

# A Tai Chi Class Collaboratively Developed for Persons With Interstitial and Other Lung Diseases: An Ethnographic Investigation

Global Advances in Integrative Medicine and Health

Volume 12: 1–13

© The Author(s) 2023

Article reuse guidelines:

[sagepub.com/journals-permissions](https://sagepub.com/journals-permissions)

DOI: 10.1177/27536130231206122

[journals.sagepub.com/home/gam](https://journals.sagepub.com/home/gam)

Karen Kilgore, PhD<sup>1,2</sup>, Jesse Leinfelder, EdD<sup>3</sup>, Joan Campbell, EdS<sup>3</sup>,  
Peter M. Wayne, PhD<sup>2,4</sup> , Robert W. Hallowell, MD<sup>4,5</sup>, and Aliaa Barakat, PhD<sup>1</sup> 

## Abstract

**Background:** Participating in physical activity (PA) can be challenging for persons with chronic and significant lung disease due to the multifaceted disruptive effects of their symptoms and variable disease course.

**Objectives:** Our study investigates a novel approach to increasing PA by collaboratively and adaptively developing a Tai Chi (TC) class for and by persons with lung diseases and explores participants' perceptions of their experiences in the co-developed TC class.

**Methods:** We initiated a collaboration between the Interstitial Lung Disease (ILD) Collaborative and the Tai Chi Foundation to develop a TC class appropriate for persons with ILD and other lung diseases. The TC class was offered online, during the early phases of the COVID-19 pandemic, when pulmonary patients were isolated socially. TC class sessions were held twice weekly for 12 weeks with 12 participants. Ethnographic field methods were used to collect observations and conduct interviews with teachers and students. The Social Ecological Model (SEM) for understanding factors in intrapersonal, interpersonal, social, and organizational contexts was used to explore ways in which wellness practices, particularly those involving changes in health behaviors, can be collaboratively conceived, and developed by persons with the lived experience of illness and community organizations that are sensitive to their personal and social contexts. The constant comparative method was used for data analysis.

**Results:** Our findings include the importance of (1) creating a supportive class environment, characterized by interactive and reciprocal relationships among students and teachers; (2) alternating segments of movement and meditation to avoid fatigue and breathlessness; (3) cultivating sensory awareness and body trust, resting when needed and rejoining the movements when ready; (4) increasing the capacity to meditate through deepening presence and renewing the vital connection with inner and outer sources of energy; (5) reducing, through meditative movement, the persistent anxiety, isolation, and sense of loss that accompany chronic disease diagnosis and progression.

**Conclusion:** We documented a collaboration between the TC and pulmonary communities to design a TC class for persons with chronic and significant lung disease. We employed the SEM to provide insights into how teachers, informed by their students, can use effective pedagogical skills to create core curricula with modifications appropriate for a specific population.

<sup>1</sup>Interstitial Lung Disease Collaborative, Pulmonary Care and Research Collaborative, Boston, MA, USA

<sup>2</sup>Osher Center for Integrative Medicine, Brigham and Women's Hospital, Boston, MA, USA

<sup>3</sup>Tai Chi Foundation, New York City, NY

<sup>4</sup>Harvard Medical School, Boston, MA, USA

<sup>5</sup>Division of Pulmonary and Critical Care Medicine, Massachusetts General Hospital, Boston, MA, USA

## Corresponding Author:

Aliaa Barakat, PhD, Interstitial Lung Disease Collaborative, Pulmonary Care and Research Collaborative, P.O. Box 300160, Boston, MA 02130, USA.

Email: [aliaa.barakat@ildcollaborative.org](mailto:aliaa.barakat@ildcollaborative.org)



Creative Commons Non Commercial CC BY-NC: This article is distributed under the terms of the Creative Commons Attribution-NonCommercial 4.0 License (<https://creativecommons.org/licenses/by-nc/4.0/>) which permits non-commercial use, reproduction and distribution of the work without further permission provided the original work is attributed as specified on the SAGE and

Open Access pages (<https://us.sagepub.com/en-us/nam/open-access-at-sage>).

## Keywords

Tai Chi, interstitial lung disease, physical activity, sociocultural model of health behavior change, meditative movement

Received July 9, 2023; Revised September 2, 2023. Accepted for publication September 18, 2023

## Introduction

Our teacher assumes the posture, *Standing at the Edge of a Precipice* and asks us to imagine ourselves at the edge of a canyon. We have viewed photos of canyons to stimulate our imaginations. She says, “shift your weight into one leg and gently probe the stability of the ground with your other.” One hand hovers to the side of your forehead; the other arm rests on a ‘column of air.’ She notes, “This is a posture of courage –centered, grounded through the earth, standing upright, eyes on the horizon, and connected to the heavens.” I realize my fellow students in this class, all of whom have interstitial or other lung disease, stand at the chasm’s edge daily, as they manage their complex, progressive illness. Later, the teacher says to me, “It takes courage for them just to be here, in this class.” [Field Notes, 04/21]

An ongoing challenge for persons with interstitial and other lung disease is not knowing where their journey leads. Interstitial lung diseases (ILDs) are a group of pulmonary disorders characterized by inflammation and scarring of the lungs. As in other chronic lung diseases, persons with ILD often suffer from debilitating breathlessness, cough, and fatigue.<sup>1-3</sup> Despite recent advances in the treatment of ILDs, the symptom burden remains high, and for most patients disease progression is at best slowed down.<sup>4-7</sup> Supportive care in the forms of psychosocial support, oxygen therapy, pulmonary rehabilitation (PR), and palliative care are recommended, but they remain underutilized due to a multitude of factors. These factors range from issues regarding access to incomplete understanding of potential benefits.<sup>8</sup>

## Pulmonary Rehabilitation for Interstitial Lung Disease

Outpatient center-based PR offers ILD patients an opportunity to exercise, supervised by healthcare professionals.<sup>9</sup> Nevertheless, during PR, ILD patients are more likely to exhibit lowered exercise tolerance, more rapid fatigue, greater breathlessness, and higher rates of exercise-induced oxygen desaturation than their peers with other lung diseases.<sup>10-14</sup> PR for chronic lung diseases, as it is currently offered, is limited in time and location, and program components rarely turn into home practices.<sup>6,14</sup>

Similar to other pulmonary patients, persons with ILD report embarrassment from coughing episodes, breathlessness, and fatigue, whether in public settings or with friends

and families, increasing their social isolation and reducing opportunities for movement.<sup>15</sup> Research in the field of palliative care has emphasized the need for more socio-emotional support and knowledgeable caregivers for persons with ILD across the disease journey, noting the multifaceted disruptive effects of ILD symptoms and variable disease course.<sup>16</sup>

## Tai Chi for Persons With Chronic Disease

In the past 2 decades, medical researchers have turned to various forms of Tai Chi (TC) as a novel form of facilitating physical activity (PA) for persons with diverse medical conditions demonstrating benefits for improving exercise capacity, self-efficacy, self-awareness, stress management, and overall health-related quality of life in patients with pulmonary conditions.<sup>17-25</sup> The role of randomized clinical trials (RCTs) has been critical for establishing the efficacy of TC as a novel PA intervention. Clinical trials, however, have limitations due to the necessity of standardized interventions, randomized allocation, de-contextualized settings, and a paucity of patient-centered outcomes. Most trials are not designed to capture individual perceptions of participants, particularly those who suffer from complex chronic diseases.<sup>26-29</sup> Additional research needs to be conducted that includes individual patients’ voices as they participate in TC, particularly those with complex, degenerative conditions.<sup>30,31</sup>

## Social Ecological Models for Changing Health Behaviors

Social ecological models of changing health behavior have provided frameworks for identifying dynamic factors affecting an individual’s level of PA. These factors interact at the intra/inter-personal, organizational, community, and policy levels.<sup>32-34</sup> A sociocultural approach advocated by Morgan et al.<sup>32</sup> recognizes the importance of patients’ voices, in considering the acceptability and efficacy of interventions, particularly in special populations. Moreover, Morgan et al. emphasize modifying interventions with an awareness of the characteristics and preferences of the sample population.

The aim of this study was 2-fold: (1) to investigate a novel approach to increasing PA by collaboratively and adaptively developing a TC class for and by persons with lung diseases, and (2) to explore participants’ perceptions of their experiences in the co-developed TC class.

## Background for the Study

During the earlier phases of the COVID-19 pandemic, in-person center-based PR programs were suspended in compliance with requirements for physical distancing to reduce the risk of infection. Vulnerability to contracting COVID-19 and susceptibility to life-threatening complications were pervasive concerns for many individuals with pre-existing medical conditions, particularly those with chronic lung disease. Against the backdrop of social isolation, heightened uncertainty about health and care provision, and declining PA in its patient community, the leader of the Interstitial Lung Disease Collaborative (ILDC)<sup>1</sup> (sixth author), a person with ILD herself, approached a member of the Tai Chi Foundation (TCF)<sup>2</sup> with the intention of offering real-time virtual TC classes to ILDC community members. In a series of conversations with TCF teachers, she provided an overview of ILDs, their symptoms and the limitations that both the diseases and the pandemic had imposed on patients' ability to engage in PA. Her own interest in Tai Chi was motivated by her emerging personal TC practice, and her experience of bodily postures as being in dynamic interaction with psychological, biological, and social factors. Two teachers agreed to develop a class, with an emphasis on awareness of the students' experience and being informed by it. The teachers also appreciated the empathetic and caring community that ILDC has cultivated among its members. Cumulatively, the 2 teachers (second and third authors), had over 80 years of practicing and/or teaching TC. Each were long-time members of the national TCF. The ILDC provided a forum to engage ILD and other pulmonary patients in the modification and adaptations of the class and resources for offering it. As an experienced TC practitioner and qualitative researcher, the first author, was invited to be an ethnographic participant observer<sup>35</sup> to document the collaborative effort to create a TC class specifically for a group of medically fragile students. She and the sixth author constituted the Research Team.

### Core Principles of the Tai Chi Class: The Eight Ways of Tai Chi Chuan<sup>TM</sup>

The teachers chose *The Eight Ways of Tai Chi Chuan<sup>TM</sup>* (TEW), offered through the international Tai Chi Foundation, as the appropriate TC form to teach the students. TEW was designed to make TC more accessible to students regardless of their health conditions or aging, consisting of 8 discrete movements and simpler than the 37 postures of the oft-taught short form. According to ancient Chinese tradition, the cultivation and circulation of vital life energy is essential to health and well-being and is an organizing principle of TC. These practices enable practitioners to be more efficient and graceful with their movements, improve balance, increase lower body strength, and to be more present and alert to the surrounding world, while maintaining tranquility.<sup>40</sup>

The teachers stressed the following guiding principles, during both movement and meditation sessions:

- (1) *Centering*. Participants are encouraged to focus on their bodies' center rather than their mind. The center of movement and awareness is located in the lower abdomen or Tan T'ien.
- (2) *Generating and circulating vital energy*. Participants are encouraged to become aware of the generation and circulation of their vital energy and their integral relationship to the natural world.
- (3) *Softening*. Participants are reminded to soften muscles, joints, emotions, and thoughts to release whatever might be held rigidly, whether physically, mentally, or emotionally.
- (4) *Stability*. Participants are encouraged to become more grounded, by connecting with the earth through their feet, noticing their weight shifting from one foot to the other, improving balance, building strength, and providing a stable foundation.
- (5) *Uprightness*. Participants are encouraged to become aware of their attraction towards the heavens, bodies held upright, eyes on the horizon, at ease between the heavens and the earth.

TEW progresses from simpler to slightly more complex postures drawn from the Yang style short form, bearing a resemblance to familiar movements in Chinese culture.

## Methods: Ethnographic Participant Observation

The study protocol was approved by the Institutional Review Board (#201900173) at the University of Florida, Gainesville.

### Class Setting

Classes were held on Zoom, an increasingly effective means to reach older patients with chronic conditions.<sup>37</sup> Class size was limited to twelve participants, enabling students to interact more easily with one another and their teachers. Teachers took turns introducing and modeling TC exercises while the other observed. Classes were held twice weekly for 12 weeks, from 02/01/21 through 04/30/21. After each class, the teachers met for an additional hour to note students' comments, questions, and responsiveness. The Research Team was invited to observe and comment during these planning sessions. The teachers then developed plans for their next class.

### Participants

Participants were recruited across the ILDC community and class was limited to 12 participants to allow for optimal

supervision by the teachers over Zoom. Initially, the ILDC had focused its services primarily on persons diagnosed with ILD, however in recent years its programs in integrative health have also appealed to persons with other chronic lung diseases. Nine of the participants had been diagnosed with ILD; 2 had COPD, and one was a double lung transplant recipient. Nine (75%) were women; 3 (25%) were male. Seven (58%) of the participants were using supplemental oxygen at the start of the study. The average age of participants was 69 years.

Prior to enrollment in the class, the following data were reviewed with each participant: age, pulmonary diagnosis, date of diagnosis, current medications, current PA, PR history, oxygen use, sleep quality, and last pulmonary function test date and values. These data were used to monitor safety and were not collected as data for future analysis. Pulse oximeters were provided to all participants, as a safety measure, and they were encouraged to measure their oxygen saturations before and after each class, and during class if needed. As an ongoing effort to monitor safety, participants were urged to keep a diary of adverse events like pain or muscle soreness, dizziness, falls, emergency department visits, hospitalizations, or minor injuries such as bruises, whether these incidents were related to the Tai Chi practice. Participants shared their diary documentation with the Research Team.

Attendance was monitored throughout the 24 class sessions. Students informed the Research Team and the teachers if they were unable to attend due to a medical event or condition. Attendance logs were maintained, noting reasons for absences. The adherence rate was 80% for the overall group during the 24 class sessions.

### **Participant Observation**

Participant observation is a qualitative research methodology in which the researchers immerse themselves in the setting being studied utilizing observational data that is laboriously and systematically collected and analyzed. Researchers view persons, relationships, and environments as complex, with further dimensions beyond isolated measurable factors. The researchers respond as empathetic human beings but refrain from interfering with the setting or individuals being studied in ways that could alter their dynamics.<sup>35</sup>

### **Data Collection**

**Observations.** ILDC participants were informed of the research objectives. Their informed consents were sought prior to conducting observations. Participants were also asked for verbal consent prior to video-recording sessions. The Research Team participated fully in the class, learning TC movements alongside the 12 participants. The Research Team noted interactions among participants and asked informal questions in the naturally occurring setting of the Zoom

classroom. They focused their observations on events as they unfolded, monitoring the entire group, and individual participants. Interactions between teachers and students were also closely noted. All 24 class sessions were video recorded, accumulating 24 hours of digitally recorded sessions. A sampling of video-recordings was transcribed. All notes and transcripts were de-identified and replaced with research IDs to protect participants' anonymity. Due to heightened confidentiality measures in qualitative reporting of patient information, quotes were not identified using pseudonyms or numbering systems.

**Field Notes and Reflective Journal.** The Research Team maintained a set of field notes, completed immediately after participating in each class session and/or teacher planning session. Field notes were used to document the researchers' thoughts, impressions, questions, or concerns during the sessions. The Research Team re-visited these prior impressions throughout stages of analysis.

**Semi-Structured Interviews, Informal Interviews, and Focus Groups.** Semi-structured, formal interviews were conducted with teachers prior to inception of TC class in 02/2021 and after the conclusion of the class in 05/2021. Informal questions were asked, when appropriate, before, during, or after class. Student focus groups were conducted 3 times—before (01/21), during (03/21), and after (05/21) the Spring 2021 session.

**Data Analysis.** Thematic analysis, employing the constant, comparative method developed by Glazer and Strauss,<sup>38</sup> was used for this study, along with participant observation protocols established by Spradley.<sup>35</sup>

Analysis included intensive reading of transcripts and field notes containing observational data. Independently, each member of the Research Team searched for and identified categories for grouping the data. Paragraphs were coded according to the categories. The 2 members of the Research Team met regularly to compare and contrast their analysis. Samples of initial coding included “kinds of questions asked by students,” “concerns expressed by students about exercise.” Additional categories emerged, such as “descriptions of relaxation” or “fears about disease progression.” The Research Team collaboratively developed overarching themes, linking categories, as they dove more deeply into teachers' and students' experiences. The Research Team monitored adequate representation of each participant's perceptions throughout analysis and in selection of quotes used for supporting evidence of a theme.

The developed themes were then discussed with the teachers and revised collaboratively. An external authority on TC for aging and medically fragile populations (fourth author), and an external authority on ILD (fifth author) reviewed the study, posing additional questions or noting additional



insights for the Research Team to consider as they composed a final draft.

**Member Check.** The completed manuscript was sent to all students in Spring 2022 for their review. The Research Team attended the ongoing TC Zoom classes that the ILDC had continued to offer to its community. During one of the class sessions, the Research Team conducted an in-person member check with students who had participated in the study regarding findings.<sup>40</sup> 5 students responded during the Zoom class session and sent follow-up e-mails to confirm their insights regarding the manuscript. Their revisions were incorporated into the final draft. Seven participants did not complete member checks for the following reasons: Four of these seven participants had died since either the commencement or the end of the study, and 3 participants were engaged in intensive therapies and were unable to attend the ongoing Zoom classes or respond to questions posed in e-mails.

**Credibility of a Qualitative Study.** Our intent in conducting this study was to explore factors outlined in our sociocultural framework influencing the development of a TC intervention for persons with ILD and other chronic lung diseases. Questions of generalizability and validity cannot be answered with these methods. As qualitative researchers, we had the ethical responsibility to be aware of our biases, maintain an inquiry stance, and continually examine dilemmas as they arose within the setting.<sup>39</sup> Both members of the Research Team had chronic lung diseases. Their personal knowledge of pulmonary concerns may have enabled them to establish better rapport with participants. Nevertheless, both were aware of how their personal experiences could influence their perceptions and data analysis and were mindful of focusing on the experiences of the 12 participants.

## Themes

At the beginning of the first class, teachers took time to speak with the students and understand the issues they faced with PA. One student explained,

“Right after the diagnosis, the doctor told me, ‘You got to take medicine every day and you got to exercise every day.’”

Other students had similar instructions from their pulmonologists. They knew they needed to exercise but described various obstacles. With the onset of the COVID-19 pandemic, students felt house-bound. Several students had tried home practice, including purchasing gym equipment, but only one student had an established home program. Other students expressed frustration with themselves.

“I can’t get off my rear end.”

“I get angry at myself; I know I should push myself a lot harder.”

Participants also viewed impaired breathing as a significant obstacle. Although they were urged to exercise, they feared breathlessness.

“I don’t get good feelings from exercise. I get short of breath. And everybody [in this class] knows what being short of breath is like. It’s painful and scary, and it doesn’t make you want to exercise. I’m afraid to go on a walk and then have some kind of episode where I’ll need to get rescued.”

“You don’t breathe well, you can’t walk as well, just the overall decline [it’s] ...challenging.”

Other students expressed problems with fatigue.

“I have less capacity for exercise. Between the pandemic and feeling fatigued a lot of the time, it’s hard for me to get up and get moving.”

“About fatigue, I am sure we all have it [in this class], and it’s really challenging when you feel too fatigued to exercise.”

During class sessions, focus groups and informal interviews, participants raised other concerns. Students talked about feeling socially isolated, the anxiety of having ILD, and lives disrupted by debilitating diseases.

Themes regarding the effectiveness of this class, adapted for these participants, included the importance of (1) creating a supportive classroom environment, characterized by interactive and reciprocal relationships among students and teachers; (2) alternating segments of movement and meditation to avoid fatigue and breathlessness; (3) cultivating sensory awareness and body trust, resting when needed and rejoining the movements when ready; (4) increasing the capacity to meditate through deepening presence and renewing the vital connection with inner and outer sources of energy; and (5) reducing, through meditative movement, the persistent anxiety, isolation, and sense of loss that accompany chronic disease diagnosis and progression.

## Creating a Supportive Class Environment

The teachers wanted to establish a caring community for their class. As experienced educators in K-12 and higher education, they recognized that a caring climate is integral to student learning (Noddings, 2020). They expected to learn from their students and created an atmosphere promoting interactions among students and teachers. The following field notes, from the first class, illustrate the interactive tone of sessions.

The teachers set Zoom to Gallery View to see participants. One says, “I want to know your goals. If your goals match mine, great! But, if they don’t, I am throwing mine out.” She

waits as her students “unmute” and describe their goals. The teachers listen. Students’ answers ranged from more PA, better balance, more social time with peers during COVID, and to relaxation through Tai Chi.

“I need to exercise and to be motivated by the group.”

“I want more focus, balance, discipline, and healthy exercise.”

“I really want better balance.”

“I’ve been really isolated during COVID, I’m really looking forward to social time and structure.”

“I’m interested in the mind and body together—the mindfulness aspect of TC.”

“I will do anything to improve my condition.”

“The meditative and relaxation part of TC appeals to me.”

One teacher responds to the students by saying, “We are all on the same page. The mother of all principles in Tai Chi is relaxation. What we mean by that is a centering, an internal awareness, and a sense of grounding. We also plan to strengthen the lower body through gentle movement. But an awareness of body is key. And now, it’s time to get into the movements. Keep your chair nearby in case you need a moment to sit. Just raise your hand and speak up whenever you need to ask a question or make a comment.” She returns to Speaker View and introduces the first exercise known as Sculling (FN, 02/2021).

Every class began with time to “catch up,” encouraging students to share their experiences with TC and ask questions. The teachers responded to every comment or question seriously, as students shared what they were experiencing in their bodies or described problems they had with certain movements or principles. A month after the first class, students described their interactions with teachers.

“There’s a gentleness to them.... They are quite approachable. I just have a sense of warmth towards them.”

“They’re self-deprecating and humble. They’re good teachers.”

“It’s their smiles when we first start, it’s one of the best parts of the whole thing. Then there’s the heaven and earth connection they talk about. It doesn’t matter what mood you’re in, it just lifts you up.”

Students felt at ease with one another whenever a pulmonary issue emerged. Students shared their struggles with their peers as they rearranged their oxygen tubing to move unencumbered or had brief moments of coughing. Students explained,

“You can’t talk to anyone, even your loved ones, your wife, your spouse, your partner... They know this illness through you, but it’s not like it’s somebody who has this illness and experiences it.”

“[My younger sister] figures that all I have to do is put my oxygen on my back and I’ll be all set, but that’s not the case. I have oxygen to help me, but that doesn’t mean that I can do everything that I used to do. I cannot put the oxygen on my back and go cut the grass.”

Students described the social aspects and cohesiveness of being in a TC class that they also shared as part of their wider ILDC community of peers.

“The TC class is a mindful exercise—mind, body, and spirit—all uplifting. I feel accomplished after it, even though I was very limited or restricted for most of the movements. ... I just feel that it’s a wonderful bonding experience for all of us.”

“I view Tai Chi as something that’s communal, meditative, and very helpful. And that is the essence. ...As you look in China, you see groups in parks. ... It’s part of the community. [Since COVID,] Tai chi and our ILDC support group is now woven into my social life, and I think that’s important.”

“I’m fascinated with the compassion this group has for one another.”

As students became more comfortable in the class, the teachers worked to help students develop a greater awareness of and trust in their bodies.

Teachers had chosen TEW rather than the 37 postures typically taught during a TC class, due the relative ease of learning eight postures without undue stress. One teacher noted,

“I really believe in The Eight Ways. ...I want people to be able to have the benefits from it. TC doesn’t have to be hard. I think that’s one of the things that I’ve really learned in life is that we make things so hard. [At this time in my life] I want to teach people who aren’t healthy or exuberant, who probably would not learn TC [in a typical class]. [Family members] have died of COPD.... I knew what it was like to be on oxygen. I knew we could teach this class.”

As professional educators, they were committed to enabling these students to have the advantages of TC, modified for their individual needs.

### *Alternating Segments of Movement and Meditation to Avoid Fatigue and Breathlessness*

The teachers developed a structure for class that alternated active, standing segments of learning TEW with seated segments to explore imagery illustrating a posture and for Q&As. Teachers encouraged students to keep a chair nearby for fatigue, rest as needed, and rejoin the movement when ready. It was common to see students sit for a few moments, and for the teachers to thank the

students for taking care of themselves and listening to their bodies.

Seated meditations, guided by one of the teachers, were placed at the beginning, at midpoint, and at the conclusion of class. The structure of the class suited the students well.

“I find that the sessions with TC are gentle ... They don’t exhaust me. I can get up, I can use my muscles, and I’m not a wet rag at the end of the session. And the way that the sessions are conducted with meditation and resting interspersed with doing the physical motions works out perfectly for me. So, on a hard day, I can recover a little bit and then get up and move again.”

“TC is almost never too much for me, and walking on my treadmill can be very difficult for me. There have been a couple of sessions where I had to sit for some of the exercises, but not many. And so, for me, it’s just about at my level right now.”

The teachers taught 2 postures per week. Principles were emphasized throughout the movements and meditations in every class.

In their debriefings after class, teachers noted who had sat down, but also noted students resting for a few minutes, then standing again. The teachers supported students’ choices of monitoring their own activity during class, but also encouraged attending regularly. If they could not stand and engage in the postures, they could meditate with the group. During some sessions, students would sit for the majority of class time, but wanted to come to class, even on difficult days. The pacing of the class, using defined segments alternating seated and standing activities, enabled students to participate without exhaustion.

A few students were surprised that the teachers had not directly addressed breathing, saying,

“There’s no breathing involved in this. Is there specific breathing that you do along with TC? Because breathing is the main focus when you have lung problems.”

The teachers explained that they were not proficient in PR approaches. Participants who knew “pursed lip breathing” or other PR techniques were welcome to integrate it into their TC practice.

The teachers decided to avoid cueing breathing patterns with specific movements or meditations to avoid self-consciousness about breathing. They occasionally mentioned taking “gentle breaths” or asked participants to notice if they were still breathing.

An essential aspect of Tai Chi is finding and focusing on one’s center, the Tan T’ien, located, according to Chinese teachings, in one’s lower abdomen.

Students embraced this approach rather than using breathing patterns to evoke a meditative state. They said,

“In PR, we focused on the diaphragmatic breathing. Now, I think more about the Tan T’ien. I try to breathe into that point, and I get

a much, much deeper breath. When I get short of breath, I try to just relax, and I think of that center point, and it gets me breathing easier much quicker.”

“The meditation part is simple breathing, it relaxes you. [...] the movements and the meditations, the whole thing is just one big breath when you think about it.”

The teachers hoped that the overall effect would result in relaxation.

### *Cultivating Sensory Awareness and Body Trust*

These students had an uneasy relationship with their bodies. Students described their conditions.

“I think of my lungs as desiccated.”

“My lungs are withering away.”

The teachers felt a responsibility to honor the seriousness of their students’ pulmonary conditions while offering an opportunity for safe and meditative moment. A key aspect of their teaching was to urge students to trust their bodies—to listen to their fatigue, to recognize when it was time to sit and rest, and when it was time to stand and move with the group. Students explained the relief of having “non-judgmental” teachers.

“If you don’t feel up to it, but you enjoy the meditation, at least you can sit for that.”

“I feel the group is very non-judgmental. The teachers very much give the message, do whatever you can, listen to your own body.”

“They made us feel so comfortable. I for one, had to sit down a lot during class, because I can’t stand for long periods of time, and 10 minutes is not that long.”

“The teachers made you feel so comfortable to listen to your own body, and you didn’t feel like you had to keep up with anybody else, you just do what you could to do, and they were just incredible.”

Students began to believe that by trusting themselves, adjusting their own pace, avoiding breathlessness, and resting when they sensed fatigue, they were able to achieve the goals they had set for themselves in TC. They described feeling more grounded, physically, and emotionally. Their lower bodies were stronger.

“It’s been quiet, it’s been kind of meditative, and the movement and the emotional mental part of it is really enjoyable. I feel like my legs are really getting worked out [...]. My legs still occasionally feel a little bit like ginger jelly, but it’s getting better, so I feel that physically I’m improving. And that mentally, it’s very strengthening or invigorating for me.”

In particular, students noticed improved balance, an important goal for many of them.

“I had no sense of balance. I thought, I’m going to try this, but I doubt that I’m going to be able to do it. But working with the shifting of weight from one leg to another, I saw that I could do things that I haven’t been able to do before. With this practice of this weight shifting, consciously doing that weight shift, that if I put all my weight on one leg, that frees the other leg to come up and then I just slowly switch to the other side. And so, for the first time in my older life I’ve been able to feel more balanced. And I think that’s huge.”

“[Balance is about] that center point.... I never thought of that center of your body as being so low in your body. I don’t know why I didn’t know where my center was. I think the focus on that point brought things all together. And I can’t wait to swing a golf club, because I haven’t done it since, probably, two years.”

Other students described improved posture.

“My posture has improved—the attraction to the heavens kind of thing.”

“I really feel that I’ve had a workout and lengthened.”

### *Increasing the Capacity to Meditate Through Deepening Presence*

While teaching specific movements of TEW, teachers emphasized that students would do best to concentrate on the center point in the lower abdomen, the Tan T’ien, and originate the TC movements from it. From this center, students were encouraged to expand awareness through movements to their entire bodies.

One student noted her inability to sense the Tan T’ien after one of these discussions. The teachers responded by developing specific meditations for awareness of the Tan T’ien as an image for the center of their body. From that center, they could create and circulate awareness. A five-minute, centering meditation became a regular routine in class, often visualizing vital energy gathering in the center and spreading throughout one’s body. Teachers emphasized the process of noticing, gathering, and using the vital energy generated, both in the movements and in the meditations.

Concentrating on the center of awareness and vital energy became integral to class, relieving the stress of monitoring breathing or following specific movements while developing a meditative state.

Overall, students liked the simplicity of TC, the slow movements, and the development of body awareness through movement and meditation. They were able to participate without frustration. As one noted,

“Tai chi is very simple to me. I think the slow movement is part of the simplicity.”

Students developed trust in their teachers, as they also developed trust in their bodies. They learned that by trusting their bodies and adapting for their pulmonary symptoms, they could gain strength, feel more secure and balanced, and had improved posture.

### *Reducing the Persistent Anxiety, Isolation, and Sense of Loss From Chronic Disease*

One student died during a hospitalization in the first weeks of the class, and 3 other students died after the class had ended. One of these students had explained his feelings about death, in an early focus group.

“In life we’re all being stalked by death. [In the ILD community], all of our clocks are more advanced, and they are ticking faster than others, so as a result, you have a lot of anxiety.”

Anxiety was part of their daily experience. Students expressed hope that the meditative aspects to TC could help alleviate anxiety.

“I’m finding with this disease, I not only need the physical conditioning, but also this kind of stress reduction. ... To get my body moving and breathing and mindfulness and all that it encompasses is good for all of us.”

“I’m interested not only for the physical conditioning, but also for the spiritual aspect, too, the grounding in the present, the meditative aspects.”

“Right now, I’m looking for a meditative effect... I want something to calm me and center me.”

“Soften, the teachers said, soften your shoulders. I have anxiety, I have a lot of tension in my body. But learning to soften and relax into my body was a new experience for me.”

They described the stress of their disease, not only on themselves, but also on their families. One participant described her close relationship with her granddaughter, who had expressed fears about her grandmother dying. Her granddaughter told her,

“I do not wanna lose you. And she told me that I cannot die. And then she says, ‘If you die, I’m gonna take you home and have you under my bed.’ ... I worry that she will be lost without me.”

They expressed the need to have a respite from their worries about themselves and their families. As one teacher noted,



“This is a serious disease these people are working with ... I keep thinking about how brave these people were to show up and want to come and do Tai Chi.”

As the class progressed, teachers felt more strongly that the meditations were essential to the group. Throughout class, teachers continually revisited the principles—centering, generating, and circulating vital energy, softening, stability, and uprightness.

Another student, who died after the conclusion of the class, had specifically noted the effect of centering meditations on her concerns about dying as well as the complex choices she faced about having a lung transplant.

“I am always aware of death, tickling the back of my mind. There’s a monologue running in the back of my head frequently during the day, just noodling on all these medical issues and decisions, so I find the meditation like getting off that mental treadmill and relaxing even for a few minutes.”

Another student, who also died after class sessions concluded, had explained that he had wanted to engage in Tai Chi, “not for a cure, but for healing.”

Other participants noted how the meditative effects from class carried over into their daily lives, calming them, day and night.

“I thought, ‘I could fall asleep while they [the teachers] are talking to me.’ Their voices are so calming. I’ve kind of incorporated that into my life.... I have a lot of times when I can’t fall asleep, and I’ll think of the things they’ve said and meditate in bed to calm myself and not be anxious.”

Another said the sessions provided some peace during stressful times.

“It’s more about relaxation, having a moment in time of calmness and community.... I’ve thought about a circle of light around me and that includes all of you, the teachers, and my family, and I don’t get really depressed, but I get scared, or I get angry, and then I think of the circle of light and how lucky I am.”

Another student described how the class had come together to practice TC but had continued to foster the compassion and empathy they felt for one another in the larger ILDC community.

“I feel like, ‘Why did I get this disease? This is **not** what I wanted to be doing when I moved [to this part of the country!]’ which is not doing very much now. But then, I’m really moved by how open people are in this group to share such inner feelings with all of us, and just like what [he] said, ‘The circle of light.’ What a nice way to put it.”

By considering contextual factors facing their students, these teachers moved away from a medical prescription for

exercise. They listened to their students, continually asked for clarifications from students and modified and adapted TC practice. They endeavored to foster meditative movement and generate a sense of well-being in their students. They were able to form a small TC practice community, nested within the larger community of the ILDC.

## Discussion

Numerous studies have documented the ways that TC can improve health for specific medical conditions. RCTs have been essential for establishing the credibility of TC in the medical community. However, as Wayne and Kaptchuk noted,<sup>30,31</sup> a pluralistic approach to studying TC is needed to fully understand this multifaceted intervention; they advocated “community-based observational studies, cross-sectional studies of long-term practitioners, and studies that integrate qualitative methods to capture the richness of participants’ experiences and teachers’ intentions in interventions” (p. 191).

We undertook this study to broaden understanding of the potential for TC practice to be informed by medically fragile students and adapted by experienced, caring TC teachers. As Morgan, et al. noted,<sup>32</sup> sociocultural models provide researchers with a sociocultural lens to view the intended population and adapt interventions informed by the unique characteristics of their sample population. Patients have important contributions that influence the effectiveness of the design and delivery of an intervention.<sup>36</sup> In this study, the TC class evolved through sessions among teachers, students, and researchers to address specific needs of the ILD and pulmonary populations. Listening to patients was critical to this endeavor.

Our first theme, *creating a supportive class environment*, reflected a process of establishing consensus for classroom goals through reciprocal, interactive processes among teachers and students. While developing a patient-sensitive TC practice, the overarching principles of TC served as the framework for modifying movement and meditation. Over time, students’ connections through the ILDC support group and shared experiences in TC led to a deepening of relationships in this live virtual class. The caring and compassionate classroom climate addressed the social isolation experienced by pulmonary patients. TC classes can offer “social connection and meaningful support”<sup>41</sup> for persons with a chronic, degenerative disease.

The adherence rate for this group, at 80%, was unusually high for engaging persons enrolled in PA programs. Most PR or PA programs for pulmonary patients experience considerable attrition, often as high as 50%.<sup>42</sup> By contrast, iLife, a recent at-home program designed to integrate PA into ILD patients’ daily routines, reported an adherence rate of 84%.<sup>43</sup> Our students were also in their own homes in a program adapted for their needs, enabling them to avoid inadvertent exposure to COVID, yet engaging in a communal experience.

From this interactive social context, our second theme, *alternating segments of movement and meditation to avoid fatigue and breathlessness*, became part of the classroom routine as teachers responded to students' questions and concerns. By listening to their students, teachers co-created class routines.<sup>32,33,36</sup> Teachers and students wanted to minimize breathlessness and fatigue. By avoiding prescribed breathing patterns, patients could re-imagine breathing and experience a fuller breath by focusing on their center of movement and awareness. Imagery, an important element of teaching TC, enabled students to imagine flowing energy from their center outward throughout their bodies. Avoiding fatigue was addressed by pacing activity levels and providing alternating segments of movement and meditation. Students were not expected to push through the discomfort of fatigue. Brief rest breaks enabled students to re-energize and re-join the group, creating a more positive affective experience of PA. Teachers and students moderated conditions, enabling students to attend class and participate fully, even while sitting, highlighting again the importance of empowering students to negotiate conditions and enjoy their PA, an often overlooked component of changing health behaviors.<sup>44-47</sup>

Our third theme, *cultivating sensory awareness and body trust*, developed in a variety of ways. Students' inner awareness was developed from the meditations, that often included body scans, from head to toe, combined with multiple ways of envisioning energy flowing throughout their bodies. They also learned more about their bodies' capacity for PA from the novel movements in TC, as students moved into unexpected postures, stimulating awareness of weight shifts or uplift during integrated whole-body movement. This increased awareness seemed to develop a renewed sense of their bodies as a whole rather than seeing their bodies through a pathological lens.<sup>29,49,50</sup> A growing body of research supports viewing the impact of TC on health from an embodied framework, in which mental and physical experiences co-create one another.<sup>50,53</sup>

When medically prescribed interventions for PA fail, individual patients often assume the blame for failure.<sup>45,46</sup> In this study, our students initially took the blame for their inability to "get moving." However, the capacity to pace themselves and work with teachers who were flexible and supportive made a difference in their self-reported capacity to engage in movement. Prior research has shown that TC practice can lead to improvements in self-efficacy and internal locus of control.<sup>48-50</sup>

Our fourth theme, *increasing the capacity to meditate through deepening presence*, was cultivated through both the slow, meditative movements of TC, as well as through seated segments enjoying quiet meditation. Class meditations focused on exploration of the body's center, the Tan T'ien, as the center of movement and energy supporting the generation of vital energy usable to the practitioner.

Students were helped to find seated postures that embodied key Tai Chi principles of uprightiness and groundedness and were invited to soften anything they might be holding tight.

Our fifth theme, *reducing, through meditative movement, the persistent anxiety, isolation, and sense of loss that accompany chronic disease*, has been more extensively researched in TC classes offered in a palliative care setting.<sup>51,52</sup> Persons with chronic, degenerative diseases avoid or isolate themselves even "from the commonality between their own and others' experiences of suffering. By opening themselves up to giving and receiving support from others in these ways, they were able to engender a desire to heal and connect" (p. 25).<sup>49</sup> Our final theme also illustrates the capacity for TC to foster a compassionate community among practitioners who suffer yet support and care for one another.

## Limitations

This study describes the process for developing a TC class designed for students with ILD and other lung conditions. The study does not meet the traditional definitions for generalizability and validity. Nevertheless, themes from this study may provide insights into future studies of TC to facilitate PA and overall wellness, by highlighting the need for including patients' voices, acknowledging the affective and embodied dimensions of behavior change, and the interactive influence of sociocultural factors.

## Conclusion

The strength of the study is modeling and documenting the opportunity for a diverse group, from the TC community and the ILD community, to devise a TC class for persons with significant lung disease. Our themes also indicate that students perceived the class as beneficial for their overall sense of health and well-being, a challenge for patients suffering from chronic lung disease. A reasonable next step for proponents of TC is to develop ways to enable greater access to TC for a more diverse population. Using socio-cultural models, proponents can gain insight into the supports needed to engage medically fragile populations in PA or meditative movement. This study provides a model of how experienced teachers, informed by their students, collaborated to create core curricula appropriate for their specific needs. It is notable that 2 non-profit organizations (ILDC and TCF) built bridges to offer the classes, with experienced and knowledgeable teachers and oversight from a community organization (ILDC) committed to the health and safety of its members and sensitive to their personal and social contexts. Bridges into communities with lived experience are needed to provide TC access to populations with special needs.

## Declaration of Conflicting Interests

The author(s) declared the following potential conflicts of interest with respect to the research, authorship, and/or publication of this article: Author Peter Wayne is the founder and sole owner of the Tree of Life Tai Chi Center. Peter Wayne's interests were reviewed and managed by the Brigham and Women's Hospital and Mass General Brigham Health Care in accordance with their conflict-of-interest policies. Remaining authors declare that they have no conflict of interest.

## Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: JL and JC received funding from the ILD Collaborative to teach the Tai Chi class. Funding was provided by the ILD Collaborative for Zoom hosting and data transcription. PW was supported by an NIH Career Development Award: K24 AT009282.

## ORCID iDs

Peter M. Wayne  <https://orcid.org/0000-0002-7561-3560>

Aliaa Barakat  <https://orcid.org/0000-0001-9411-9798>

## Notes

1. <https://www.ildcollaborative.org>.
2. <https://www.taichifoundation.org>.

## References

1. Guenther A, Krauss E, Tello S et al. The European IPF registry (eurIPFreg): baseline characteristics and survival of patients with idiopathic pulmonary fibrosis. *Respir Res*. 2018 Jul 28; 19(1):141. doi:10.1186/s12931-018-0845-5.
2. Wilson MS, Wynn TA. Pulmonary fibrosis: pathogenesis, etiology and regulation. *Mucosal Immunol*. 2009 Mar;2(2): 103-121. doi:10.1038/mi.2008.85.
3. Carvajalino S, Reigada C, Johnson MJ, Dzingina M, Bajwah S. Symptom prevalence of patients with fibrotic interstitial lung disease: a systematic literature review. *BMC Pulm Med*. 2018 May 22;18(1):78. doi:10.1186/s12890-018-0651-3.
4. Harrison AC, Robinson JF, Tu L, McDonald CF, Khor YH. Multidisciplinary care and prognosis in patients with COPD and interstitial lung disease prescribed long-term oxygen therapy. *Respir Care*. 2022 Jun;67(6):667-675. doi:10.4187/respcare.09446.
5. Raghu G, Remy-Jardin M, Richeldi L et al. Idiopathic pulmonary fibrosis (an update) and progressive pulmonary fibrosis in adults: an official ATS/ERS/JRS/ALAT clinical practice guideline. *Am J Respir Crit Care Med*. 2022 May 1;205(9): e18-e47. doi:10.1164/rccm.202202-0399ST.
6. Robinson H, Williams V, Curtis F, Bridle C, Jones AW. Facilitators and barriers to physical activity following pulmonary rehabilitation in COPD: a systematic review of qualitative studies. *Npj Primary Care Respiratory Medicine*. 2018 Jun 4; 28(1):19. doi:10.1038/s41533-018-0085-7.
7. Wijsenbeek MS, Holland AE, Swigris JJ, Renzoni EA. Comprehensive supportive care for patients with fibrosing interstitial lung disease. *Am J Respir Crit Care Med*. 2019 Jul 15;200(2):152-159. doi:10.1164/rccm.201903-0614PP.
8. Meis JJ, Bosma CB, Spruit MA et al. A qualitative assessment of COPD patients' experiences of pulmonary rehabilitation and guidance by healthcare professionals. *Respir Med*. 2014 Mar 1; 108(3):500-510. doi:10.1016/j.rmed.2013.11.001.
9. Armstrong M, Vogiatzis I. Personalized exercise training in chronic lung diseases. *Respirology*. 2019 Sep;24(9):854-862. doi:10.1111/resp.13639.
10. Mendes RG, Castello-Simões V, Trimer R et al. Exercise-based pulmonary rehabilitation for interstitial lung diseases: a review of components, prescription, efficacy, and safety. *Frontiers in Rehabilitation Sciences*. 2021 Nov 16;2:744102. doi:10.3389/fresc.2021.744102.
11. Molgat-Seon Y, Schaeffer MR, Ryerson CJ, Guenette JA. Cardiopulmonary exercise testing in patients with interstitial lung disease. *Front Physiol*. 2020 Jul 10;11:832. doi:10.3389/fphys.2020.00832.
12. Brunetti G, Malovini A, Maniscalco M et al. Pulmonary rehabilitation in patients with interstitial lung diseases: correlates of success. *Respir Med*. 2021 Aug 1;185:106473. doi:10.1016/j.rmed.2021.106473.
13. Condon C, Moloney E, Lane S, Stokes E. Pulmonary rehabilitation for patients with chronic obstructive pulmonary disease: an audit of referral and uptake. *Physiother Pract Res*. 2015 Jan 1;36(2):115-119. doi:10.3233/PPR-150058.
14. Lee AL, Holland AE. Time to adapt exercise training regimens in pulmonary rehabilitation & a review of the literature. *Int J Chronic Obstr Pulm Dis*. 2014 Nov 10;9:1275-1288. doi: 10.2147/COPD.S54925.
15. Moy ML, Wayne PM, Litrownik D et al. Long-term exercise after pulmonary rehabilitation (LEAP): design and rationale of a randomized controlled trial of Tai chi. *Contemp Clin Trials*. 2015 Nov;45(Pt B):458-467. doi:10.1016/j.cct.2015.09.004.
16. Bajwah S, Higginson IJ, Ross JR et al. The palliative care needs for fibrotic interstitial lung disease: a qualitative study of patients, informal caregivers and health professionals. *Palliat Med*. 2013 Oct;27(9):869-876. doi:10.1177/0269216313497226.
17. Gilliam EA, Cheung T, Kraemer K et al. The impact of Tai Chi and mind-body breathing in COPD: insights from a qualitative sub-study of a randomized controlled trial. *PLoS One*. 2021 Apr 8;16(4):e0249263. doi:10.1371/journal.pone.0249263.
18. Gilliam EA, Kilgore KL, Liu Y et al. Managing the experience of breathlessness with Tai Chi: a qualitative analysis from a randomized controlled trial in COPD. *Respir Med*. 2021 Aug; 184:106463. doi:10.1016/j.rmed.2021.106463.
19. Kreuter M, Bendstrup E, Russell AM et al. Palliative care in interstitial lung disease: living well. *Lancet Respir Med*. 2017 Dec;5(12):968-980. doi:10.1016/S2213-2600(17)30383-1.
20. Easwaran K, Gopalasingam Y, Green DD et al. Effectiveness of Tai Chi for health promotion for adults with health conditions: a

- scoping review of Meta-analyses. *Disabil Rehabil.* 2021 Oct; 43(21):2978-2989. doi:[10.1080/09638288.2020.1725916](https://doi.org/10.1080/09638288.2020.1725916).
21. Yang FC, Desai AB, Esfahani P, Sokolovskaya TV, Bartlett DJ. Effectiveness of Tai chi for health promotion of older adults: a scoping review of meta-analyses. *Am J Lifestyle Med.* 2021 Mar 24;16(6):700-716. doi:[10.1177/15598276211001291](https://doi.org/10.1177/15598276211001291).
  22. Yang GY, Hunter J, Bu FL et al. Determining the safety and effectiveness of Tai Chi: a critical overview of 210 systematic reviews of controlled clinical trials. *Syst Rev.* 2022 Dec 3;11(1): 260. doi:[10.1186/s13643-022-02100-5](https://doi.org/10.1186/s13643-022-02100-5).
  23. Wu W, Liu X, Wang L, Wang Z, hu J, Yan J. Effects of Tai Chi on exercise capacity and health-related quality of life in patients with chronic obstructive pulmonary disease: a systematic review and meta-analysis. *Int J Chronic Obstr Pulm Dis.* 2014 Nov 7;9:1253-1263. doi:[10.2147/COPD.S70862](https://doi.org/10.2147/COPD.S70862).
  24. Yeh GY, Wang C, Wayne PM, Phillips R. Tai chi exercise for patients with cardiovascular conditions and risk factors. *J Cardpulm Rehabil Prev.* 2009 May;29(3):152-160. doi:[10.1097/HCR.0b013e3181a33379](https://doi.org/10.1097/HCR.0b013e3181a33379).
  25. Yeh GY, Chan CW, Wayne PM, Conboy L. The impact of Tai chi exercise on self-efficacy, social support, and empowerment in heart failure: insights from a qualitative sub-study from a randomized controlled trial. *PLoS One.* 2016 May 13;11(5): e0154678. doi:[10.1371/journal.pone.0154678](https://doi.org/10.1371/journal.pone.0154678).
  26. Charmaz K. Experiencing chronic illness. In: *Handbook of Social Studies in Health and Medicine*. UK: Sage; 2000: 277-292.
  27. Charmaz K. *Constructing Grounded Theory: A Practical Guide through Qualitative Analysis*. UK: Sage; 2006.
  28. Cairney J, McGannon KR, Atkinson M. Exercise is medicine: critical considerations in the qualitative research landscape. *Qualitative Research in Sport, Exercise and Health.* 2018 May 29;10(4):391-399. doi:[10.1080/2159676X.2018.1476010](https://doi.org/10.1080/2159676X.2018.1476010).
  29. Charmaz K, Rosenfeld D. Reflections of the body, images of self: visibility and invisibility in chronic illness and disability. In: D Waskul, P Vannini, eds. *In Body/Embodiment: Symbolic Interaction and the Sociology of the Body*. UK: Routledge; 2016:49-64.
  30. Wayne PM, Kaptchuk TJ. Challenges inherent to t'ai chi research: part I—t'ai chi as a complex multicomponent intervention. *J Altern Complement Med.* 2008 Jan-Feb;14(1): 95-102. doi:[10.1089/acm.2007.7170a](https://doi.org/10.1089/acm.2007.7170a).
  31. Wayne PM, Kaptchuk TJ. Challenges inherent to t'ai chi research: part II—defining the intervention and optimal study design. *J Altern Complement Med.* 2008 Mar;14(2):191-7. doi:[10.1089/acm.2007.7170b](https://doi.org/10.1089/acm.2007.7170b).
  32. Morgan PJ, Young MD, Smith JJ, Lubans DR. Targeted health behavior interventions promoting physical activity. *Exerc Sport Sci Rev.* 2016 Apr;44(2):71-80. doi:[10.1249/JES.0000000000000075](https://doi.org/10.1249/JES.0000000000000075).
  33. Sallis JF, Owen N, Fisher EB. Ecological models of health behaviour. In: K Glanz, BK Rimer, K Viswanath, eds. *Health Behaviour and Health Education: Theory, Research, and Practice*. San Francisco CA: John Wiley & Sons; 2008:465-482.
  34. Bradshaw A, Phoenix C, Burke SM. Living in the mo(ve)ment: an ethnographic exploration of hospice patients' experiences of participating in Tai Chi. *Psychol Sport Exerc.* 2020 July49;49: 101687. doi:[10.1016/j.psychsport.2020.101687](https://doi.org/10.1016/j.psychsport.2020.101687).
  35. Spradley JP. *Participant Observation*. Waveland Press; 2016 Feb 17.
  36. Forsythe LP, Carman KL, Szydowski V et al. Patient engagement in research: early findings from the patient-centered outcomes research institute. *Health Aff.* 2019 Mar;38(3): 359-367. doi: [10.1377/hlthaff.2018.05067](https://doi.org/10.1377/hlthaff.2018.05067).
  37. Koren Y, Leveille S, Moraes CA et al. A remote Tai Chi program for diverse older adults with multisite pain during the COVID-19 pandemic. *Innovation in Aging.* 2021;5(Supplement\_1):989-989. doi:[10.1093/geroni/igab046.3553](https://doi.org/10.1093/geroni/igab046.3553).
  38. Charmaz K, Thornberg R. The pursuit of quality in grounded theory. *Qual Res Psychol.* 2021 Jul 3;18(3):305-327. doi:[10.1080/14780887.2020.1780357](https://doi.org/10.1080/14780887.2020.1780357).
  39. Wayne PM, Fuerst M. *The Harvard Medical School Guide to Tai Chi: 12 Weeks to a Healthy Body, Strong Heart, and Sharp Mind*. Boston, MA: Shambhala; 2013.
  40. Bradshaw A, Walker L, Borgstrom E, Burke SM. Group-based Tai Chi as therapy for alleviating experiences of social death in people with advanced, incurable disease: an ethnographic study. *Qualitative Research in Sport, Exercise and Health.* 2021 Feb;14(1):84-100. doi:[10.1080/2159676X.2021.1879918](https://doi.org/10.1080/2159676X.2021.1879918).
  41. Keating A, Lee A, Holland AE. What prevents people with chronic obstructive pulmonary disease from attending pulmonary rehabilitation? A systematic review. *Chron Respir Dis.* 2011 May;8(2):89-99. doi:[10.1177/1479972310393756](https://doi.org/10.1177/1479972310393756).
  42. Paixão C, Almeida S, Ferreira PG, Mendes MA, Brooks D, Marques A. Lifestyle integrated functional exercise for people with interstitial lung disease (iLiFE): A mixed-methods feasibility study. *Heart Lung.* 2023 Jul;60:20-27. doi:[10.1016/j.hrtlng.2023.02.018](https://doi.org/10.1016/j.hrtlng.2023.02.018).
  43. McLeroy KR, Bibeau D, Steckler A, Glanz K. An ecological perspective on health promotion programs. *Health Educ Q.* 1988 Winter;15(4):351-377. doi:[10.1177/109019818801500401](https://doi.org/10.1177/109019818801500401).
  44. Ekkekakis P, Russell JA. *The Measurement of Affect, Mood, and Emotion: A Guide for Health-Behavioral Research*. Cambridge: Cambridge University Press; 2013. doi:[10.1017/CBO9780511820724](https://doi.org/10.1017/CBO9780511820724).
  45. Ekkekakis P. People have feelings! Exercise psychology in paradigmatic transition. *Current Opinion in Psychology.* 2017 Aug;16:84-88. doi:[10.1016/j.copsyc.2017.03.018](https://doi.org/10.1016/j.copsyc.2017.03.018).
  46. Glanz K, Rimer BK, Viswanath K, eds. *Health Behavior and Health Education: Theory, Research, and Practice*. San Francisco CA: John Wiley & Sons; 2008 Aug 28.
  47. Murley B, Haas B, Hermanns M, Wang YT, Stocks E. Influence of Tai chi on self-efficacy, quality of life, and fatigue among patients with cancer receiving chemotherapy: a pilot study brief. *J Holist Nurs.* 2019 Dec;37(4):354-363. doi:[10.1177/0898010119867557](https://doi.org/10.1177/0898010119867557).

48. Tong Y, Chai L, Lei S, Liu M, Yang L. Effects of Tai Chi on self-efficacy: a systematic review. *Evid base Compl Alternative Med*. 2018 Jan 1;2018:1-21. doi:[10.1155/2018/1701372](https://doi.org/10.1155/2018/1701372).
49. Yeh GY, Chan CW, Wayne PM, Conboy L. The impact of Tai chi exercise on self-efficacy, social support, and empowerment in heart failure: insights from a qualitative sub-study from a randomized controlled trial. *PLoS One*. 2016 May 13;11(5):e0154678. doi:[10.1371/journal.pone.0154678](https://doi.org/10.1371/journal.pone.0154678).
50. Bradshaw A. *Physical Activity and Quality of Life in Palliative Care: An Ethnographic Study Exploring Patients' Experiences of and Views on Participation in a Hospice- Based Tai-Chi Programme*. [dissertation]. Leeds, England: Leeds University; 2018. uk.bl. ethos.767258.
51. Kilgore KL. An invitation to live: insights from an older, long-term practitioner of Tai Chi. *Phys Act Health*. 2019 Jan 29;3(1):11-22. doi:[10.5334/paah.31](https://doi.org/10.5334/paah.31).
52. Osypiuk K, Thompson E, Wayne PM. Can Tai chi and qigong postures shape our mood? Toward an embodied cognition framework for mind-body research. *Front Hum Neurosci*. 2018 May 1;12:174. doi:[10.3389/fnhum.2018.00174](https://doi.org/10.3389/fnhum.2018.00174).
53. Bradshaw A, Walker L, Borgstrom E, Burke SM. Group-based Tai Chi as therapy for alleviating experiences of social death in people with advanced, incurable disease: an ethnographic study. *Qualitative Research in Sport, Exercise and Health*. 2022 Jan 2;14(1):84-100. doi:[10.1080/2159676x.2021.1879918](https://doi.org/10.1080/2159676x.2021.1879918).