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The Feasibility of Implementing Tai Chi for Nursing Home Residents With Knee Osteoarthritis and Cognitive Impairment

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Abstract

This paper addresses the feasibility of implementing Tai Chi (TC) as an intervention for nursing home residents with osteoarthritis knee and cognitive impairment (CI). Recruiting elderly residents to participate was difficult. Only 9 out of the 31 originally thought eligible meet study

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criteria and 8 of the 9 elders eventually completed the study. With 2 sessions per week, the elders needed 8–10 weeks to learn the complete set of TC. They could not memorize the TC sequences, but they could follow the instructor who also employed verbal and visual cueing during the intervention. Clearly, elders with CI need different teaching methods and doses of TC. Using extended TC and teaching strategies tailored to participants' physical and cognitive capacity may promote effective learning.

Keywords

Tai Chi; dementia; arthritis; pain

OBJECTIVE

This study examined the feasibility of using Tai Chi (TC) as an intervention for nursing home residents with osteoarthritis (OA) of the knee and cognitive impairment (CI).

INTRODUCTION

Cognitive impairment and knee OA are highly prevalent in the elderly, and with the aging of the baby boomers, the number of elders with CI and OA may increase fourfold by 2050.1 Elders with CI show declines in ability to perform activities of daily living (ADL) because these tasks require cognitive capacity 2 and knee OA pain accelerates CI elders' functional decline.3 An intervention that can alleviate knee OA pain in elders with CI and delay functional decline is thus extremely important.

Pharmacological interventions for knee OA pain have limited efficacy and produce severe side effects.4 Tai Chi, a low-impact aerobic exercise, has shown promise in reducing pain in elders without CI.5 If TC can reduce knee OA pain in elders with CI, we can perhaps maintain their ability to perform ADL longer and therefore delay or prevent institutionalization. The theoretical basis for using TC to reduce OA knee pain is that through repetition of TC forms, elders gradually strengthen the quadriceps,6 which in turn may re-establish normal mechanics around the knee joint 7 and reduce knee pain.8

There are currently no study examining the efficacy of TC as an intervention to reduce knee OA pain in elders with CI, and no information is available on the feasibility of teaching TC to this population. Therefore, this study examined the feasibility of using TC as an intervention for nursing home residents with OA of the knee and CI.

METHOD

The Committee on the Conduct of Human Research of the University of Arkansas for Medical Sciences approved the study. Feasibility data were collected as part of a larger study that examined TC's effects on OA knee pain and cognition in cognitively impaired nursing home residents.

Residents were recruited for the study from four long-term care facilities. Inclusion criteria were 1) age ≥ 60 years old; 2) English speaking; 3) self-report of knee OA pain; 4) CI as

measured by MMSE score of 15–27; 5) no depressive symptoms as measured by Geriatric Depression Scale <5; 5) physician's permission to participate; and 6) low activity levels, defined as no regular exercise in the last 30 days. Because this was a study, exclusion criteria were strict; which included: 1) moderate or severe hearing deficits; 2) Parkinson's disease; 3) cancer pain; 4) diabetic neuropathy; 5) arthroscopic surgery or total knee or total hip replacement surgery in the past 3 months; 6) a history of vertigo in the past month; 7) a history of falls during the past 3 months; 8) any fractures in the past 6 months; and 9) use of cholinesterase inhibitors < 3 months.

To screen for self-report of OA knee pain, the Medical Outcomes Study short form (SF-36) bodily pain subscale was used.9 This subscale score combines the magnitude of pain and the level of pain's interference with daily life, with a range from 0% to 100%. High scores indicate less pain and less interference with daily life. Elders needed to have a pain score equal to or lower than 84% to participate, to allow room for improvement after participating in TC.

To recruit elders, nursing home administrators and/or the facilities' advanced practice nurses identified potential participants and obtained written permission for a research assistant (RA) to contact the elders/family. The RA then visited the elders and family members and explained the study. If they agreed to participate, the RA obtained consent and Health Insurance Portability and Accountability Act research authorization and screened the elder for eligibility. Participants received 12-form Sun TC for arthritis twice a week for 15 weeks. The TC program included warming up, TC, and cooling down, for a total of 20–50 minutes per session. A certified instructor in TC with 4 years of experience led participants in performing the TC forms.

The PI created a study log to collect information on feasibility issues. The RA used an attendance sheet to record the number of sessions attended and to record the time and reason for un-planned rest. The accuracy of TC performance was evaluated using Rosengren's method.10

RESULTS-FEASIBILITY OF IMPLEMENTING TAI CHI

The initial information obtained from administrators in four nursing homes indicated that 51 elders might be eligible to participate. However, the facilities' advanced practice nurses, who reviewed the list, concluded that 20 of the 51 elders were ineligible because: 1) they had no pain (N=8); 2) had other illnesses or health conditions (N=5); or 3) were at risk of falls (N=7). Fourteen of the remaining 31 elders were determined to be ineligible because the residents: 1) could not conduct meaningful conversations with the research staff, indicating low cognitive functioning (N=11) or 2) they had hearing problems (N=2), or 3) could not walk (N=1). We failed to recruit another nine elders because one elder was depressed, three elders refused to participate, and we could not get consent from 5 elders' family/guardian. Thus, we recruited only 8 participants from four nursing homes. The mean age of the participants was 83 years old and the majority was female.

Among the 8 participants we enrolled, one received the pretest assessment but never participated in the intervention. He died a few weeks later from causes unrelated to the

study. One participant had sleep disturbance such that she was awake during the night and slept during the day. Thus, she never attended TC sessions but allowed us to collect data. The elders participated in 0 to 29 TC sessions. The initial analysis showed no significant differences in pain score before and after the TC intervention as analysis by paired t test [t(df)=−.35(6), p=.74]. However, the Spearman's rho correlation between the change in pain scores and the number of minutes attended was .78 (p<.05). Furthermore, Furthermore, the correlation between the change in pain score and accuracy of performance was .70 (p=.08). These results indicated possible dose-response relationship between pain score, and minutes attended or accuracy of performance. Detailed results were reported elsewhere.11 The following sections discuss the feasibility issues of running TC programs in nursing homes.

The first issue is scheduling conflicts with on-going activities in nursing homes. We scheduled two TC groups in the morning and two groups in the afternoon. Several sessions in the afternoon conflicted with other activities, including a game, a birthday party, a residential council meeting, and parties for special occasions. As a result, the TC instructor often had to reschedule the intervention.

To encourage and ensure attendance, the RA often located the participants in the facility and accompanied them to the exercise room because the participants usually forgot their TC sessions. The TC practice also tailored the teaching method to the elders' cognitive conditions. To promote learning, the instructor used a "holding the baby" script, which tied the 12 TC forms together. Because of their inability to memorize the forms, the instructor always stood in front of the group and performed TC with the participants.

In addition, the instructor started with basic form 1 in Week 2 and gradually added 1or 2 new forms as participants made progress. We found that elders with mild CI needed at least 8–10 weeks (16–20 sessions) to learn the complete set of TC with this pace. The instructor then repeated the 12 forms each session. Even though elders could not memorize the sequences of TC forms during the 15-week TC intervention, but they could follow the instructor to perform the complete 12 TC forms with verbal and visual cueing.

We also tailored TC practice to the participants' physical conditions. For example, because the elders could not stand for a long time and they tired easily, we started with about 20 minutes per session and gradually increased exercising per session to 50 minutes. We gave participants a 5-minute rest in each session, which allowed them to have a drink and relax.

The instructor started the TC intervention in the following sequence at each session: 1) in the sitting position to teach/practice upper extremity forms; 2) in the standing position to teach/practice lower extremity forms; 3) in the standing position to teach/practice TC using both upper and lower extremities; and 4) in the standing position to repeat the TC forms using both upper and lower extremities.

Usually TC requires a person to stand in a low squat position, which necessitates lower extremity muscle strength. We found that most elders had very weak lower extremity muscles. They could not stand long without holding on to a chair or a staff member, or using a high-squat position. Thus, the instructor used a high-squat position in the beginning and gradually changed to a low-squat position. However, some elders still needed personal

assistance or had to hold on to a chair/walking device and never could assume a low-squat position. Our experience indicated that elders needing a walking device had worse TC performance because they usually had unstable gait, and holding on to the walking device affected their overall performance.

TC proved to be a safe exercise for this group of elders. Only minor side effects occurred from the TC practice. One elder complained about minor pain in the finger/arm, and three had minor knee pain while practicing TC. The instructor directed elders to sit down when they complained of minor knee pain. She also told elders not to perform the full range of arm/hand motions if they experienced pain. After rest, the minor pain subsided.

Majority of elders who participated enjoyed TC. One elder's anxiety prevented uninterrupted participation in the TC sessions. The instructor had to conduct a gentle conversation with her and allow her a mid-session break as necessary. By doing that, the participant was able to continue the session. One elder's depressive mood prevented her from participating in TC regularly. The research staff often found her in the bed and had difficulty talking her into practice.

Our experience indicated that incorporation of several activities could help to retain the participants we recruited. For example, we gave mid-term and graduation parties for participants. In addition, elders who completed the TC received graduation certificates, photos of themselves, and a videotape of them and the instructor performing TC together.

DISCUSSION

Even though we found it difficult to recruit participants for TC programs in nursing homes because of their cognitive or physical frailty, the reason for their institutionalization, our experience with this group of participants proved to be invaluable. Not only the participants in our study enjoyed TC practice, our preliminary results also suggested that it is feasible to conduct a TC program in nursing homes and TC helped to relieve their pain conditions.11

The American Geriatrics Society has recommended that exercise for sedentary elders with OA start at low to moderate intensity, with a minimum of 20–30 minutes of exercise per day (session duration) for at least 3 days a week (frequency).12 Although we found that some elders with CI could perform TC for 40–50 minutes and other studies support this,13 some in our study could not do this in the beginning. We suggest that future TC programs for this population should start with a short session (e.g., 20 min) and gradually extend the duration. Thus, elders can gradually improve their overall physical strength and then start to work on reducing knee pain. In addition, this study showed dose-response relationship between OA knee pain and minutes attended or accuracy of performance. Thus, after improving their general health, it might be worth a try to offer TC program daily to increase the dosing of TC.

Securing staff for monitoring their safety is another issue to consider when implementing TC program in nursing homes. Although all of the participants in our study were able to walk with walking devices, some required personal assistance from the RA while participating in the TC sessions. If only one RA was available, providing personal assistance

to one or two elders could prevent the RA from monitoring the other participants' safety. Because we always start with our TC practice in a seated position, performing this "sitting TC" for the whole session could be an option if there is only one interventionist available for the program. In fact, if staff can assist elders walking to and from the program, elders will have the opportunity to get up from their bed or chair, stand up and walk to the intervention room. When the program finishes, they will need to stand up again and walk back to the room. The participation of the program itself creates an opportunity for walking exercise in addition to the TC exercise in the regular sessions.

For this group of participants, one obstacle to learning TC was a lack of ability to recall the sequences of TC forms. These elders could not memorize the sequences of TC forms, but they could follow the instructor and respond to visual and verbal cues. Thus, good teaching strategies should tailor to elders' memory capacity to reduce the cognitive requirements, to avoid overwhelming the participants, and to reduce their anxiety in learning. In our experience, using an interesting script to link all the forms together makes it easy to remember the sequence of forms. An extended learning and practicing phase of the TC intervention can ensure that elders with CI achieve some levels of proficiency.

Another important issue to consider is the availability of TC instructors in a nursing home setting. Training staff to be certified TC instructors does require some investment. For example, for the Sun TC used in our study requires about $300 per person in a training workshop, which might be less for a group rate. There are also other local TC clubs/groups available to train the TC instructors. Alternatively, this can be achieved through train the trainer program. TC instructor assumes the major teaching role but the trained staff can practice with elders.

Pain assessment was one of the major outcomes. Our experience indicated that the SF-36, the tool used in this study, might be inappropriate for elders with low cognitive capacity since it required elders to recall their pain.14 A pain tool that does not require recall but measures knee pain associated with difficulty in performing ADL may be useful. For example, the staff may inquire elders' pain level using Verbal Descriptor Scale 15 or Faces Pain Scale 16 after implementing an activity protocol since OA knee pain is very likely to be induced by activity. Alternatively, a disease specific tool, such as WOMAC OA pain subscale 17 or a pain observational method, such as observational method developed by Keefe,18 that specifically assesses OA knee pain may be more useful with this population.

Afternoon TC interventions often conflicted with other activities. In addition, elders are more alert in the morning, and this influences the efficiency of their cognitive functioning 19 and might affect TC learning. Thus, it might be more appropriate to schedule the intervention in the morning. In addition, evening option may be worth exploring if staff is available.

The current feasibility study provides us with much useful information. The findings in this study should help us to design future studies that implement TC programs to alleviate OA pain in the nursing home population. If effectiveness is shown, we can adopt it as a routine cost-effective exercise intervention for this population.

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