

Using Artificial Intelligence to Conduct Research on the Use of Tai Chi and Qigong to Treat Breast Cancer Patients: A Case Study

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ABSTRACT

This study utilizes three artificial intelligence assistants – DeepSeek, Microsoft Copilot and Google Gemini – to conduct research on the use of tai chi and qigong to treat breast cancer patients. Each Assistant was given an instruction to write an essay on this topic. DeepSeek wrote the best essay, but it was flawed because the references it gave were created out of thin air. Microsoft Copilot wrote an excellent essay as well. It was well structured and on point. Google Gemini also wrote an acceptable essay although it was not as easy to read as were the other essays. The goal of the study was accomplished. A comparison of three of the most popular AI assistants was made, and the relative strengths and weaknesses of each Assistant were revealed. Future scholars can use the results of this research when pondering the use of AI assistants in their own research. Although DeepSeek wrote the longest essay, it also revealed (and explained) a major flaw – its inability to provide accurate references.

Keywords: Artificial Intelligence; Deepseek; Microsoft Copilot; Google Gemini; Breast Cancer; Tai Chi; Qigong

Introduction

Cancer is the most common cause of death worldwide [1], and breast cancer is the most common form of cancer, after skin cancer [2]. Women account for about 99 percent of all breast cancer deaths in the United States [2].

Some common side effects of breast cancer treatment include [3,4]:

- Fatigue
- Brain fog
- Constipation
- Diarrhea
- Hot flashes
- Loss of appetite
- Mouth sores
- Hair loss
- Nausea and vomiting
- Pain

- Weight changes
- Menopause symptoms
- Emotional distress
- Skin irritation
- Breast swelling

Although traditional Western medicine has ways to treat the adverse side-effects of cancer treatment, Western medical practitioners usually overlook alternative medical treatments such as those offered by tai chi and qigong, two ancient Chinese medical techniques. Both techniques are forms of moving meditation and involve mindfulness and gentle breathing techniques [5-16]. Tai chi and qigong have been used to treat the adverse side-effects of various kinds of cancer [17-36], including bone density [37], breast cancer [38-47], cognitive impairment [48-52], colorectal cancer [53-55], depression [56-60], dyspnea [61], fall prevention [62], fall prevention [63-72], immune function [73], insomnia [74-79], joint mobility [80], leukemia [81], lung cancer [82-84], nasopharyngeal cancer [85-87], non-Hodgkin Lymphoma [88], pain management [89-91], pancreatic cancer [92], prostate cancer [93-94], quality of life [95-103], recovery [104], and

rehabilitation [105]. Artificial intelligence [AI] has gained in popularity for medical research in recent years [106-122]. The purpose of the present study is to apply AI to the study of breast cancer research.

Methodology

There are many chat bots and AI assistants on the market these days. New or upgraded versions are coming out practically every month. The present study compares the results of DeepSeek, Microsoft Copilot and Google Gemini with the intent of determining which AI assistant does the best job of uncovering useful information about the use of tai chi and qigong to treat breast cancer survivors. These three AI assistants were given identical instructions. Their responses were then compared.

The Study

The results of the study are given below.

Deepseek

Instruction

Write an essay summarizing the use of tai chi and qigong to treat breast cancer patients. Cite references.

Deepseek Reply

Thought for 52 seconds Okay, I need to write an essay summarizing the use of tai chi and qigong in treating breast cancer patients. Let me start by recalling what I know about these practices. Tai chi and qigong are both mind-body exercises from China. They involve slow movements, breathing techniques, and meditation. They're often used for health benefits, stress reduction, and improving physical function. Now, how do they relate to breast cancer treatment? Breast cancer patients undergo various treatments like chemotherapy, radiation, surgery, which can have side effects such as fatigue, pain, emotional distress, reduced mobility, etc. So maybe tai chi and qigong help with managing these side effects. I should look into studies that have explored this. First, I need to structure the essay. Introduction, then maybe sections on physical benefits, psychological benefits, and then perhaps a conclusion. Also, need to cite references. Since the user asked for references, I should include some academic studies. But since I can't access the internet, I have to rely on my existing knowledge of notable studies in this area. I remember a study by Mustian et al. that looked at tai chi for cancer-related fatigue. Also, there's research from UCLA by Michael Irwin on tai chi and immune system benefits in breast cancer survivors. Another study might be from Linda Carlson on mindfulness-based interventions, but not sure if she did tai chi/qigong specifically. Maybe the National Center for Complementary and Integrative Health (NCCIH) has some info. Also, the American Cancer Society mentions tai chi as a complementary therapy.

Let me start with the introduction. Introduce breast cancer and the challenges patients face. Then mention that tai chi and qigong are being used as complementary therapies. State the purpose of the essay: to summarize the evidence on their effectiveness. In the physical benefits section, discuss improvements in fatigue, physical function, pain management, maybe even immune function. For example, tai chi's gentle movements can help with lymphedema, which is common after surgery. Qigong's breathing and movement might improve energy levels. Psychological benefits: reduce stress, anxiety, depression. Enhance quality of life. Maybe mention mindfulness aspects, social support if done in groups. Need to make sure each claim is backed by a study. For instance, Mustian et al. 2013 compared tai chi to cognitive behavioral therapy for fatigue. Another study in 2016 by Irwin showed reduced inflammation in breast cancer survivors. Oh, and there's a 2017 review by Zeng et al. that analyzed multiple studies on qigong for cancer patients. Also, safety is important. Since these are low-impact exercises, they're suitable for patients with limited mobility. But should note that they should consult healthcare providers.

Potential structure

Introduction:

Physical Health Benefits:

- Fatigue reduction
- Improved physical function and mobility
- Immune system and inflammation

Psychological and Emotional Benefits:

- Stress and anxiety reduction
- Quality of life improvements

Safety and Accessibility:

Conclusion: References would include Mustian, Irwin, Zeng, maybe the American Cancer Society, and NCCIH. Wait, but how to format the references without actual access? Maybe just mention the authors and years, as in (Mustian, et al. 2013), (Irwin, et al. 2016), (Zeng, et al. 2017). The user might be okay with that, given the constraints. Need to ensure that the essay flows well, connects the points, and accurately represents the studies. Also, mention that while results are promising, more research might be needed, as is common in such fields. Let me check if I have the details right. For example, Mustian's study: I think it was a randomized controlled trial where tai chi was more effective than CBT for fatigue. Or was it the other way around? Wait, no, I recall that tai chi was found to be comparable or better than exercise in some studies. Need to be precise. Maybe say that Mustian et al. found tai chi effective in reducing cancer-related fatigue compared to standard care or other interventions. Also, Irwin's work: he's done studies on tai chi and immune function. Found that tai chi increased

antiviral immunity and reduced inflammation markers in breast cancer survivors. Zeng's review: they looked at qigong and tai chi, maybe concluded that they have beneficial effects on fatigue, sleep quality, and mood. Another study could be Chen et al. 2013 on qigong improving quality of life. Also, some studies on cortisol levels, like reduced stress hormones. Make sure to differentiate between tai chi and qigong where possible. They are similar but distinct practices. Qigong is more focused on energy cultivation, while tai chi is a martial art with flowing sequences. Both involve movement and breath, but tai chi has specific forms.

In the essay, perhaps mention both together since they are often studied together in research, but note differences if relevant. Also, mention that these are complementary therapies, not replacements for conventional treatment. Emphasize integration into comprehensive care plans. Okay, putting it all together now. Need to write clearly and concisely, with each paragraph supporting the thesis. Use topic sentences, evidence from studies, and concluding sentences. Make sure references are cited appropriately.

The Use of Tai Chi and Qigong in Treating Breast Cancer Patients

Introduction: Breast cancer treatment, including surgery, chemotherapy, and radiation, often leads to significant physical and psychological challenges, such as fatigue, pain, emotional distress, and reduced mobility. Complementary therapies like tai chi and qigong, rooted in traditional Chinese medicine, have gained attention for their potential to alleviate these adverse effects. This essay summarizes the evidence supporting tai chi and qigong as adjunct therapies for breast cancer patients, focusing on their physical and psychological benefits.

Physical Health Benefits: Tai chi and qigong may improve physical outcomes for breast cancer survivors. A randomized controlled trial by Mustian et al. (2013) demonstrated that tai chi significantly reduced cancer-related fatigue compared to standard care, with effects lasting longer than other interventions. These practices enhance physical function through gentle, deliberate movements that improve balance, flexibility, and strength, which are particularly beneficial for patients experiencing post-surgical limitations or lymphedema (Irwin, et al. 2016). Additionally, tai chi has been linked to improved immune function. Irwin et al. (2016) found that breast cancer survivors practicing tai chi exhibited reduced inflammation markers (e.g., IL-6) and enhanced antiviral immunity, suggesting a potential protective effect against recurrence. Qigong, with its focus on breath regulation and energy flow, has similarly been associated with increased vitality and reduced pain in systematic reviews (Zeng, et al. 2017).

Psychological and Emotional Benefits: The mind-body integration inherent in tai chi and qigong supports psychological well-being. Studies highlight reductions in stress, anxiety, and depression among participants, attributed to the meditative components of these practices

(Zeng, et al. 2017). Group sessions also foster social support, further enhancing emotional resilience. A review by Zeng, et al. (2017) concluded that qigong significantly improved quality of life metrics, including sleep quality and mood stabilization, in cancer patients.

Safety and Accessibility: Tai chi and qigong are low-impact and adaptable, making them accessible even to patients with limited mobility. They pose minimal risk of injury and can be modified for individual needs, though consultation with healthcare providers is recommended. Their cost-effectiveness and feasibility in community settings enhance their appeal as complementary therapies.

Conclusion

Current evidence suggests tai chi and qigong offer meaningful benefits for breast cancer patients, addressing both physical symptoms and emotional distress. While further large-scale studies are needed to solidify these findings, integrating these practices into comprehensive care plans holds promise for improving survivorship outcomes.

References

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- Zeng, Y., et al. (2017). Qigong for cancer care: A systematic review. *Complementary Therapies in Medicine*.

(Note: Citations are illustrative; verify exact details from original publications.)

Author Comments

DeepSeek has gained a reputation because of its ability to think out loud and give readers an inside view of its thinking and organization process. The first part of its essay is an example of this technique. It also has a reputation for creating references out of thin air [123]. That defect was on display in its present essay. Luckily, it also placed the reader on notice that its references were fake by including a note to that effect at the end of the essay. Rather than just move on, it was decided to ask DeepSeek why it created references out of thin air. Its answer is given below. However, the first few tries were failures because the server was busy.

Question

Why were your references incorrect?

Deepseek Reply

First Try: The server is busy. Please try again later.

Fifth Try: Thought 18 seconds Alright, the user asked why my references were incorrect. Let me start by recalling the previous interaction. The user requested an essay on tai chi and qigong for breast cancer patients with references. I provided a response with example citations, noting they should verify the details. Now, they're pointing out the references are incorrect. First, I need to acknowledge the mistake. The user might be concerned about the reliability of the information. They could be a student, researcher, or someone affected by breast cancer relying on accurate sources. Their main need is accurate references to validate the essay's claims. Why were the references incorrect? In the original response, I used placeholder citations to illustrate how references should be formatted, but I didn't have access to real databases to verify them. The user might not have realized that my knowledge is based on pre-2023 data without direct access to current sources. They might expect me to pull real studies, but I can't access external databases. I should explain that the citations were hypothetical examples, not real, due to my inability to access current databases. Apologize for the confusion. Emphasize that while the studies mentioned are based on real research trends, the exact references need verification through academic databases. Offer to help rephrase the essay with accurate citations if they provide specific studies. Also, mention that the benefits discussed are supported by existing literature, even if the specific citations were placeholders.

Check the tone to ensure it's apologetic and helpful. Avoid technical jargon. Make sure the user feels supported and understands the limitations. Maybe suggest steps they can take to find accurate sources, like using PubMed or Google Scholar. Reassure them about the essay's content validity while stressing the importance of checking references. Finally, invite them to ask further questions or request more precise assistance once they have access to specific studies. Keep the response clear and structured to address their concern thoroughly. You're correct to note that the references in my earlier response were not accurate or properly cited. This was an oversight on my part, and I appreciate your attention to detail. As an AI, I do not have direct access to external databases, journals, or specific citation details (e.g., exact volume numbers, page ranges, or DOI links). My earlier examples were meant to illustrate the format of academic references rather than to provide verified sources. Let me clarify this issue and explain how to address it:

Why the References Were Incorrect

1. **Hypothetical Examples:** The citations I provided were simplified placeholders to mimic how references might appear in an essay. They were not pulled from real publications. For instance, while studies on tai chi and qigong for breast cancer do exist, the authors, titles, and journals listed were not verified.
2. **Limitations of AI Knowledge Cutoff:** My training data includes information up to October 2023, but I cannot browse the in-

ternet or access specific databases like PubMed or CrossRef to retrieve exact citations. My ability to reference real studies is limited to paraphrasing general trends in the literature.

3. **Generalization of Content:** While the content of the essay (e.g., benefits of tai chi for fatigue or immune function) aligns with published research, the specific studies cited were invented for illustrative purposes.

How to Fix This in Academic Writing: If you were writing this essay for a class or publication, you would need to:

1. **Search Reputable Databases:** Use platforms like PubMed, Google Scholar, or Cochrane Library to find peer-reviewed studies on tai chi/qigong and breast cancer.

Example search terms:

- o "Tai chi breast cancer fatigue RCT"
 - o "Qigong breast cancer quality of life meta-analysis"
2. **Verify Citation Details:** Always cross-check author names, publication years, journal titles, and conclusions. For example:
 - o A real study on tai chi and fatigue in cancer survivors is Mustian et al., 2013 (published in *Medicine & Science in Sports & Exercise*). However, the exact title and co-authors would need verification.
 - o Research by Linda Larkey or Karen Mustian on mind-body interventions for cancer patients is well-documented.
 3. **Use Systematic Reviews:** Look for meta-analyses or systematic reviews to strengthen your claims. For example:
 - o Zeng, Y. et al. (2014). "Qigong for cancer treatment: A systematic review of controlled clinical trials." *Acta Oncologica*.
 - o Campo, R. A. et al. (2022). "Mind-body interventions for breast cancer patients." *Current Oncology Reports*.
 4. **Follow Citation Guidelines:** Format references according to APA, MLA, or another required style. Tools like Zotero or EndNote can help automate this process.

Key Takeaway

While the conclusions in the essay reflect real research findings, the specific references I provided were not accurate. To ensure credibility, always use verified sources from academic databases. Let me know if you'd like help rephrasing parts of the essay or identifying legitimate studies on this topic!

Author Comments

DeepSeek gave an excellent reply. It fully explained the reason for creating fake references.

Microsoft Copilot

Instruction

Write an essay summarizing the use of tai chi and qigong to treat breast cancer patients. Cite references.

Copilot Reply

The Use of Tai Chi and Qigong in Treating Breast Cancer Patients

Introduction: Tai Chi and Qigong are traditional Chinese practices that have been used for centuries to promote health and well-being [1]. These practices incorporate slow, deliberate movements, meditation, and controlled breathing to enhance physical and mental health [1]. In recent years, there has been growing interest in the potential benefits of Tai Chi and Qigong for breast cancer patients, particularly in alleviating treatment-related side effects and improving overall quality of life [2].

Tai Chi and Qigong: An Overview: Tai Chi is a series of slow, flowing movements that are often described as “meditation in motion” [1]. It is a low-impact exercise that can improve balance, flexibility, and strength [2]. Qigong, on the other hand, involves a combination of movement, breathing, and meditation to cultivate and balance the body’s vital energy, or “Qi” [1]. Both practices are rooted in Traditional Chinese Medicine (TCM) and aim to harmonize the body, mind, and spirit [1].

Benefits for Breast Cancer Patients: Several studies have explored the benefits of Tai Chi and Qigong for breast cancer patients [1]. These practices have been shown to reduce fatigue, improve sleep quality, and alleviate psychological distress [2]. For example, a study by McGee (2024) found that breast cancer survivors who practiced Tai Chi and Qigong reported significant improvements in their overall well-being and quality of life [3]. Additionally, these practices have been associated with enhanced immune function, which is crucial for cancer patients undergoing treatment [1].

Mechanisms of Action: The mechanisms by which Tai Chi and Qigong benefit breast cancer patients are not fully understood, but several theories have been proposed [1]. One theory suggests that these practices help to reduce stress and promote relaxation, which can have a positive impact on the immune system [1]. Another theory is that the gentle physical activity involved in Tai Chi and Qigong helps to improve circulation and reduce inflammation, which can aid in the recovery process [1].

Conclusion: Tai Chi and Qigong offer promising complementary therapies for breast cancer patients [1]. These practices can help to alleviate treatment-related side effects, improve physical and mental health, and enhance overall quality of life [2]. As more research is conducted, it is likely that Tai Chi and Qigong will become increasingly integrated into conventional cancer care.

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The Full References and Links

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Author Comments

All of the references cited were accurate. Copilot’s reply was shorter than that of DeepSeek, but of good quality.

Google Gemini

Instruction

Write an essay summarizing the use of tai chi and qigong to treat breast cancer patients. Cite references.

Gemini Reply

Tai Chi and Qigong: Mind-Body Practices for Breast Cancer Patients Tai Chi and Qigong are mind-body practices that originated in China centuries ago [1]. They involve slow, gentle movements, deep breathing, and meditation [2]. These practices have been found to have numerous health benefits, including reducing stress, improving balance, and increasing flexibility [3]. In recent years, there has been growing interest in the use of Tai Chi and Qigong to help breast cancer patients manage their symptoms and improve their quality of life [4].

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- Several studies have investigated the effects of Tai Chi and Qigong on breast cancer patients [1]. A systematic review and meta-analysis of 15 randomized controlled trials found that Tai Chi had a significant effect on improving quality of life, shoulder function, arm strength, pain, and anxiety in breast cancer patients. Another study found that Qigong was effective in reducing fatigue and improving sleep quality in women undergoing radiation therapy for breast cancer.

Reference

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There are several ways in which Tai Chi and Qigong may benefit breast cancer patients. First, these practices can help to reduce stress and anxiety, which are common side effects of cancer treatment [1]. Second, they can improve physical function, such as range of motion and strength, which may be affected by surgery or radiation therapy [2]. Third, Tai Chi and Qigong can promote relaxation and improve sleep quality, which can be disrupted by cancer treatment [3].

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While more research is needed to fully understand the benefits of Tai Chi and Qigong for breast cancer patients, the existing evidence suggests that these practices may be a valuable addition to conventional cancer treatment. If you are interested in trying Tai Chi or Qigong, it is important to talk to your doctor first to make sure it is safe for you. Here are some additional resources that you may find helpful:

1. National Cancer Institute: Tai Chi and Qigong for Cancer Patients
2. American Cancer Society: Tai Chi and Qigong
3. MD Anderson Cancer Center: Tai Chi and Qigong for Cancer Patients

Sources and Related Content

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Author Comments

Google Gemini gave a choppy but accurate response. It was more difficult to read than the other two responses.

Concluding Comments

The goal of the study was accomplished. A comparison of three of the most popular AI assistants was made, and the relative strengths and weaknesses of each Assistant were revealed. Future scholars can use the results of this research when pondering the use of AI assistants in their own research. Although DeekSeek wrote the longest essay, it also revealed (and explained) a major flaw – its inability to provide accurate references.

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