Based Medicine, Randomized Controlled Trial, Meta-analysis, Rehabilitation

Introduction

Taijiquan originated in Chenjiagou, Wen County, Henan Province, China, and has developed over several centuries into multiple major styles, including Chen, Yang, Wu, Wu/Hao, and Sun. Despite stylistic differences, all share common characteristics such as slow and continuous movements, the integration of body and mind, coordinated breathing, and the emphasis on mental focus and intention.

On the cultural level, the global dissemination of Taijiquan has received major recognition. In 2020, the United Nations Educational, Scientific and Cultural Organization (UNESCO) officially inscribed Taijiquan on the Representative List of the Intangible Cultural Heritage of Humanity[16], highlighting its international cultural value and providing strong support for worldwide promotion. However, from the perspective of modern health sciences, Taijiquan still faces a number of critical questions:

DOI: 10.57612/JS25.JTS.04.06

- **Efficacy:** Can Taijiquan consistently generate measurable health benefits across different populations?
- **Applicability:** In which populations and disease conditions does Taijiquan show the most significant intervention effects?
- **Safety:** Are there potential adverse events? Can it be recommended as a safe intervention[11]?
- **Scalability:** Can Taijiquan be widely implemented in communities and healthcare institutions, and is it cost-effective?

Evidence-Based Medicine (EBM) provides a rigorous scientific framework to address these issues[5,6]. Through randomized controlled trials (RCTs), causal relationships can be established; through systematic reviews and meta-analyses, the totality of evidence can be synthesized; and through clinical practice guidelines (CPGs), evidence can be translated into actionable recommendations. This paper, therefore, aims to systematically review the current body of evidence on Taijiquan within the EBM framework, compare research and dissemination pathways across different regions (the United States, Europe, and China), identify existing methodological and institutional limitations, and propose strategic directions for its scientific and international development.

Current Status and Organizational Ecosystem

Global Dissemination and Cultural Endorsement

Taijiquan has been practiced in more than 190 countries and regions, making it one of the most widely recognized traditional

mind–body practices worldwide. According to the World Health Organization (WHO) 2019 report, Taijiquan has already been incorporated into community health projects and rehabilitation programs in several countries[16]. In 2020, UNESCO inscribed Taijiquan on the Representative List of the Intangible Cultural Heritage of Humanity, further strengthening its international visibility and providing strong cultural legitimacy for global dissemination[16].

International Organizations and Federations

The International Wushu Federation (IWUF), recognized by the International Olympic Committee (IOC) as the sole global governing body for Wushu, has more than 160 member federations across five continents[17]. The IWUF plays a central role in the promotion of Taijiquan internationally by setting competition rules, technical standards, and training systems.

Sports Events and the Olympic System

In 2026, with IOC approval, Wushu—including Taijiquan—will officially enter the Dakar 2026 Summer Youth Olympic Games (YOG), where competition events such as the “Taijiquan Combination” (Taijiquan + Taiji Fan) will be featured[17]. This marks the first time Taijiquan has been included in the Olympic system, symbolizing a significant shift from cultural heritage toward competitive sport on the global stage.

Academic and Community Platforms

Beyond IWUF’s competition system, various academic and community-based organizations play complementary roles in

advancing the internationalization of Taijiquan:

- **World Taiji Science Federation (WTSF):** Promotes academic research and organizes international scientific forums.
- **International Taiji Science Forum and Silicon Valley Health Forum:** Provide platforms for interdisciplinary exchange and cross-cultural dialogue.
- **University-based Integrative Medicine Centers (e.g., Harvard, Stanford):** Conduct clinical trials and foster academic publication in evidence-based healthcare[5,6].
- **Public Health Systems and National Associations:** Explore dissemination models integrating “community–hospital–university” pathways for widespread adoption and policy embedding.

Research Perspectives within the EBM Framework

Evidence-Based Medicine (EBM) emphasizes transparent and reproducible methods to minimize bias, integrating the best available evidence, clinical expertise, and patient values into decision-making[5]. In Taijiquan research, the application of EBM primarily involves the following methodological approaches:

Randomized Controlled Trials (RCTs)

RCTs serve as the gold standard for assessing the effectiveness and safety of interventions[1,2]. By randomly assigning participants to Taijiquan or control groups, researchers can determine causal relationships between practice and health outcomes. Key variables include

intervention intensity (frequency, session length, duration), type of control group (no intervention, education, stretching, resistance training, etc.), outcome measures (falls, balance, blood pressure, quality of life, etc.), follow-up duration, and adherence monitoring.

Systematic Reviews and Meta-Analyses

Systematic reviews and meta-analyses synthesize data across multiple RCTs, providing pooled effect sizes and evaluating heterogeneity and publication bias[4,5]. They are essential for identifying consistent patterns of efficacy and for strengthening external validity across populations and contexts.

Clinical Practice Guidelines (CPGs)

CPGs translate evidence into practice by grading the strength of recommendations and clarifying clinical indications, safety, and implementation pathways. Incorporating Taijiquan into CPGs helps bridge the gap between research evidence and real-world healthcare systems[16].

Table 1. Key Methodological Elements in Evidence-Based Research on Taijiquan

Methodological Component	Description	Key Variables
Randomized Controlled Trials (RCTs)	Random allocation to intervention and control groups; assessment of efficacy and safety	Intensity, frequency, session length, type of control, outcome measures
Systematic Reviews &	Synthesize results from multiple	Heterogeneity, publication

Meta-Analyses	trials to provide pooled effect sizes	bias, subgroup analyses
Clinical Practice Guidelines (CPGs)	Translate graded evidence into recommendations and policies	Recommendation strength, clinical indications, implementation pathways

Evidence Review

From the perspective of randomized controlled trials (RCTs) and systematic reviews, Taijiquan demonstrates relatively robust evidence in **fall prevention**,

balance, blood pressure regulation, and mental health, while showing promising signals in **Parkinson's disease, stroke rehabilitation, cancer recovery, and chronic disease management**.

Fall Prevention and Balance in Older Adults

Falls are a leading cause of disability and mortality among older adults worldwide, with nearly one in three individuals aged 65 years or older experiencing a fall each year. By emphasizing weight shifting, posture control, and lower-limb strength, Taijiquan has been shown to significantly reduce fall risk.

Table 2. Representative Taijiquan RCTs and Meta-Analyses

Author (Year, Country)	Participants	Intervention vs Control	Duration	Primary Outcomes	Main Findings	Ref.
Wolf (1996, USA)	Older adults, n≈200	Taijiquan vs balance/education	15 weeks	Falls, frailty	Significant fall reduction ($p < 0.05$)	[1]
Li (2005, USA)	Older adults, n=256	Taijiquan (3x/week) stretching education vs +	6 months	Falls, balance confidence	38 vs 73 falls; RR = 0.45 (95% CI 0.30–0.70, $p < 0.001$)	[2]
Li (2012, NEJM, USA)	Parkinson's patients, n=195	Taijiquan resistance stretching vs vs	24 weeks	Postural stability, falls	Significantly fewer falls in Taijiquan group ($p < 0.01$)	[3]
Voukelatos (2007, AUS)	Community-dwelling older adults	Taijiquan routine activity vs	16 weeks	Fall incidence	HR = 0.72 (95% CI 0.56–0.93, $p = 0.01$)	[10]
Chen (2023, Meta-analysis, China)	Older adults, 24 RCTs	Taijiquan routine care/exercise vs	8–24+ weeks	Fall risk	RR = 0.76 (95% CI 0.65–0.88, $p < 0.001$)	[4]
Hackney & Earhart (2008, USA)	Parkinson's patients, n≈60	Taijiquan vs usual care	10 weeks	Balance, gait	Significant improvement ($p < 0.05$)	[8]

Taylor-Piliae (2014, USA)	Stroke survivors, n≈145	Taijiquan vs usual care	12 weeks	Falls, QoL	Fewer falls; improved physical function ($p < 0.05$)	[9]
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Key representative studies include:

- Wolf et al.. (1996, USA): Taijiquan significantly reduced falls compared with balance training and education ($p < 0.05$)[1].
- Li et al.. (2005, USA): In 256 older adults, total falls were 38 in the Taijiquan group vs 73 in controls after 6 months; RR = 0.45 (95% CI 0.30–0.70, $p < 0.001$)[2].
- Voukelatos et al.. (2007, Australia): Community-based Taijiquan significantly reduced fall incidence; HR = 0.72 (95% CI 0.56–0.93, $p = 0.01$)[10].
- Chen et al.. (2023, Meta-analysis): Pooled analysis of 24 RCTs showed a 24% reduction in fall risk (RR = 0.76, 95% CI 0.65–0.88, $p < 0.001$)[4].
- Li et al.. (2012, NEJM, USA): Among Parkinson’s patients, Taijiquan

significantly improved postural stability and reduced falls compared with resistance or stretching exercises ($p < 0.01$)[3].

- Hackney & Earhart (2008, USA): In ~60 Parkinson’s patients, Taijiquan improved balance and gait function ($p < 0.05$)[8].
- Taylor-Piliae (2014, USA): In ~145 stroke survivors, Taijiquan reduced falls and improved quality of life compared with usual care ($p < 0.05$)[9].

In summary, robust evidence from RCTs and meta-analyses demonstrates that Taijiquan reduces fall risk and enhances balance in older adults. Moreover, emerging trials suggest these benefits extend to neurological populations such as Parkinson’s disease and stroke survivors, indicating broader clinical applicability.

Table 3: Representative Trials and Reviews on Cardiovascular, Mental Health, and Chronic Disease Outcomes

Author (Year, Country)	Participants	Intervention vs Control	Duration	Primary Outcomes	Main Findings	Ref.
Yeh (2008, USA)	Hypertensive adults, multiple RCTs	Taijiquan vs routine activity	12–24 weeks	Blood pressure	SBP –12 mmHg (95% CI –15.5 to –8.5, $p < 0.001$); DBP –6 mmHg (95% CI –7.8 to –4.2, $p < 0.001$)	[5]

Lan (2013, Review, Taiwan)	Adults with CV/metabolic risk	Multiple trials	12–24 weeks	VO ₂ max, HbA1c	VO ₂ max ↑ ~10% (p < 0.05); HbA1c ↓ 0.3% (p < 0.05)	[6]
Wayne & Kaptchuk (2008, USA)	Older adults, conceptual review	–	–	Research framework	Identified Taijiquan as a complex multi-component intervention; reported cognitive benefit (SMD ≈ 0.36, p < 0.05)	[7]
Wayne (2014, Meta-analysis, USA)	Older adults, multiple RCTs	Taijiquan stretching vs	8–24 weeks	Cognition	Reduced depression: SMD = –0.45 (95% CI –0.70 to –0.20, p < 0.001); Improved sleep: RR = 0.72 (95% CI 0.55–0.90, p = 0.01)	[14]
Sun & Buys (2013, AUS)	Community older adults	Taijiquan vs control	16 weeks	Falls, mental health	Reduced falls; reduced anxiety (p < 0.05)	[12]
Cancer Survivors (Meta-analysis)	Breast and mixed cancers	Taijiquan vs usual care	12–24 weeks	Fatigue, QoL	Fatigue SMD = –0.42 (95% CI –0.68 to –0.16, p = 0.002); QoL improved (p < 0.01)	[12]
Chronic Pain	Adults with chronic pain	Taijiquan vs stretching/education	8–12 weeks	Pain, function	SMD = –0.35 (95%	[13]

Populations (Review)					CI -0.55 to -0.15, p = 0.001)	
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Parkinson's Disease and Stroke Rehabilitation

Patients with neurological disorders frequently present with postural instability and impaired balance. Taijiquan has shown significant therapeutic effects in these populations.

- Li et al.. (2012, NEJM, USA): In 195 patients with Parkinson's disease, Taijiquan significantly improved postural stability and reduced falls compared with resistance and stretching exercises[3].
- Hackney & Earhart (2008, USA): Demonstrated improvements in balance and gait among Parkinson's patients after Taijiquan practice[8].
- Taylor-Piliae et al.. (2014, USA): Reported that stroke survivors engaging in Taijiquan experienced fewer falls, improved physical function, and enhanced quality of life[9].
- Huang He et al.. (2025, forthcoming): A forthcoming study tested a novel handheld Tai Chi water-resistance fitness ball intervention in middle-aged and elderly patients with Parkinson's disease, showing significant improvements in balance, coordination, and motor symptoms, alongside validated measures of exercise compliance[15].

Overall, Taijiquan demonstrates high feasibility and safety in neurological rehabilitation, with growing evidence — including innovative modalities such as

water-resistance Tai Chi ball training — supporting its role in Parkinson's disease and stroke recovery. Larger-scale, stratified studies are still required.

Cardiovascular and Metabolic Outcomes

Recent meta-analyses further confirmed these effects, demonstrating significant improvements in blood pressure, lipid metabolism, and glycemic control following Tai Chi interventions[19–21].

Taijiquan has been investigated as a low-to-moderate intensity exercise suitable for patients with cardiovascular and metabolic risk.

- Yeh et al.. (2008, USA): A systematic review indicated that Taijiquan significantly reduced both systolic and diastolic blood pressure in hypertensive patients, with effects comparable to aerobic exercise[5].
- Lan et al.. (2013, Taiwan): Reported improvements in VO₂ max (~10%) and modest reductions in HbA1c (-0.3%), suggesting potential benefits for cardiometabolic rehabilitation[6].

These findings support Taijiquan as a safe, accessible adjunct for hypertension and cardiometabolic health management.

Mental Health and Cognitive Function
Moreover, several recent systematic reviews and meta-analyses highlighted Tai Chi's effectiveness in reducing anxiety and

depression in older adults and clinical populations[22, 23].

The multi-component features of Taijiquan—movement, breathing, and focused attention—may improve mental health via mechanisms of mindfulness and autonomic regulation.

- Multiple trials have reported reductions in anxiety and depression, alongside improvements in sleep quality.
- Wayne & Kaptchuk (2008, USA): Conceptualized Taijiquan as a complex, multi-component intervention, highlighting both methodological challenges and cognitive benefits (SMD ≈ 0.36 , $p < 0.05$)[7].
- Wayne (2014, USA): A meta-analysis found significant reductions in depressive symptoms (SMD = -0.45 , $p < 0.001$) and improvements in sleep (RR = 0.72 , $p = 0.01$) among older adults[14].
- Preliminary findings also suggest Taijiquan may enhance executive function and dual-task gait in individuals with mild cognitive impairment (MCI).

4. 5 Cancer Rehabilitation and Chronic Disease Management

Taijiquan has been increasingly evaluated in cancer survivorship and chronic disease populations.

- Cancer Survivors (Meta-analysis): Demonstrated significant reductions in cancer-related fatigue (SMD = -0.42 , $p = 0.002$) and improved quality of life ($p < 0.01$) among breast and mixed cancer cohorts[12].
- Chronic Pain Populations (Review): Taijiquan provided moderate pain relief

(SMD = -0.35 , $p = 0.001$) and improved physical function in adults with chronic pain[13].

As a low-impact, stress-regulating intervention, Taijiquan appears particularly well-suited for long-term management of cancer-related symptoms, chronic pain, and multimorbidity.

Constraints and Limitations

Despite significant progress in evidence-based research and international promotion, the further scientific and global development of Taijiquan remains constrained by multiple factors. These limitations can be summarized into five major categories:

Methodological Heterogeneity

- **Intervention variability:** Frequency, session length, and program duration differ substantially across studies, making cross-trial comparisons difficult.
- **Control group inconsistency:** Some studies use no-intervention controls, while others employ stretching, health education, or resistance training.
- **Outcome diversity:** A lack of standardized “core outcome sets” limits comparability and evidence synthesis.
- **Sample size and follow-up:** Many trials involve small cohorts and short follow-up periods, undermining external validity.
- **Blinding limitations:** Insufficient blinding increases the risk of bias in outcome assessment.

Instructor Quality and Intervention Fidelity

- Absence of internationally recognized teacher certification and quality assurance mechanisms.
- Considerable variation in teaching quality across different schools and regions.
- Limited monitoring of “intervention fidelity” in research protocols, affecting reproducibility.

Limited Medical Integration

- Taijiquan has not yet been systematically incorporated into clinical pathways in most countries.
- Reimbursement mechanisms remain underdeveloped, with insurance coverage mostly confined to pilot projects.
- Current clinical guidelines primarily address fall prevention in older adults, while integration into chronic disease management and mental health remains insufficient.

Data Infrastructure Gaps

- Lack of international data-sharing platforms; research findings remain fragmented across journals and regions.
- No established mechanisms for pooling **Individual Participant Data (IPD)**, hindering subgroup analysis and effect modification studies.
- Limited validation of external generalizability and scalability.

Policy and Sustainability Challenges

- Significant regional disparities in policy support.
- Long-term funding for international, multi-center studies remains

inadequate; many projects rely on short-term grants with limited sustainability.

- Lack of clear policy positioning for Taijiquan within public health frameworks.

Table 4 : Current Challenges and Constraints

Category	Key Issues
Research Methodology	Variability in design, intensity, control groups, and outcomes; small samples; short follow-up; insufficient blinding
Instructor & Fidelity	No international certification; quality differences across schools; lack of fidelity monitoring
Medical Integration	Limited inclusion in clinical pathways; weak insurance reimbursement models; narrow guideline coverage
Data Sharing	No international databases; lack of IPD pooling; weak external validation
Policy & Funding	Regional policy disparities; insufficient long-term funding for multi-center trials

Summary: At present, the evidence-based development of Taijiquan is still in a stage of “fragmented exploration without systematic integration.” Methodological standardization, international collaboration, and stronger policy support are urgently needed to overcome these barriers and achieve global scalability.

Pathways for International Scientific Development

To advance the transformation of Taijiquan from cultural heritage to evidence-based

intervention, a comprehensive strategy that integrates cross-disciplinary and cross-regional collaboration is required. This paper proposes six major pathways:

Academic Institutionalization

- **Multi-center RCTs and Real-World Studies (RWS):** Establish large-scale, multi-center randomized trials through international collaboration, complemented by real-world studies to enhance external validity.
- **Trial pre-registration and core outcome sets:** All studies should be registered on platforms such as *ClinicalTrials.gov* or the Chinese Clinical Trial Registry (ChiCTR) and adopt standardized core outcome measures (e.g., fall rate, balance, blood pressure, mental health).
- **Systematic safety monitoring:** Build adverse event surveillance systems to ensure transparency of safety data.
- **Reducing publication bias:** Encourage the publication of null or negative results.
- **Living systematic reviews and GRADE evaluation:** Promote Cochrane-style living reviews and use the GRADE framework to provide graded evidence for clinical guidelines.

Educational Integration

- **International certification system:** Develop globally recognized certification and continuing education frameworks for instructors, with clear standards at different levels.
- **Tiered curricula and assessment:** Establish a structured curriculum ranging from beginner to advanced and clinical/rehabilitation levels, with standardized evaluation metrics.

- **University and medical school courses:** Integrate Taijiquan modules into higher education and medical curricula, fostering interdisciplinary “medicine–sports integration” talent development.

Societal Adoption

- **Community and eldercare institutions:** Implement standardized Taijiquan programs in communities, nursing homes, and wellness centers to expand accessibility.
- **Digital and wearable technologies:** Utilize mobile health apps and wearable devices to monitor adherence, intensity, and physiological indicators such as heart rate.
- **Public health embedding:** Collaborate with health authorities to incorporate Taijiquan into national programs for healthy aging and chronic disease prevention.

Medical Incorporation

- **Exercise prescriptions and rehabilitation pathways:** Define clinical indications (e.g., high fall risk, mild-to-moderate hypertension, early Parkinson’s disease) and contraindications for Taijiquan practice.
- **Reimbursement and cost-effectiveness evaluation:** Promote pilot programs for health insurance coverage and conduct cost-effectiveness studies to ensure sustainability.
- **Guidelines and prescription tools:** Include Taijiquan in clinical practice guidelines and develop physician-friendly exercise prescription templates and referral algorithms.

Collaborative Research Communities

- **Multidisciplinary teams:** Integrate expertise from exercise science, rehabilitation medicine, psychology, public health, and artificial intelligence.
- **International research networks:** Establish a global Taijiquan research alliance to promote joint multi-center projects.
- **Data sharing and privacy governance:** Develop international databases and apply federated learning technologies to enable secure data integration.
- **Open science:** Encourage open access to research data and outcomes to improve transparency, reproducibility, and reusability.

Federations and Platforms as Hubs

- **IWUF's competitive platform:** Develop global rules and standards for referees and coaches; the inclusion of Taijiquan in Dakar 2026 YOG will significantly enhance international visibility.
- **Academic organizations (e.g., WTSPF):** Advance evidence-based research and foster global collaboration through conferences and scientific platforms.
- **Regional and local platforms:** Universities, integrative medicine centers, and public health institutions should collaborate to translate research evidence into scalable, community-based interventions.

Conclusion and Outlook

As an essential component of traditional Chinese culture, Taijiquan has gradually transformed from a practice rooted in

marital arts and wellness into a subject of global interest in public health and rehabilitation medicine. Its inscription on the UNESCO *Representative List of the Intangible Cultural Heritage of Humanity* in 2020 affirmed its cultural significance, while its official inclusion in the Dakar 2026 Youth Olympic Games further elevated its status as an international competitive discipline.

Within the framework of Evidence-Based Medicine (EBM), research has provided a solid foundation for the scientific development of Taijiquan. A growing body of randomized controlled trials (RCTs) and systematic reviews has produced robust evidence of effectiveness in **fall prevention, balance improvement, blood pressure regulation, and mental health**. Moreover, promising results have been observed in **Parkinson's disease rehabilitation, stroke recovery, cancer survivorship, and chronic disease management**. With its low-impact, mind-body regulatory characteristics, Taijiquan holds strong potential as a health-promoting intervention in the context of global population aging.

Nevertheless, the field continues to face major challenges, including **methodological heterogeneity, lack of standardized instructor training and fidelity monitoring, limited medical integration, insufficient data-sharing platforms, and weak policy and funding support**. These constraints restrict the comparability, scalability, and international dissemination of research findings.

To overcome these barriers, this paper proposes six key international pathways for scientific development:

- **Academic Institutionalization** – strengthening multi-center RCTs, real-world studies, pre-registration, and GRADE-based systematic reviews.
- **Educational Integration** – establishing international certification systems, tiered curricula, and integration into higher education and medical training.
- **Societal Adoption** – implementing community-based programs, integrating digital health technologies, and embedding Taijiquan into public health strategies.
- **Medical Incorporation** – embedding Taijiquan into exercise prescriptions and rehabilitation pathways, supported by insurance reimbursement and cost-effectiveness evaluations.
- **Collaborative Research Communities** – promoting international research alliances, open science platforms, and cross-disciplinary collaborations.

In essence, Taijiquan is at a pivotal stage of transition—from cultural heritage to evidence-based intervention, from community practice to international health policy. Future research and dissemination should adhere to the principles of **evidence orientation, interdisciplinary collaboration, cultural preservation, and scientific innovation**, thereby promoting the broader application of Taijiquan in healthy aging, chronic disease management, and global wellness initiatives.

Ultimately, Taijiquan is not only a treasure of Chinese cultural heritage but also a shared health resource for humanity. Through the combined advancement of evidence-based research, educational and

medical integration, and international collaboration, Taijiquan has the potential to become a vital tool for achieving the goals of **Healthy China 2030** and building a **Global Community of Health for All**.

Acknowledgment

The authors would like to express their gratitude to all individuals who provided valuable support and guidance throughout this work.

Conflict of Interest

Shudong Li serves as the Editor-in-Chief of the Journal of Taiji Science (JTS). To ensure transparency and avoid potential bias, the editorial handling and peer review of this manuscript were managed independently by Associate Editor Dr. Xin Xue and external reviewers. Dr. Li had no involvement in the peer review process or the final editorial decision. The authors declare no other conflicts of interest.

Funding Information

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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