

The Integration of AI and Acupuncture: A Contemporary Approach to Ancient Healing

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Abstract: *Acupuncture, originating in China over 2,000 years ago, remains one of the world's most widely practiced forms of traditional medicine, expected to generate \$141 billion in global revenues by 2034. Based on the idea of restoring balance to the body's natural energy flows, known as Qi, acupuncture has gained increasing popularity and scientific validation, with studies demonstrating measurable benefits in pain reduction, improved procedural outcomes, and reduced medical costs. Meanwhile, advances in artificial intelligence (AI) and robotics are revolutionizing modern medicine by improving accuracy, efficiency, and accessibility. This paper explores whether acupuncture can integrate such technologies without undermining its holistic foundation. Evidence from AI-assisted medical procedures demonstrates potential for improved precision in needle placement, cost savings, and more consistent standardization of care. At the same time, the industry would need to address numerous challenges, including safeguarding against data errors, preserving practitioner intuition, and mitigating concerns over job losses. Despite these obstacles, this paper advocates for a doctor-assisted AI model that could provide a balanced approach, ensure acupuncture's evolution while preserve its traditional essence.*

Keywords: AI in healthcare, acupuncture, doctor-assisted robotics, traditional medicine, digital health equity, Eastern Medicine, Diagnostic accuracy, Precision in Medicine, Large Language Models (LLMs), Equity in Healthcare Access, Loss of human intuition

1. Background

One of the oldest forms of healing, acupuncture is estimated to have originated in China between 100 and 200 BCE. In their seminal work on the history of Chinese medicine, Harriet Beinfield and Efrem Korngold found that the first documentation of acupuncture was discovered in the Huang Di Nei Jing (The Yellow Emperor's Classic of Internal Medicine) [1]. According to Korngold and Beinfield, the Chinese viewed the body as comprising a network of energy, known as Qi, that flows through the body. When all the networks are available, energy can pass freely; however, if the networks are blocked, pain and discomfort can occur throughout the body. Their book describes acupuncture as the practice of unblocking these energy networks through the insertion of needles into specific points, thereby unblocking the pathways. In short, practitioners regard acupuncture as a way of rebalancing the body and restoring peace within the Qi flows.

At the other end of the spectrum lies Western medicine with its more invasive approach and reliance on pharmaceuticals. It's a modality that constantly evolves and adapts, incorporating new techniques, methods, and technology. Over the last five years, doctors in virtually all fields of medicine have begun to incorporate robotics, sensors, and artificial intelligence into their practices, from diagnostics to surgical procedures. Due to its Eastern medicine holistic nature, however, the acupuncture industry has arguably remained reluctant to incorporate AI. It has not addressed the question of whether AI is necessary to enhance care for its patients. This paper will examine whether these technological advances can benefit the practice without undermining its holistic approach, or is the difference between them too great, too vast to bridge?

2. Methodological Note

This paper is an argumentative analysis of the intersection between acupuncture and emerging technologies. Although none of the research uses original empirical data, all the sources chosen were selected due to their relevance, credibility, and contribution to the problem being researched. Through the synthesis of reputable medical reports, peer-reviewed articles, and essential texts, this paper is able to develop a thorough analysis of whether the integration of AI can enhance the acupuncture field without undermining its unique and holistic principles.

Modern Acupuncture

Before attempting to understand whether it is possible to integrate these fields, it is essential to examine whether or not acupuncture is an industry worth investing in. Over the years, acupuncture has gained widespread recognition and is now practiced in over 180 countries. A 2018 study determined that mainland China had between 10,000 and 18,000 practitioners [2]. Meanwhile, some estimates suggest that the number of practitioners globally ranges from 70,000 to 100,000, with the United States having approximately 38,000 licensed acupuncturists as of 2018. The evolution of acupuncture and its acceptance as a viable medical option has also created an industry with an estimated \$44 billion in yearly revenues, with an expectation that these numbers will increase to \$141 billion by 2034 [3]. Aside from increased accessibility and acceptance, technological innovations, including electronic acupuncture and laser acupuncture devices, are expected to drive revenue.

Although acupuncture has been practiced for thousands of years, many still lack complete trust in its effectiveness. Despite this skepticism, scientific research continues to support its medical value. In a recent 2022 trial, Oh and

Kim studied the results of acupuncture treatments at ST36, a point just below the kneecap [4].

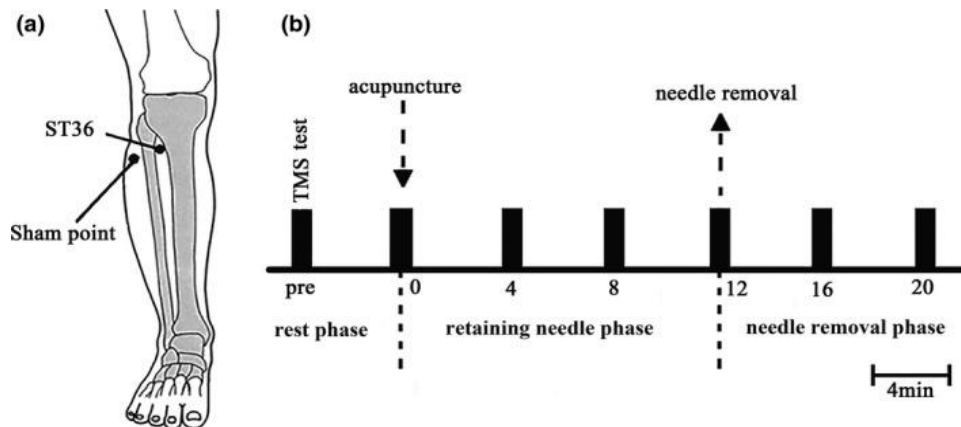


Figure 1: The location of Zusanli (ST36) and the experimental procedure. This figure illustrates the location of ST36 and the recommended duration for needle insertion in the patient. Adapted from Effect of acupuncture at ST36 on motor cortical excitation and inhibition [4].

This location is often targeted for patients experiencing knee pain or inflammation. The study concluded that acupuncture at ST36 significantly reduced swelling, alleviated pain, and accelerated recovery. Oh, and Kim's findings support the idea that acupuncture should be recognized as a scientifically supported method for aiding in pain management and in recovery from injuries in the same manner as Western medicine.

Origins of Artificial Intelligence

Although its inclusion in our everyday lives is a recent development, the idea of artificial intelligence (AI) was initially explored by Alan Turing in 1950, laying the foundation and baseline principles for AI to become what it is today [5]. Since then, scientists have achieved many breakthroughs in the capabilities and power of AI, machine learning (ML), and robotics. These advancements include: the creation of the first robot in 1961, named Unimate, the first driverless vehicle in 1986, the unveiling of machine learning in 2012 with AlexNet, and, more notably, OpenAI's chatbot, ChatGPT, which was first introduced to the public in 2020.

Overall, however, breakthroughs in AI and ML, a subset of artificial intelligence that analyzes data to detect patterns and create solutions without explicit human direction, are relatively recent. The expansion of AI, particularly through the public release of ChatGPT and Siri, has not only caused seismic changes in everyday lives but is also predicted to grow in size, importance, and reliance. So, as AI and ML continue to impact various practices, it is essential to examine how this new technology may impact traditional medical practices, such as acupuncture.

One of the most apparent advantages of incorporating AI and robotics into acupuncture practice is an increase in the precision and accuracy of both the needle placement and the points associated with the patient's ailment. As previously discussed, the placement of needles is crucial for demonstrating the effectiveness of acupuncture treatments. Therefore, finding a solution whereby

practitioners incorporate AI into their practice, perhaps in the form of a doctor-assisted AI-controlled robot, would benefit patients.

A variety of studies across numerous medical fields have shown that the usage of AI assistance can significantly improve the overall accuracy, consistency, and effectiveness. In one such study, Fatima, Massaad, Hadzipasic, Shankar, and Shin investigated how AI could aid in the placement of pedicle screws, a type of screw used in spinal fusion surgery to stabilize the spine. The study concluded that the accuracy in inserting and securing the "perfect" pedicle screw was significantly superior, about 68% more accurate, with robotic-assisted surgery compared to the free-handed technique [6]. Similarly, the accuracy rate for a "clinically acceptable" pedicle screw insertion was also significantly higher with robotic-assisted surgery compared to the free-handed technique, at approximately 54%. This difference is significant because, similar to acupuncture, the more precisely the screw is placed, the more likely the procedure will be successful, leading to better outcomes for patients. By utilizing AI robotic technology that can instantly analyze the optimal location for a needle (or a pedicle screw), the overall effectiveness is significantly enhanced.

The practice of acupuncture is complex, with over 400 points located through an interconnected network of twenty main cutaneous and subcutaneous meridians through which energy flows. These meridians and associated points control different functions within the body and are stimulated through the use of needles to open the channels, thereby allowing the Qi to flow freely [7]. The finesse and subtlety required of acupuncture practitioners are not limited to selecting the appropriate points in which to insert the needle, but also to making minor adjustments to ensure that the needle reaches its intended target. This raises an important question: how could a robot locate the appropriate points and recognize if a needle needs to be shifted slightly? While understandable, the study referenced above demonstrated that a properly trained AI repeatedly proved itself to be more accurate in terms of angles and precision during a

medical procedure than its human counterparts. With sufficient mapping, data, and experience, a Doctor-Assisted AI-Controlled Robot would be more likely to avoid mistakes by missing the point altogether, with the added benefit of instantly recognizing if the angle of needle insertion was incorrect.

Regardless of a robot's accuracy, however, one must still consider the potential for errors with the AI. This complex issue relating to self-correcting AI was explored in a 2024 study examining how large language models, or LLMs, are capable of self-correction, particularly when provided with external feedback or trained under structured and rigid frameworks [8]. These new software-based technologies are essential because they enable the AI to be more responsive and reactive while learning and performing tasks. The overall system could utilize LLMs to guide the robot and assist with angles and speed during needle insertion, while simultaneously analyzing and estimating needle depth and angle to ensure the needle accurately hits its intended target. If the point was missed or the angle of insertion was off, even by a fraction of a degree, the AI would recognize the error, remove the needle, and try again, while simultaneously gaining expertise to prevent such errors. If the point was missed or the angle of insertion was off, even by a fraction of a degree, the AI would note that a mistake occurred and simultaneously gain expertise to avoid such errors. In the end, as AI systems become more reliable in identifying their own mistakes, AI's role in these high-precision fields will become even more transformative and effective.

Integrating AI into the practice of acupuncture would also reduce the significance of the digital divide, making acupuncture resources more accessible and equitable. The digital divide refers to the disparity in access to technological resources among people from different backgrounds. Currently, only professionals who have had years of schooling and hands-on training can become licensed acupuncturists. Along with the baseline educational requirements, a practitioner's technique will also vary based on the acupuncturist's environment and

resources. For instance, an acupuncturist who attended a school with limited resources or resides in an area with a weaker economy may lead to worse results for patients compared to an acupuncturist who has access to the best education and available resources, including apprenticeships to learn from masters. By minimizing disparities in practice efficacy, the information the robot uses remains the same regardless of where the patient seeks treatment. As discussed in Freund's 2024 research paper, the data AI is provided is constantly being built upon itself [9]. The fundamentals of AI are based on recognizing patterns and learning which solutions yield the best results for a given problem. AI is constantly learning, whether through human direction or self-reflection.

Furthermore, AI has no limits on how far the information can spread. The newest model of an AI robot acupuncturist could run on modern global data, not just from an outdated textbook or a weekend seminar. Engineers could program the AI and the underlying LLMs to enable the system to instantly share its knowledge base with other AI robots, regardless of geography, including data related to needle insertion depth and angle, point selection for various diagnoses, and novel treatment approaches. The advantage of interconnectability within AI is one of the most significant benefits the acupuncture field could have after its integration. Not only would it reduce the overall divide between people, but the dissemination of knowledge would be vastly improved, likely leading to a significant improvement in the overall effectiveness of acupuncture treatment.

Co-existing with the idea of a shrinking digital divide, another positive component that could arise through the integration of AI within the practice of acupuncture is the potential for cost reduction, as seen in other medical fields. A study published by *The Lancet Digital Health* found that AI-assisted colonoscopies not only produced more accurate findings but also led to overall reduced cost [10]. On average, a patient who received AI assistance for colonoscopy procedures costs \$57 less than a patient with only human aid.

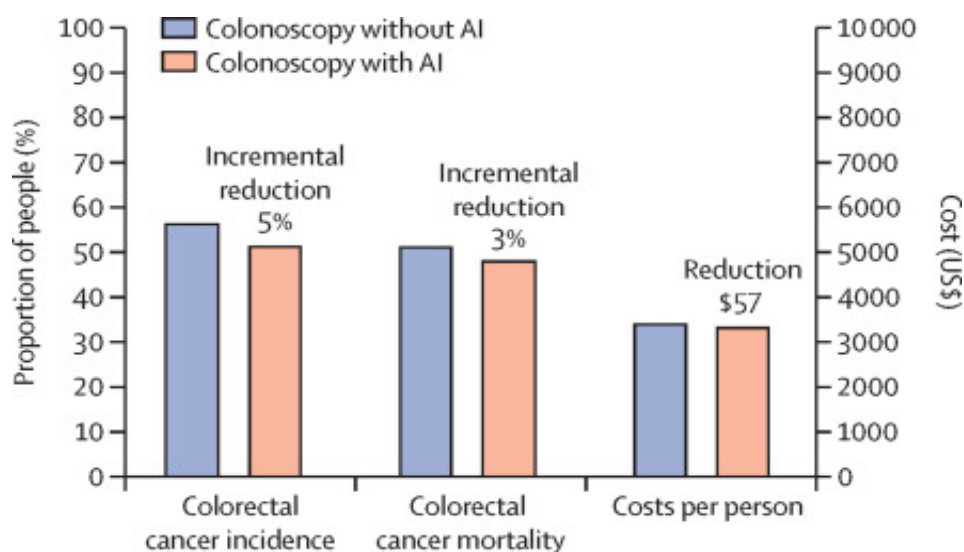


Figure 2: Results of the primary health and cost analyses. This graph shows the overall decrease in the price of a colonoscopy, both with AI assistance and without [9].

Besides lowering costs, AI-assisted colonoscopies helped doctors identify precancerous polyps 4–8% more accurately. It is expected that AI would have similar effects in acupuncture. AI would enhance diagnostic precision, expedite treatment regimens, and reduce the need for unnecessary sessions. As a result, more people could access higher-quality and advanced acupuncture treatments, thanks to an AI-integrated model.

Another key advantage of AI is its ability to operate objectively and in a non-biased manner. Unless instructed otherwise, AI will only provide the answer it believes is

most accurate, based solely on concrete data. As shown in Tessler's 2024 study, one of AI's most concrete advantages is that it can accomplish tasks without the interference of external factors, such as fatigue or self-interest [11]. The study aimed to determine whether AI could be used as an effective mediator. Researchers took various statements and points made by politicians and used AI to refine their positions, making them sound less biased and more logical based on the facts provided. Ultimately, nearly 5,800 people preferred the AI-generated statements over the human-made ones. They noted that the AI-generated positions were more "informative, clear, and unbiased."

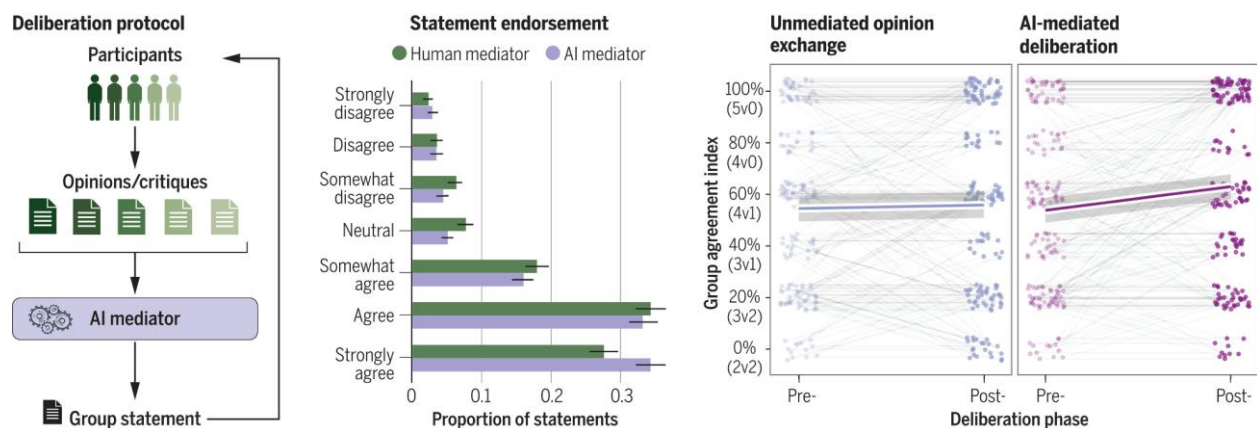


Figure 3: AI helps people find common ground in collective deliberation. The first diagram illustrates the overall process by which the study was conducted. Then, in the second and third diagrams, the overall agreement rates are shown before and after the AI altered the original arguments [10].

In acupuncture, an objective and unbiased diagnosis could transform the entire practice. The AI would be able to identify the most effective points to address a patient's problem, and this conclusion would be based on data rather than an acupuncturist's subjective judgment. Emotional or physical fatigue, illness, or distraction, which inevitably can impact the effectiveness of an acupuncture diagnosis or treatment, is simply non-existent and irrelevant with AI. Over time, this system would enhance the overall effectiveness of acupuncture, foster trust with patients, and likely expand the consumer base.

Like most changes, however, AI integration could lead to particular negative consequences within the industry. The first is overreliance on AI, resulting in the loss of human intuition, which is pivotal in acupuncture. Although AI is exacerbating this problem across many facets of human life, it may have a significant impact on this medical specialty. Acupuncture relies to a great extent on intuition and a practitioner's ability to recognize and feel energy flows within the body, something a machine cannot currently accomplish. Simply, no database or LLM can replace human intuition or instinct, good or bad. Second, AI, like any computer program, remains susceptible to a corrupted or tampered dataset. This idea is explored in Wang, Liu, Yang, Guo, Wu and Liu's 2023 study, which discusses how, specifically, ChatGPT, can be good in certain instances, but that some ethical concerns remain, including data corruption, issues within the software or code that "can reduce patient adherence and encourage self-diagnosis," potentially leading to the erosion in the AI's efficacy and reliability [12]. To avoid these issues and negative consequences on the industry, including loss of

trust and revenue, the safeguarding of data and the avoidance of over-reliance must be addressed before AI is fully implemented.

As highlighted in this paper and its proposal, one solution is to include a practitioner in the room to supervise the AI's work. This requirement would address several AI-related concerns. First, as mentioned above, it would prevent the AI from accidentally making a mistake and placing the needle in the incorrect spot. Furthermore, a supervising practitioner could remove a possibly incorrect needle faster than a robot, particularly if the needle causes pain to the patient, which the patient exhibits vocally or through facial cues that the AI may not immediately recognize. Second, this solution would address another critical issue related to integrating AI in business fields: the potential loss of jobs. A major concern people have about AI is that it could lead to an increase in unemployment, potentially displacing a significant segment of the workforce. In fact, a recent study from the Bentley-Gallup Business in Society Study found that 75% of Americans believe that the integration of AI will lead to job losses [13; 14]. Simultaneously, however, a Gallup survey of American workers found that "[s]ixty-eight percent of employees who had firsthand experience using AI to interact with customers said it had a positive effect on customer interactions." Keeping an acupuncturist in the room while an AI completes its tasks would help prevent acupuncturists from losing their jobs and ease patient anxiety about being treated by a robot.

3.Conclusion

The integration of AI into the field of acupuncture has the potential to create significant changes in the practice. AI can offer numerous benefits that outweigh its potential drawbacks, making it an essential tool for the future of healthcare. Many areas of medicine are already adapting to AI-based systems, which have shown positive results for both doctors and patients. As acupuncture continues to expand in terms of the number of licensed professionals, patients, and overall revenue, it will need to adopt new technologies, including AI, to remain relevant. Without these changes, the practice risks becoming outdated. Through a combination of a doctor-assisted AI robot, the practice would improve in precision, cost-effectiveness, accessibility, and fairness in its treatment. These advantages will lead to more trust and growth in the industry. Although some challenges exist, AI integration will lead to a positive and promising future and may represent a pivotal step in modernizing this enduring medical tradition.

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