

Analysis and Reflections on the Scientific Research of Taijiquan in China

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Abstract—Taichiquan has recently come to the attention of the world's scientific community, and within this community there exists diverse development trends. Based on an analysis of the published research papers within and outside of China, this paper discusses the institutional factors, internal factors and external factors that affect the development of Taijiquan scientific research. From there are three suggestions: First, through establishing a research paradigm based on life science and body experience, we may find the reason why Taijiquan has so many benefits in the physical and mental health for humans. Secondly, we should pay attention to intervention in the whole process of overall medical treatment (this includes preventive-care, general healthcare, diagnosis, treatment and rehabilitation through Taijiquan health promoting); and third the standardization of the basic concepts of Taijiquan is a rich area for further research that can act as a reference for the future scientific research of Taijiquan.

Introduction

With the successful launch of the World Taiji Science Federation" and the "International Taiji Science Forum", Taijiquan has gained more attention from the global science community, and it is already clear that a new chapter has opened for the scientific research of Taijiquan.

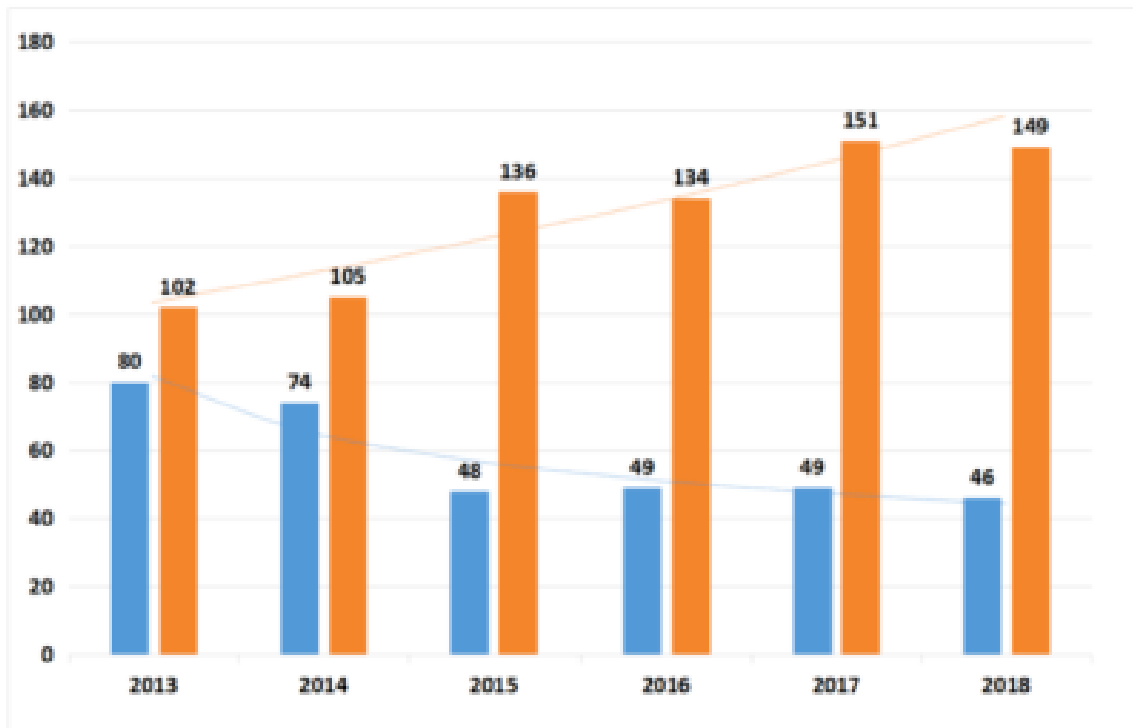
In the past two decades, academic research on Taijiquan has ranged from its cultural

communication, education & inheritance, technical research, and studies in scientific fitness and the underlying health mechanisms; to interdisciplinary research fields, which study biochemical and medical effects, physical integration, rehabilitation, medical intervention, medical care, mental psychology, neurocognition, brain remodeling and cell health. As a result of these efforts, many groundbreaking science-based achievements have been made. For the future, a type of blueprint and trajectory can now be drawn, where physical laws, and new research areas may be identified using a modern, science-based approach for the research of Taijiquan. It is expected that, both within China and abroad, there will be a rapid increase in the number of published papers that use modern scientific principles to study Taijiquan; and the presence of various different research efforts in Taijiquan research will result in not only an increase in new discoveries, but also an increase in the number of institutions participating in collaborative Taijiquan research.

More published papers on scientific research of Taijiquan outside of China

According to our observation, the most recent five year period, from 2013 to 2018, saw a broad, general growth in the number of papers on Taijiquan research published by international academic journals, with the greatest growth occurring in the United States (Fig. 1). New research centers also began to take root for the first time in Australia, South Korea, Canada, Turkey, the United Kingdom, Japan and Germany, to

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Comparison chart of quantity change trend of research literatur on Taiji in China and at abroad from 2013 to 2018. ■ China, ■ Abroad

Fig. 1

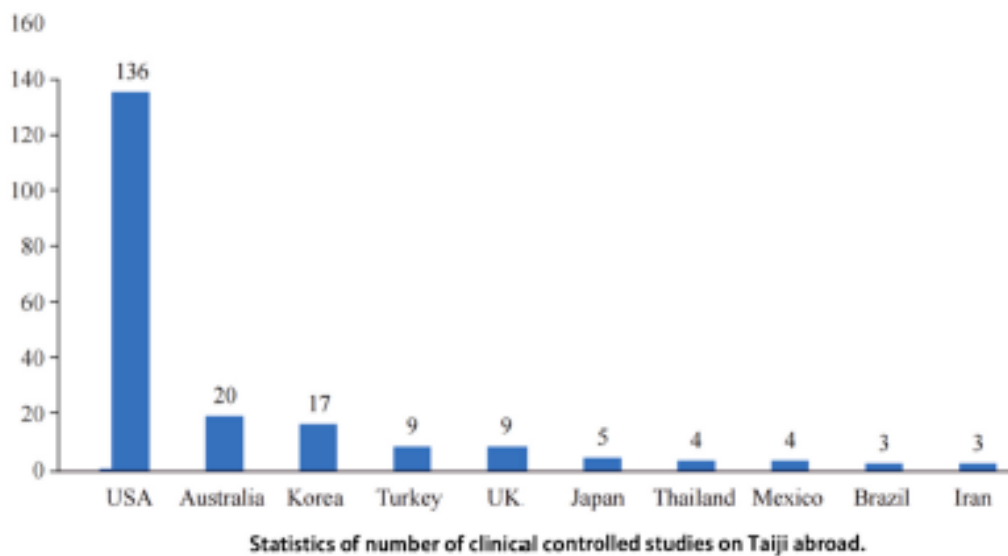


Fig. 2

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name just a few countries. However, within the same study there was observed a worrying decrease in the number of scientific papers produced in China (Fig. 2). Despite this, the overall total in the number of papers published remained flat, at circa 180 papers per year: this is because of the greater visibility of Taijiquan internationally. Within the US, there was a sharp increase, which was mainly driven by the development of new theories, new scientific tools, and the use of computer-based studies to analyze and model in greater detail the mental, physical benefits of Taijiquan. This was despite there being no dedicated research journal for research scientists to publish their work. With the launch of the Journal of Taiji Science in 2022, it will be interesting to see if there is an increase in the number of papers published, as research scientists begin to locate new avenues for collaborative research, and identify new areas to raise research funding.

Different focuses of Taijiquan research in China and abroad

In the studied five-year period, within China Taijiquan was mainly studied as a “sports and cultural event”, while outside of China it has traditionally been viewed more as a means for low-cost medical treatment and for the efficient promotion of health. Another difference is in the field of Taijiquan and health, Chinese research focuses more on physical fitness, whereas in other countries the research focuses is on the treatment of clinical symptoms. In terms of research hotspots, Chinese researchers are more interested in the sports science system, the international communication of Taijiquan, and its use within the public sphere (for example in dance and yoga, etc.); in contrast, research undertaken in other countries shows a greater interest in the health benefits of Taijiquan for example as an effective treatment for some specific types of depression, and in therapeutic improvements, it is also used as an “alternative medicine”, and for general cardio improvements that can be assisted by low-impact exercises.

The number of academic institutions participating in Taijiquan research at home and abroad is increasing

Over the past decade, it was observed that the research of Taijiquan in China was mainly carried out by individual scholars, or by independent researchers who work either at physical education institutions of higher learning, or within the universities researching traditional Chinese medicine. Few interdisciplinary research groups were involved. This is a problem, because this isolation of research scientists acts to prevent the transfer of new research ideas between different research groups.

In contrast, in studies looking at the effectiveness of Taijiquan for clinical intervention, overseas research was mainly undertaken by research teams and by interdisciplinary groups. Some of these studies have also been undertaken at prestigious research institutes, such as the research groups working at Harvard Medical School, Oregon Research Institute, Tufts University School of Medicine, Emory School of Medicine the University of Sydney, and the various Universities of California, with some institutions now holding decades of trace records (Fig. 3).

This reveals Taijiquan has gained more attention and is now considered to be a fertile and acceptable area for research within the global science community, and the momentum driving Taijiquan research has now diversified to the point it is now becoming a well-accepted interdisciplinary research subject, that covers a wide range of research areas. Many new scientific research studies of Taijiquan are thus advancing internationally, not only within the medical field, but also within engineering and in computational analysis, and each study has its own merit.

It is also noted that the many different cultural and social backgrounds present in various countries are clearly influencing how research projects are developing. These different insights are not always a disadvantage, and the differences can bring great potential for the development of Taijiquan, and Chinese culture.

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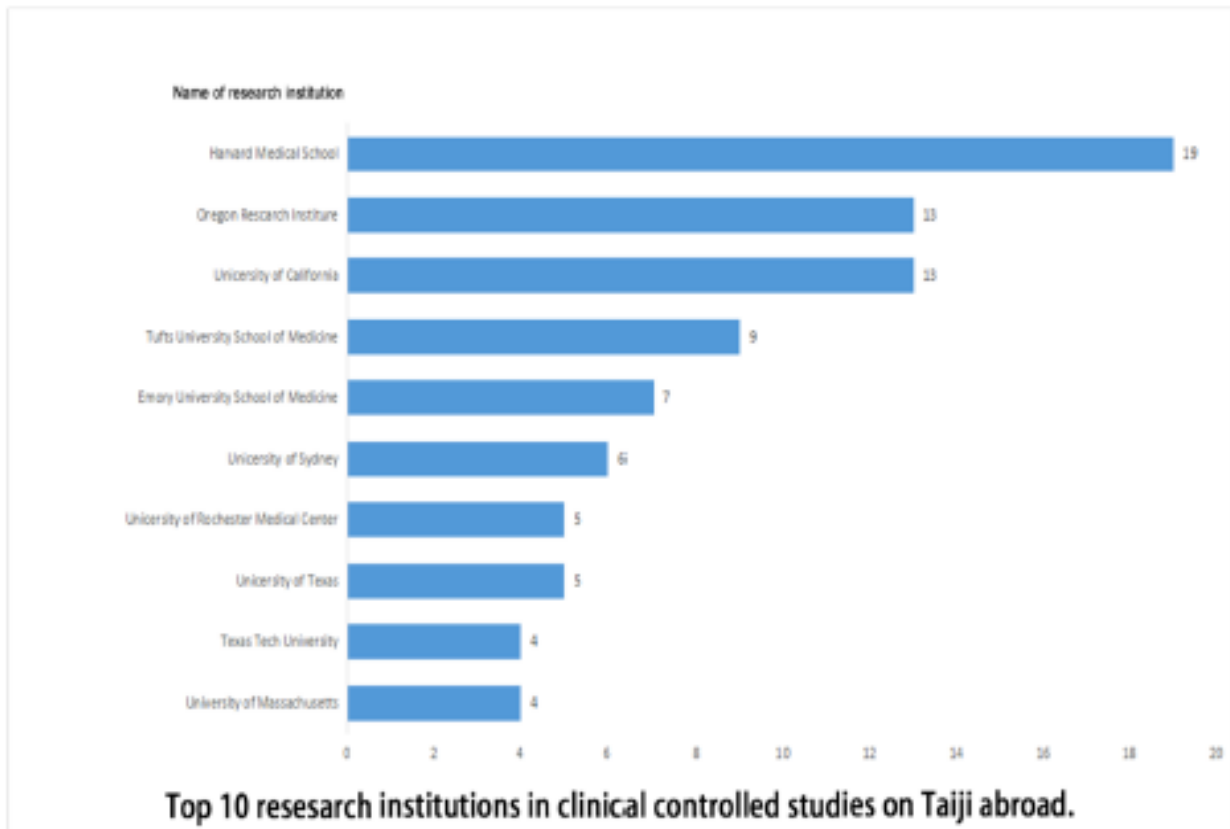


Fig. 3

The differences in the research on health promotion of Taijiquan within China and abroad.

Taijiquan research within China and abroad have roughly the same clinical experiment scope, but in general the research fields outside of China are more extensive and diversified. Looking back over the last few decades, within China and within international research centers the research of disease intervention and clinical experiment involving Taijiquan has gone through four stages; the initial research into motor control involving balance, restricted movement, falls, gait; the prevention and treatment of chronic diseases, such as osteoarthritis, Parkinson's disease, heart failure and hypertension; the research of diabetes, musculoskeletal system diseases; and then most recently the research into the effect of Taijiquan on the immune system, and its effects on psychosocial diseases, like insomnia, anxiety, depression, and autism. In the past 25 years, we were able to record a

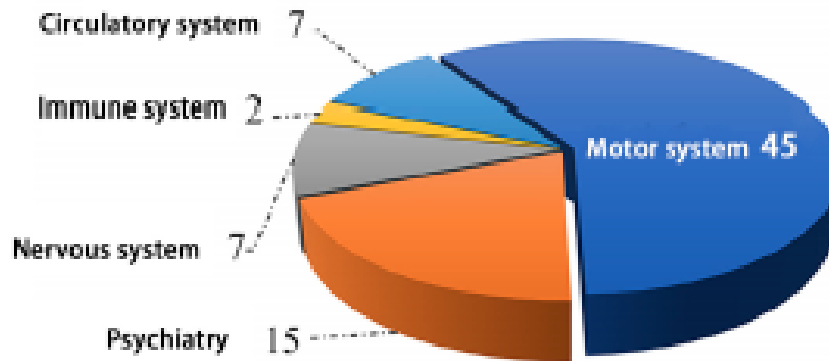
total of 209 scientific research programs on Taijiquan that were undertaken outside of China. About 47 of these studies review its influence on various diseases. These covered roughly the same scope and research fields as those undertaken in China (Fig. 4).

Other overseas research shows Taijiquan also had a positive effect on the improvement of lower urinary tract symptoms in elderly patients with benign prostatic hypertrophy (Eun-Nam Lee, 2012); Taijiquan had good therapeutic effect on elderly patients with periodontal disease (Víctor Manuel Mendoza-Núñez, 2014); it could effectively improve the withdrawal symptoms of alcohol dependent patients (Chung-uk Oh, 2016); and Taijiquan was therapeutically effective on attention deficit hyperactivity disorder in school adolescents (Alexander K. Converse, 2020). In addition, Taijiquan was also reported to affect the intestinal flora of general population, the remodeling of the cerebral motor cortex, and the changes in cell gene expression.

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Human System of Healthy Subjects

1



Statistics of Top 10 Subjects of Disease

B

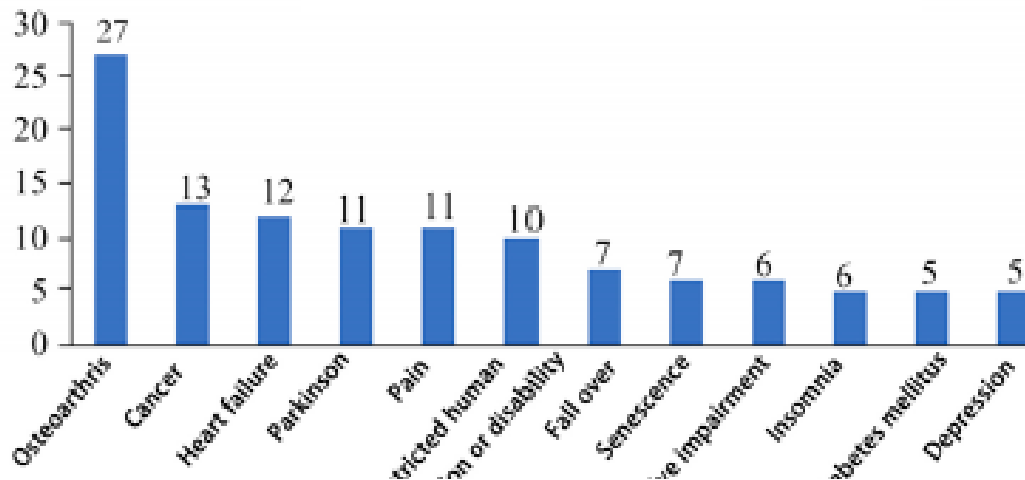
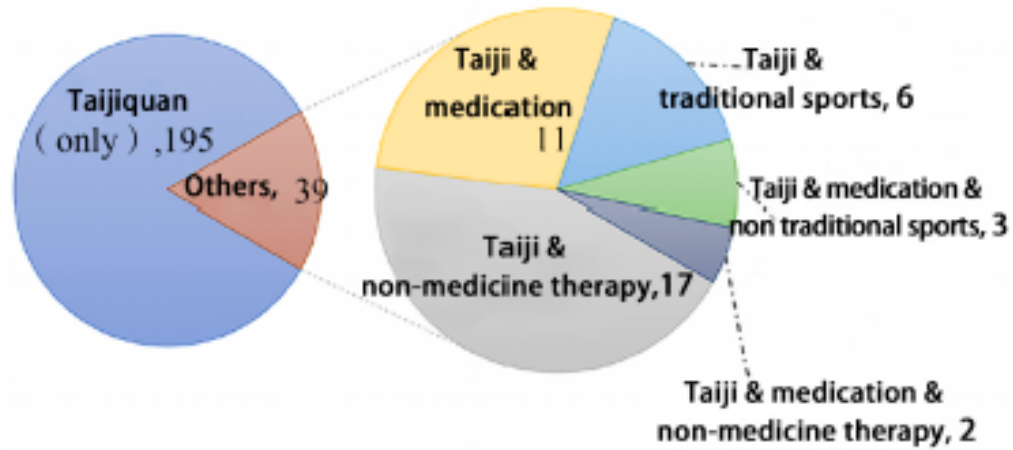
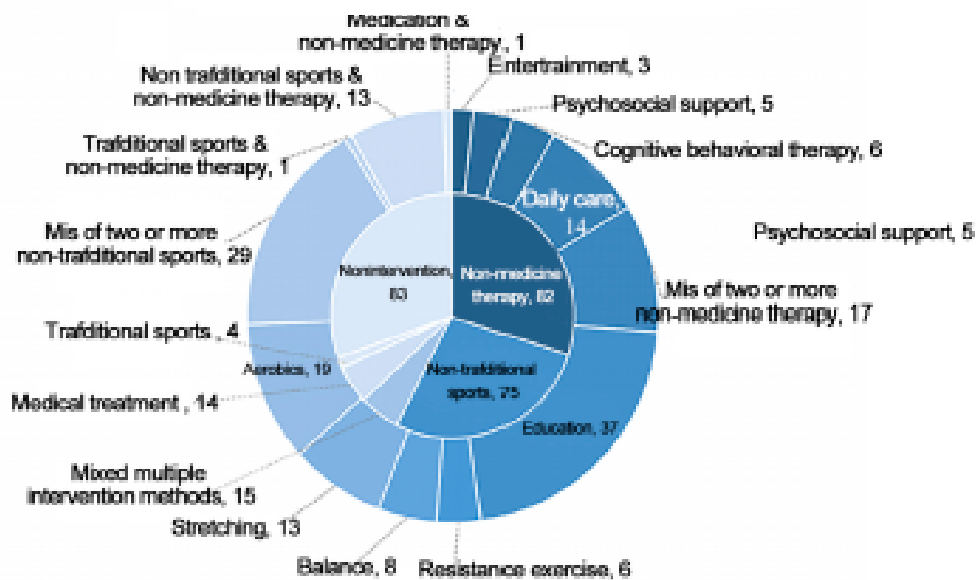


Fig. 4 and b. Research objects of clinical controlled studies on Taiji outside of China. Note, there were three cross studies in psychiatry and motor systems (which repeated 3 times), three cross studies in motor systems and circulatory systems (repeated 3 times), there was one cross study in the motor system and nervous system (repeat count 1 time) and there was one cross study in the Immune system and psychiatry (repeat count 1 time).

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5a. Intervention Methods in the Treatment Group

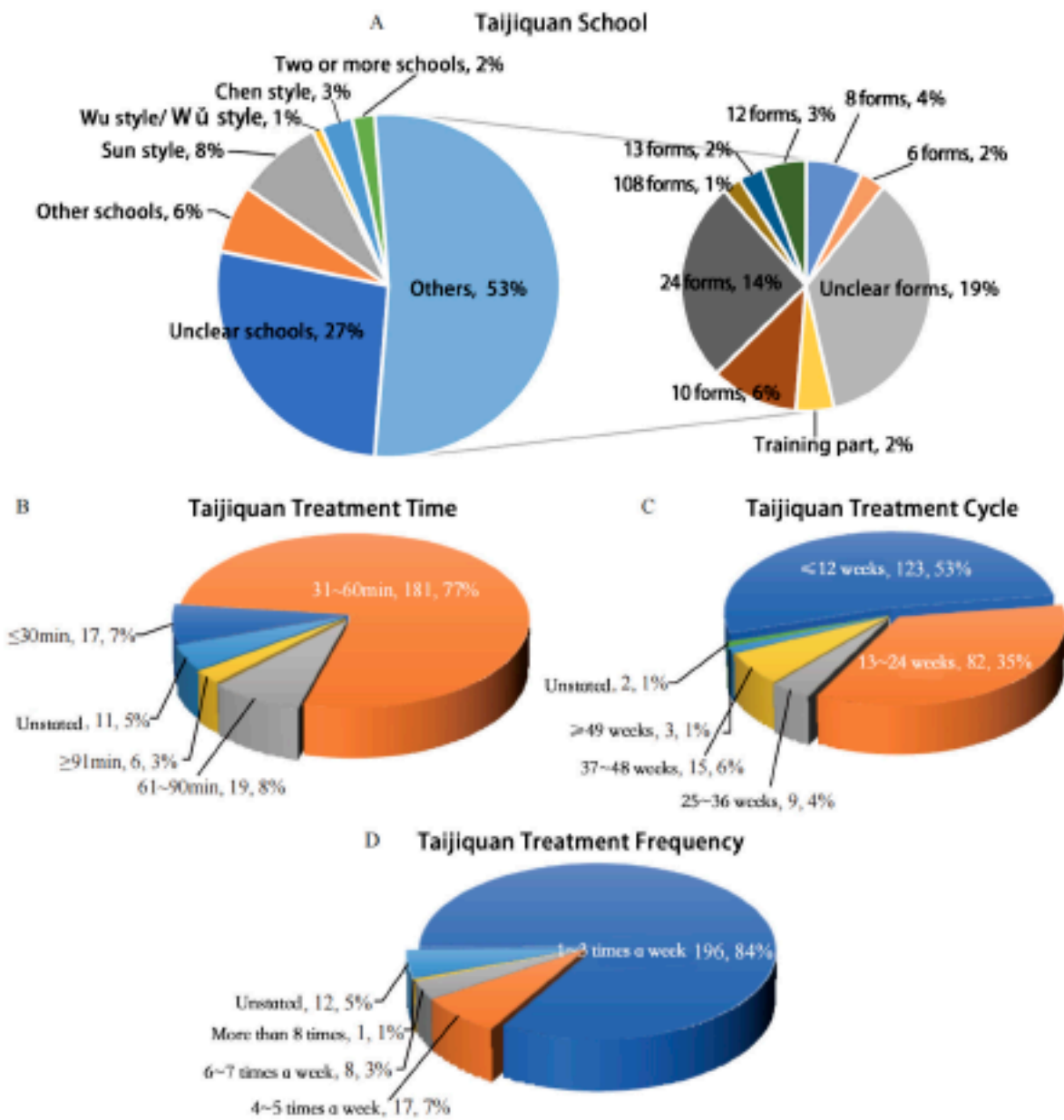


5b. Intervention Methods in the Control Group

The setting of treatment groups and control groups in clinical controlled studies on taiji abroad

Fig. 5

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Taijiquan intervention therapy program in the comparative studise of Taijiquan abroad

Fig. 6

2.2 The differences in experimental methods, research objects and results of clinical intervention of Taijiquan in China and abroad.

The clinical experimental research studies on health intervention of Taijiquan show a surprising consistency in research subject, experimental methods and conclusions: First of all, symptomatic patients were usually taken as research subjects, and clinical control researchers usually studied healthy people, such as teenagers, practitioners of Taiji, or both healthy or sick people who have long practice Taiji. Secondly, a simple control study is adopted in most research methods by dividing the subjects into the group practicing Taijiquan and a group refraining from Taijiquan or exercise. Other factors like psychological training and self-healing capacity enhancement are often ignored in the reference indicators and analysis indicators of experimental research. Finally, it is found that all conclusions for clinical research of Taijiquan in China are again surprisingly consistent, and show that Taijiquan has a significant positive role in the intervention of different diseases. Most Chinese research groups select simplified 24-style Taijiquan and 48-style Taijiquan in their studies, with some focusing on Taijizhuang, Taijicao, and other physical activities.

For clinical intervention research of Taijiquan by research groups outside of China, the subjects are again divided into healthy people and patients. In terms of other control indicators of Taijiquan intervention treatment, research groups also reviewed the direct comparisons between Taijiquan therapy and drug treatment, and non-drug treatment; the differences between Taijiquan and various sports, and other traditional sports; and between social psychological support and cognitive behavior therapy. The intervention indicators of Taijiquan technology have also been divided into Taiji schools, Taijiquan practice duration, practice cycle and practice frequency. For selection of Taijiquan schools, different schools of Taijiquan were also adopted for the intervention control study of the same disease (Fig 5, and 6).

Among 209 overseas clinical research reports on Taijiquan over the past 25 years, 90% of the research results showed that the effect of Taijiquan group, or Taijiquan plus other interventions, was better than that seen within the control group, 9% of the research results indicated no significant difference between the effects of Taijiquan intervention group and the control group, and 1% of the results were inconclusive. None showed any detrimental effect.

Several factors that affect the development of scientific research of Taijiquan in China.

In China, the disciplinary orientation and setting of Taijiquan research are the major institutional factors affecting the scientific research of Taijiquan.

In China, Taijiquan research is listed as a sub-program of national traditional sports, under the Sports Discipline. Although some universities treat martial arts or Taijiquan as part of national traditional sports, they generally prefer to research competitive Taijiquan.

The problem with this approach is a competition-oriented training model is unable to satisfy the average person's need for physical and mental health, nor can it assist with cultural and spiritual help, and there is a demand for diversified Taijiquan studies. Among master and doctoral students majoring in martial arts, only a small number take Taijiquan as a special subject, and few scholars take part in any interdisciplinary, or cross-international cooperation in the field of Taijiquan research.

Within China, Taijiquan is considered to be far beyond any general sports, given its value and orientation. Under the background of Chinese traditional culture, Taijiquan is more a branch of learning related to life, that is closer to life science amongst the modern science disciplines. This is because it manages to integrate together philosophy, psychology, anthropology, sociology, neurocognitive science, traditional Chinese medicine, clinical medicine, sports physiology, rehabilitation medicine and

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other scientific research areas. In China, its restriction to a single restricted discipline limits the vision of Taijiquan research, and it is also very difficult to access academic resources and financial support from the leading universities and key national programs.

The cognitive limitations of domestic researchers on Taijiquan are the main internal factors affecting the scientific research of Taijiquan.

It is important to realize that sufficient traditional *cultural* literacy and an understanding of meditation are, from the perspective of Taijiquan, indispensable for researchers to understand and cognize Taijiquan, as a life science that is linked to physical and mental practice. With often little experience in Taijiquan techniques and its physical and mental practice, many Taijiquan researchers in China are incapable of forming any independent innovations in their research design, research methods, and research ideas. These problems might be driving the gradual decrease in the number of papers being published annually in China. On the other hand, being local and at the source of local knowledge, and being closer to the actual inheritors and thus having greater access to long-term practitioners of Taijiquan who usually have greater in-depth meditation skills and cognition of Taijiquan, there is reasons to believe this trend can be reversed, even if it has previously been noted that it is difficult for many practitioners to express their experience and to have dialogue with academics.

Of course, the enhancement of awareness of the value of Taijiquan is a society-wide issue, that is affected by the cultural popularization, education guidance, enhanced image and better training of Taijiquan. At present, most people still misunderstand Taijiquan, and the perception is only some middle-aged and elderly people agree that Taijiquan is beneficial to physical and mental health. Promotion of the Taijiquan culture is difficult throughout the society, mainly because there are not enough teachers with comprehensive knowledge and excellent skills in Taijiquan, in the Chinese education system.

The hot spot orientation of overseas Taijiquan research is an external factor that has begun to affects the scientific research of Taijiquan in China.

In previous decades, overseas research learnt from, and referenced the scientific research of Taijiquan in China, especially in clinical experimental research for health promotion. As a result, some research studies tend to be more prominent, and consequently several diseases were repetitively included in early disease intervention studies by overseas research groups. In terms of research methods, the quantitative indicators of the control study, the technical control of Taijiquan, the psychological role of patients, and other important factors affecting the rehabilitation of patients were often ignored; and not enough attention was paid to the repeatability of the experiment, the specific functions of different types of Taijiquan, and whether the clinical intervention actually produces different results. Recently, these trends are changing, with Chinese scientists recognizing the benefits of international collaborative research.

China's strategies and paths in the scientific research of Taijiquan.

The comparative analysis of the clinical experimental studies on the health promotion of Taijiquan, both in China and abroad shows that, there are many things to be discussed, with respect to the research orientation and strategies in China. As an ancient saying goes, "With copper as the mirror, you can correct your clothes; with history as the mirror, you can know the ups and downs; with people as the mirror, you can see the gains and losses." Under the exchange and collision of Chinese and Western Taijiquan studies, we now see more clearly our own shortcomings and also some of our advantages.

In general we should return to the perspective of Taijiquan itself, and focus on the study of "cause" rather than "effect" In the past ten years, a large number of clinical experiments in China and abroad have only focused on the effect of Taijiquan on disease intervention, failing to identify the root

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cause, (the biochemical and in some cases the mental cause), of "why Taijiquan is good for human body and mind", that is to say, there has been more emphasis on the effects, not the cause.

In China, Taijiquan is a life science based on the internal evidence and practice of body and mind, which has come down in one continuous line with the theory of traditional Chinese medicine and the life-practice view of harmony between man and nature. In contrast, when western medicine is used to study traditional Chinese medicine, we often run in the opposite direction. Science and physical evidence are the two primary ways to know the truth. To reach the same goal via different approaches, we need to work together in the same direction, and not in opposite directions.

It seems that we have to return to the life experience of Taijiquan practice. It is not necessary for every researcher to need to practice Taijiquan, but the person undertaking research must work with those who do.

If we are to understand the biochemical processes that are responsible for Chi, and to link up the inner microcosm with the bigger universe, and to try to understand the body view and life view of heaven and man, body and mind, yin and yang in traditional Chinese culture there is no other way. Only by working together, can we realize the mechanism of Taijiquan health as summarized by ancient people, and understand its "physical and mental interaction" and the "harmony between nature and man". Physical and mental interaction is to balance and adjust a person's mind and body through communication and interaction by practicing Taijiquan. "Harmony between man and nature" is to deal with the relationship between our internal body and the external nature, universe and society. These ideals share common ground with the World Health Organization's definition of health.

During embodiment of Taijiquan's role in living individuals, we can note changes in both the physical and physiological data recorded in clinical experiments, the

improvement on the non-material (psychological) level, and even a moral transcendence to the realm of life. The concept of moral cultivation may sound strange to science, but the body view and life view of Taijiquan inherently stresses the influence of moral cultivation on physical and mental health - a parameter that is becoming more important in the modern stress-filled world.

We should focus on the extensive application of Taijiquan in all links of Holistic Medicine, rather than just on the clinical intervention in the rehabilitation stage.

Taijiquan can participate in the whole process of disease development: from prevention, to health care, diagnosis, and treatment, to final rehabilitation. But, its value often lies more in prevention and health care than in rehabilitation support after an illness had taken hold. In terms of the intervention and clinical research of "preventing disease", it might be promising to broaden both the scope of subjects and the research vision, and to focus on long-term follow-up studies of healthy people, Taiji groups or chronic patients.

Given the impact of COVID-19 over recent years, we have begun to define COVID-19 as a "self-limited disease of the human body". Chinese scholars have published more than 20 papers and research reports on improving immunity and intervening in the rehabilitation treatment of late COVID-19. This should be translated and shared in the international academic community.

We should make good use of China's local resources to provide the ground for future scientific research of Taijiquan around the world.

More than 90% of Taijiquan knowledge can be considered traditional and comes from those who can be considered inheritors, practitioners or scholars of Taijiquan. Such "local knowledge" of Taijiquan is mainly derived from their physical experience of Taijiquan techniques, cultural understanding, life experience, the existence of so many individuals from different schools and groups, gives us a holographic complex
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three-dimensional image of the world of Taijiquan.

However, in this knowledge, many basic concepts and special terms of Taijiquan, like the basic definitions of the eight exerting methods, and basic concepts in the body view and life view, are *very* difficult to understand and can be easily mistranslated, misread, and misunderstood by those practicing in other countries. This can form cognitive barriers in the international communication of the benefits. China undoubtedly has great advantages in the academic application and standardization of local knowledge of Taijiquan, and it can provide more meaningful academic concepts for the worldwide research of Taijiquan.

In addition, with international research cooperation, the inheritors, social organizations and institutions of Taijiquan in China can provide more knowledgeable groups, and individual cases to expand our research horizons and scientific research fields.

The Summary & Conclusions

China's traditional culture is based on life experience and physical and mental internal evidence. China should and can establish a research paradigm that is based on life science and China's physical experience on the mechanism of Taijiquan and mental health. It is also necessary to highlight Taijiquan's unique values and advantages. Secondly, we should combine or review the link to and between traditional Chinese medicine, and extensively explore the intervention role of Taijiquan in the process of disease prevention, health care, diagnosis, treatment and rehabilitation. This may start from the Holistic Medicine of Taijiquan's intervention in health promotion, rather than just focusing on clinical experimental research in rehabilitation treatment. Finally, Chinese Taijiquan researchers should respect and learn the local knowledge of Taijiquan, to further standardize the basic concepts of Taijiquan research, and combine their knowledge to academic applications, in order to provide academic tools and a rich ground for the future scientific research of Taijiquan around the world.

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