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Preventing falls with Tai Ji Quan: A public health perspective

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Abstract

Falls among people aged 65 and older are a significant public health problem and one that is expected to increase as the population ages. Randomized controlled trials have demonstrated that Tai Ji Quan can reduce falls and associated injuries among older adults. In this paper, we describe how Tai Ji Quan community programs are being utilized by public health and aging services organizations to reduce older adult falls. We conclude that, to have a population-level impact on reducing falls and improving the health of older adults, Tai Ji Quan interventions must be translated into community programs that meet the needs and abilities of older adults. These programs must be adapted to fit into existing community structures, disseminated through multiple delivery channels, adopted and implemented broadly by organizations, and institutionalized to ensure sustainability.

Keywords

Elderly; Falls; Falls prevention; Older adults; Tai Chi; Tai Ji Quan

1. Introduction

Falls and fall-related injuries among older adults (those aged 65 and older) are a substantial challenge to public health worldwide. The world population is aging due to rising life expectancies combined with declining birth rates. Globally, the number of older persons is growing by 2% per year, considerably faster than the population as a whole. By 2050, the number of persons aged 60 and older in the world will exceed the number of younger adults for the first time in history.[1] These changing demographics will increase the pressure on public health organizations and healthcare systems that maintain older adults' health and quality of life.

The reported proportion of older adults who fall each year differs among countries and areas, with estimates of 14% in Taiwan, China,[2] 15% in Japan,[3] 30% in the US,[4] 31% in

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Mainland, China,[2] 34% in Chile,[5] and 46% in Spain.[6] Many types of organizations are working to address this important public health problem including international organizations such as the World Health Organization.[7] Within the US, there are professional organizations such as the American Geriatrics Society and the Osteoporosis Foundation, national public health agencies such as the Centers for Disease Control and Prevention (CDC) and the Administration for Community Living, non-governmental advocacy groups such as the National Council on Aging, state falls coalitions, state and local health departments, and local community organizations.

Reducing the burden of falls requires effective prevention programs that are broadly disseminated, adopted, and implemented. To benefit the increasing number of older adults, falls prevention must be addressed at the national, state, and local levels, and it must become an integral part of both the healthcare delivery system and the aging support services system.

In the US, falls are the leading cause of deaths and hospital emergency department visits for injuries among older adults.[8] In 2010, 21,649 adults aged 65 and older died as a result of falls and almost 2.4 million more were treated in emergency departments for fall injuries.[8] Many older adults who fall, whether or not they sustain an injury, show a decrease in social activities, reduced mobility, and poorer performance on cognitive and physical health tests.[9,10] In addition, fall injuries place a substantial burden on the healthcare system. Adjusted for inflation, the direct medical costs of fall injuries among adults 65 years and older in the US exceed US$30 billion annually.[11] Effective fall prevention programs promise to reduce the economic impact of fall injuries while improving the health and well-being of the older adult population.

In the past 25 years, researchers have identified numerous fall risk factors. Those most strongly associated with falls include older age, female gender, a previous fall,[12] muscle weakness,[13] difficulties with gait and balance,[14] the use of psychotropic medications,[15] functional limitations, vertigo, walking aid use, and depression.[12,16] Although some important risk factors cannot be changed (e.g., age and female gender) others are potentially modifiable.

2. Falls prevention

Public health approaches to preventing older adult falls have focused on modifiable risk factors, most often addressing leg weakness, unsteady gait, and balance problems through various types of exercise. In two meta-analyses, group exercise was shown to reduce fall risk by 14%–29%.[17,18] A recent report by the US Preventive Services Task Force on fall interventions recommended that primary care providers refer community-dwelling adults aged 65 years and older who are at increased risk for falls to exercise or physical therapy.[19] Based on this evidence, the American and British Geriatrics Societies recommend multifactorial interventions that include balance, gait, and strength training.[20]

3. Tai Ji Quan

As a form of exercise, Tai Ji Quan is a plausible approach for reducing falls. It is well suited for older adults because it is a moderate intensity aerobic exercise that consists of

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continuous, rhythmic, and low impact movements.[21] Tai Ji Quan addresses a number of important fall risk factors by improving leg strength, balance, coordination, postural control, mobility, and reducing fear of falling.[22–24] In addition, studies have demonstrated that Tai Ji Quan can have positive effects on a number of chronic conditions. For example, improving bone density, cardio-pulmonary outcomes, physical functioning, psychological symptoms, quality of life, and immune system functioning.[22]

Tai Ji Quan interventions have been shown to reduce falls in randomized controlled trials (RCTs) in Australia[25] and the US.[26,27] Although most interventions used programs modified for older adults and taught one style of Tai Ji Quan, one RCT that demonstrated effectiveness used existing community Tai Ji Quan programs and local Tai Ji Quan instructors who taught a variety of styles.[25]

In a comprehensive review of the health benefits of Tai Ji Quan, Jahnke et al.[22] found that Tai Ji Quan improved balance and postural stability and reduced the risk and rate of falls among community-dwelling older adults. A more recent meta-analysis by Gillespie et al.[18] reported that Tai Ji Quan programs reduced fall risk by 28%.

However, not all studies have found that Tai Ji Quan was effective in reducing falls.[28–30] A meta-analysis of exercise-based falls interventions indicated that, to be effective, exercise must: 1) focus on improving balance, 2) become progressively more challenging, and 3) involve at least 50 h of practice.[31] For some ineffective Tai Ji Quan interventions, participants may not have obtained a sufficient “dose”. Participants may have attended classes infrequently or the program may not have continued long enough to demonstrate effectiveness.

Additionally, there is growing evidence that the effectiveness of Tai Ji Quan as a falls intervention depends, at least in part, on the health status of participants. A recent Cochrane review concluded that Tai Ji Quan classes reduced the risk of falling but were less effective in trials with high-risk participants.[18] Tai Ji Quan appears to be most beneficial for healthy, and possibly transitionally frail, older adults, but less suitable for older frail individuals.[32–34]

A number of public health organizations have recognized that Tai Ji Quan programs are an effective fall prevention approach. The World Health Organization recommends community-based programs that link Tai Ji Quan-based exercises with an educational component.[35] The CDC has published the *CDC Compendium of Effective Fall Interventions* that includes 10 exercise-based interventions;[36] three of these are Tai Ji Quan programs. Additionally, the US Administration for Community Living includes Tai Ji Quan programs among those that, for funding purposes, meet their criteria for evidence-based falls interventions.[37]

4. Translation

After an intervention has demonstrated effectiveness in an RCT, the next step is to translate the intervention into practice.[38] This includes actively spreading the intervention to the intended recipients through multiple delivery channels (dissemination);[39,40] engaging in efforts to facilitate uptake of the intervention by organizations (adoption); putting the

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intervention into place within an organizational system (implementation); attracting program participants (reach); and ensuring maintenance and institutionalization of the intervention (sustainability).

4.1. Dissemination

Broad implementation of Tai Ji Quan programs will require widespread support and active dissemination by a variety of stakeholders. Partnerships provide crucial support and help to ensure the success and sustainability of a Tai Ji Quan fall prevention program. It is important to develop partnerships with organizations at the national, state, and local levels. Key partners would include public health organizations, aging and/or disability services, community organizations and healthcare providers.

The CDC's Injury Center has long recognized that older adult falls are a serious public health problem and has made substantial investments in fall-related research and programs.[41] As part of these ongoing efforts, the Injury Center is funding the New York, Colorado, and Oregon Departments of Health to implement a number of fall prevention approaches in several communities within their states. One of three community programs being implemented is *Tai Chi: Moving for Better Balance*.

The Injury Center also provides information about preventing falls on their website at www.cdc.gov/homeandrecreationalsafety/falls. The educational materials are designed to meet the needs of diverse audiences, including healthcare practitioners, public health professionals, older adults, and caregivers.

4.2. Adoption

Organizations find Tai Ji Quan programs appealing for a number of reasons. They are evidence-based, shown to be effective, and relatively inexpensive. Costs consist mainly of instructor training and salary and classroom rental. These programs also are easy to implement since they require only modest classroom space. Programs can be funded through a variety of methods, including participant fees, government grants, and insurance reimbursement programs.[42,43]

To have a population-level impact on reducing falls and improving the health of older adults, Tai Ji Quan interventions must be translated into community programs that fit into existing community structures and meet the needs and abilities of older adults. In an RCT, all study participants must meet strict selection criteria (e.g., age, functional abilities), receive the same intervention, and, ideally, complete the entire program. Depending on the study, participants attended classes two to three times a week for 15–26 weeks.[27,44] Most interventions used one or two highly experienced Tai Ji Quan instructors that taught one specific style.[45]

In contrast, a Tai Ji Quan program implemented at a senior center or a community center typically is offered to everyone over the age of 60 years. Classes are held once a week and programs last, on average, between 8 and 12 weeks. Participants may attend as many or as few classes as they wish, and the programs are led by instructors with varying degrees of experience and who teach different styles of Tai Ji Quan. To overcome some of these

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challenges, beginning, intermediate, and advanced Tai Ji Quan classes could be offered on an ongoing basis. Scheduling also could improve adherence. Older adults are more likely to attend classes offered between 9:00 am and noon rather than later in the day.[46]

4.3. Implementation

Translated programs need an appropriate infrastructure in order to be implemented effectively. This involves building capacity within the adopting organizations (e.g., Young Men's Christian Association, retirement community) to provide the Tai Ji Quan programs as well as developing implementers, (i.e., training Tai Ji Quan instructors) to deliver the programs to the participants. Finally, these new programs have to fit into the existing structures of community and senior services organizations so that the programs can be accessed easily by older adults.

A large number of qualified Tai Ji Quan instructors will be needed if Tai Ji Quan programs are to be implemented widely. There are many trained instructors now in community and senior services organizations that are implementing older adult exercise, health and wellness programs. With organizational encouragement and support, some of these teachers could receive additional training to deliver Tai Ji Quan fall prevention programs. Practical short-term workshop programs have been developed to train Tai Ji Quan instructors with previous experience working with older adults and who have an allied health or medical background, or are qualified exercise instructors.[25,45]

To accommodate the needs and abilities of older adults in the community, it may be necessary to modify aspects of a Tai Ji Quan program, (e.g., reducing the number of movements and level of difficulty).[44] However, reduced exercise intensity and low completion rates will lessen a program's effectiveness.[29,33] Older adults may find it difficult to attend even one class a week, let alone the two classes a week often recommended, for a total of 50 h.[31] Possible solutions include encouraging participants to practice Tai Ji Quan at home, thereby increasing the effective "dose",[45] and providing practice opportunities by scheduling frequent group classes.

Although an evidence-based program may be modified, it must maintain fidelity to the original intervention to preserve effectiveness. The program must retain the key elements that made the intervention effective while at the same time being adapted to fit the requirements of the implementation setting such as a senior center or community center. To successfully implement evidence-based Tai Ji Quan programs that can be widely distributed and delivered in a consistent manner, organizations will need to develop effective and efficient implementation strategies. These would include providing resources for training instructors to deliver the program with fidelity, identifying program sites, and actively recruiting participants. In addition, these organizations would need to address barriers to participation in community Tai Ji Quan programs, as well as cost and feasibility issues.

To date, few Tai Ji Quan interventions have been scientifically tested, systemized, and translated into community fall prevention programs that can be broadly disseminated. One is *Tai Chi: Moving for Better Balance*,[45] which has been shown to be effective in reducing falls. Another is the *Tai Chi for Arthritis* program.[47] Although it has not been studied as a

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falls intervention, it comprised the majority of the community Tai Ji Quan programs used in the effective falls intervention, the Central Sydney Tai Chi Trial.[25] Both programs provide training materials for instructors and supporting materials for participants; train the instructors using a standardized approach; and teach the instructors to deliver the programs with fidelity.

4.4. Reach

To be effective, Tai Ji Quan programs must be accepted by older adults. Challenges to adopting Tai Ji Quan are similar to those for other types of exercise programs for older adults: health and mobility issues, low interest in increasing physical activity, and concerns about injury.[48–50] In addition, Tai Ji Quan faces some unique barriers. It may be seen as strange or foreign, which could make Tai Ji Quan less appealing to many people.[51,52] The process of marketing a Tai Ji Quan program provides opportunities to dispel misconceptions, raise awareness about falls, and promote Tai Ji Quan as a gentle exercise that can reduce falls and promote independence.[51]

A number of factors can enable or encourage older adults to enroll in a Tai Ji Quan program. These include the support and encouragement of other people, the expectation that Tai Ji Quan will improve their quality of life,[53] and the accessibility of classes. Accessibility includes such things as reasonably priced classes, available public transportation, and accessible venues, (e.g., nearby parking, not having to climb a lot of stairs). Encouragement by a friend, relative or heath professional is very important. They can correct mistaken ideas about Tai Ji Quan, recommend specific classes, and support an older adult's confidence in his or her ability to carry out the program.

Making Tai Ji Quan programs that appeal to older adults widely available can reduce falls and fall injuries, which are very costly to individuals, families, society, and the healthcare system. Including fall prevention programs, such as Tai Ji Quan, as a covered healthcare benefit would be an effective option for payers that offers an opportunity to reduce the healthcare costs associated with older adult falls.

4.5. Sustainability

To reduce older adult falls at the population-level through the provision of evidence-based fall prevention programs, such as Tai Ji Quan, will require integrating the public health and healthcare delivery systems at the federal, state, and local levels.

It is critical for program sustainability that organizations evaluate community Tai Ji Quan programs and demonstrate both uptake and effectiveness. The implementing organization would need to develop methods to determine the number of instructors that were trained; the number of classes that were conducted by each instructor; the extent to which the program reached the intended audience, including the number of people who enrolled; the number that completed the program; and participant feedback about the perceived benefits of the program. In addition, maintaining reliable program resources, including ongoing funding support, is essential for long-term sustainability.

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5. Next steps

There are a number of important research questions that need to be addressed in order to maximize the effectiveness of Tai Ji Quan fall prevention programs. At the organizational level, questions include, “How can we improve leadership and/or community support for Tai Ji Quan programs?”, “How can we increase the capacity of the existing health promotion infrastructure to effectively deliver Tai Ji Quan fall prevention programs?”, and “How can these programs be promoted and sustained by service providers such as healthcare providers, public health and community-based organizations, and allied health professionals?”

Research questions at the individual level include, “What is the best way to teach Tai Ji Quan to older adults?”, “What is the optimal frequency, duration, and intensity of practice that will produce the best outcomes?”, “What are the most clinically relevant fall-related outcomes and how should these be measured?”, “What are the characteristics of participants who will be most likely to benefit?”, and “How can we support long-term adherence of Tai Ji Quan practice among older adults?”

6. Conclusion

Older adult falls are a significant public health problem and one that is expected to increase as our population ages. Tai Ji Quan has demonstrated effectiveness in reducing falls and associated injuries among older adults, as well as reducing the symptoms of some chronic conditions and improving overall health and well-being. To have a positive impact on the health of older adults, Tai Ji Quan programs must be adapted to meet their needs and abilities. Finally, to become widely adopted, these programs also must be modified to fit into existing community structures, broadly implemented by organizations, and institutionalized to ensure sustainability.

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