



Study Protocol

Improving Balance Control in Older Persons Through Martial Arts: a Scoping Review Protocol

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Abstract

Introduction: Martial arts, other than Tai chi, are now being integrated into exercise programs to improve the balance control of older adults. This scoping review aims to describe the extent, range, and nature of available literature on martial arts use to improve balance control in older adults. **Methods and Analysis:** This scoping review will adhere to the steps described in the Arksey and O'Malley framework. Studies on martial arts use, aside from Tai chi, in improving balance in older adults are eligible. Only experimental studies written in English will be included. Literature search on published articles from inception to February 2021 will be conducted in ScienceDirect, PubMed, Scopus, CINAHL, Medline, and ProQuest. Grey literature search will be implemented in Google Scholar, Pro-Quest Dissertations and Theses Open, University of Santo Tomas Library. Hand-searching for additional articles from reference lists of included studies will also be performed. Data on author and year of publication, country, study design, target population, type of martial art, exercise protocol, balance outcome measures used, and main findings will be extracted from the included studies. **Ethics and Dissemination:** This protocol describes the rigorous process that will be implemented to map the breadth of existing literature on martial arts use in improving the balance control of older adults. Ethical approval is not required because only information from publicly accessible sources will be collected. Review findings will be disseminated through publications and presentations in local and international conferences and shared with relevant agencies and societies. **Scoping review registration:** This protocol was registered in Open Science Framework (OSF): <https://osf.io/vez68>.

Keywords: older adults, martial arts, balance, scoping review protocol

INTRODUCTION

Maintaining balance as the body stays in a particular position or moves in space relative to the surroundings requires the integration of visual, vestibular, proprioceptive inputs, muscular strength, and reaction time.¹⁻³ It is imperative to have good static and dynamic balance control to perform necessary activities of daily living and recreational pursuits successfully.¹⁻³ There is an age-related decline in the ability to regulate mechanisms to maintain balance that can stem from impairments in sensory, motor, and central processing systems.² These impairments may result from a general

progressive loss of function due to the normal aging process or a specific pathology affecting a particular component of these systems.³

Problems in maintaining balance are one of the most common reasons older adults seek medical consult.⁴ The prevalence rate of balance problems in the geriatric population is 34.3%.⁵ Reduced balance control in old age posts significant healthcare burden and is associated with an increased risk of falls, greater dependency, rise in hospitalization, decreased quality of life, morbidities, and mortalities.^{1,2,5-7}

Several clinical trials have been conducted to investigate the effects of different exercise types in mitigating the geriatric population's reduced balance.¹ A systematic and meta-analytic review revealed that balance training positively affects static balance (standardized mean difference (SMD)= 0.51), dynamic balance (SMD= 0.44), and performance of balance assessment (SMD= 1.52) in health older adults.⁸ In a randomized controlled trial study, older adult participants who participated in a multimodal balance-enhancing exercise program for six weeks improved their balance control ($p \leq 0.033$) and gained balance confidence ($p \leq 0.018$).⁹ The study also found that the program helped enhanced coordination, strength, and mobility of the lower extremities. Besides the physical benefits, a literature review summarized that balance exercises also improve the overall quality of life and mental functioning in older adults.¹⁰ However, compliance with an exercise program is very challenging in this population, and many exercises require sophisticated and expensive equipment.

In its literal, traditional definition, martial arts are arts of war designed for the battlefield.^{11,12} From being combat arts for self-defense, these martial arts can be redesigned to become age-appropriate exercise regimens for older persons to improve their balance control.¹²⁻¹⁵ Martial arts emphasize dynamic movement components¹³ that challenge the visual, vestibular, and proprioceptive systems of the body and require adequate strength and reaction time to maintain balance.¹⁴ There are approximately 200 unique martial arts disciplines worldwide categorized in various schools, styles, and systems.^{11,16} Martial arts, such as Kung Fu and Karate, that focus on quick and decisive execution of movements are considered hard martial arts, while some others, such as Tai Chi and Yoga, that focus on the quality of movement execution, are classified as soft martial arts.¹⁷ Some martial arts, such as Tae Kwon Do, contain both elements.¹⁷

It may be advantageous to employ martial arts to address balance problems in old age, particularly the reduced ability to maintain balance and adapt to the environmental changes.² These do not just involve integrating the body, mind, and soul, but are also contextually grounded on local

culture.^{16,18} A more culturally relatable and low-cost strategy is needed to increase older adults' engagement to exercise.^{17,18} Older adults prefer to actively participate in exercise programs culturally familiar and relevant to them.¹⁹

Among the different martial arts forms, Tai chi is the most commonly investigated.^{15,20,21} It is an ancient Chinese martial art consisting of slow, continuous, fluid movements for total self-development.²²⁻²⁴ It has been proven effective in improving balance control in older adults with or without medical conditions.^{1,25-28} The other martial arts disciplines are now being incorporated into exercise programs for their health benefits, including increasing the older adults' balance control.^{16,17,29,30} However, the information on what, where, and how these martial arts are being used around the world to improve balance in older adults has not yet been comprehensively reviewed. Hence, the objective of this scoping review is to describe the extent, range, and nature of literature on martial arts, aside from Tai chi, to improve both the static and dynamic balance control of older adults. Information about the extent of research work, the range or the variations of applications, and the nature or the fundamental characteristics of studies and research activities on improving balance in older adults through martial arts-based exercise regimens will be reviewed and summarized.

METHODS AND ANALYSIS

A scoping review will be conducted to map the extent of current literature on martial arts use in improving balance in older adults. As martial arts are broadly and heterogeneously practiced worldwide, a scoping review was chosen to present the magnitude of available research and determine if a systematic review is warranted on the topic.³¹ This scoping review will adhere to the steps outlined by Arksey and O'Malley (2005) and Levac, Colquhoun, and O'Brien (2010), which include: 1) Identifying the research question; 2) identifying relevant studies; 3) Study selection; 4) Charting the data; 5) Collating, summarizing and reporting results.^{32,33} The Preferred Reporting Items for Systematic Reviews and Meta-Analyses

extension for Scoping Reviews (PRISMA-ScR) Checklist will also be followed.³⁴ An accomplished PRISMA-ScR Checklist for this scoping review protocol is provided as Supplement A. Given the nature of the scoping review, assessment of methodological quality and risk of bias using critical appraisal tools for the included studies will not be conducted. The protocol has been registered through Open Science Framework (<https://osf.io/vez68>).

Identifying the research question. The target population of this review is the geriatric population, who are aged 60 years or above. The intervention of interest is an exercise program based on martial arts other than Tai chi. The outcome measure should be focused on assessing the intervention's effect on either static and dynamic control of balance. Hence, the research question of this scoping review is "What is the extent of research activity in martial arts use on improving balance in older adults?"

Identifying relevant studies. Published studies will be searched in seven electronic databases, including ScienceDirect, PubMed, Scopus, CINAHL, Medline, and ProQuest, to have an exhaustive exploration of peer-reviewed research articles. Search for grey literature will be conducted in Google Scholar, Pro-Quest Dissertations and Theses Open, and the University of Santo Tomas Library to ensure that the review's findings will be based on a thorough search of the literature and to minimize publication bias. Only literature written in English will be sought from inception to February 2021. Considering that some studies might be published in languages other than English, the authors will then be contacted to request an English translation of their articles. An initial limited search will be conducted in ScienceDirect and PubMed using search terms "martial arts," "balance," and "older adults" to find other text words, index terms, and medical subject heading words in the titles and abstracts of relevant articles. A second search will be undertaken using all identified keywords and index terms across all chosen databases. Checking the bibliography or the reference lists of selected studies will also be implemented to identify additional pertinent articles. Digital hand-searching on key martial arts journals such

as Martial Arts Studies, International Journal of Martial Arts, Journal of Combat Sports and Martial Arts, and Journal of Martial Arts Research will also be performed to locate other articles that might be missed in the database and reference list searches. Martial arts experts and practitioners will be consulted regarding their knowledge of potential studies to include in this scoping review. The Mendeley citation manager will be the repository of relevant studies. A sample search strategy and the accompanying result from PubMed is presented in Supplement B.

Study selection. Studies that focused on the outcome of improving the static or dynamic balance control of older adults through martial arts or martial arts-based exercise regimen, other than Tai chi, as the intervention will be included. All forms of martial arts, whether hard or soft based on the velocity of movement execution will be considered.¹⁷ Also, all categories of martial arts such as 1) close combat, which focuses on defensive purposes, 2) warrior arts for the offensive attacks, 3) martial paths for spiritual purposes, 4) martial arts for self-development and education, and 5) martial sports for athletic participation and competition¹¹ will be included for as long as these were modified to improve the balance of the group of older adults. The participants must be from the geriatric population, aged 60 years or above, with or without health conditions, living in the community or in an institutional care facility. The age of 60 is the reference age used by the World Health Organization when referring to older persons.³⁵ Considering the nature of our research question, studies that are experimental in design, such as randomized clinical trials, quasi-experimental studies, cross-over studies that used exercise programs based on martial arts as interventions to improve balance, will be included.

Studies will be excluded if 1) the specific type or style of martial art was not identified, 2) balance control was not assessed objectively as an outcome, 3) full-text is unavailable, 4) participants younger than 60 years old were also recruited in the study, 5) data collection is not complete, or the study has not commenced yet. The particular type of martial art has to be

explicitly stated in the study to achieve the review objective of describing the range of martial arts being studied. Subjective reporting of the participants regarding their balance status in the form of perceived confidence in doing activities and fear of falling³⁶ are proxy measures of balance and will not be considered in this review. A full-text copy of the manuscript is necessary to complete the data extraction procedure. Authors will be contacted when only the abstract is available; otherwise, the article will not be included. This review focuses on martial arts exercise regimens with older adults, at least 60 years old, as the target beneficiaries and will exclude studies that recruited younger participants aside from older persons. Only completed studies will be included to appropriately describe the extent and nature of current literature on martial arts use for balance improvement in older adults.

Two assigned investigators will initially screen search hits based on details provided in the title and abstract before full texts are obtained. When full-text is not accessible or available, assistance from the librarian will be sought, and authors will be contacted to procure a copy; otherwise, the study will not be included. Further screening against the set eligibility criteria for all full-text articles will continue. Discussion between the

two investigators will be carried out to resolve any disagreements to arrive at a consensus.

Charting and summarizing the data. Data extraction will be performed iteratively and independently by two designated investigators using a descriptive-analytical method.^{32,33} The information to be extracted from the selected studies will include author and year of publication, country, study design, target population, type of martial art, exercise protocol, balance outcome measures used, and main findings. Table 1 shows the guide in extracting relevant information from the included studies to determine the extent, range, and nature of studies and research articles available about martial arts use in improving balance in older adults. Prior to the actual data extraction, the two assigned investigators will meet and agree on a standard procedure following the guide in Table 1 to ensure consistency in charting the data. Data will be encoded in MS Excel Version 16.41. Frequency distributions and percentages will be used to summarize the charted data. Overall trends on what, where, and how martial arts were used in the chosen studies will be described. The martial arts experts and practitioners will again be consulted at this stage to provide feedback on the summarized data for finalization.

Table 1. Data Extraction Guide

Domains	Guide Questions	Areas of the Scoping Review		
		Extent	Range	Nature
Authors	Who were the authors of the article?	✓	✓	
Publication year	In what year was the article published?	✓	✓	
Country and location	In what country was the study conducted?	✓	✓	
Study design	What was the research design employed in the study?	✓	✓	✓
Target population	How many participants were included?	✓	✓	✓
	What were their main characteristics in terms of age, gender, and medical status?			
	Were they community-based or institution-based?			
Martial art type	What specific martial art type or form was employed in the study?	✓	✓	✓
Exercise protocol	What were the exercise parameters (frequency, intensity, time, type and progression) used in the exercise program?	✓	✓	✓
Balance outcome measures	What outcome measures were used to assess the change in balance control?	✓	✓	✓
Main Findings	What were the main findings, key points or take-home messages of the article?	✓	✓	✓

Patient and public involvement. The conceptualization and completion of this scoping

review protocol did not involve patient or public participation. Nonetheless, martial arts experts

and practitioners will be consulted from the stage when relevant studies will be identified to the stage when data from included studies will be extracted and summarized.

Ethics and dissemination. This scoping review protocol described the rigorous process to be undertaken to map the breadth of existing literature on martial arts use in improving the static and dynamic balance control of older adults. This review constitutes the initial step of a more prominent study on designing an exercise program based on a promising locally and culturally grounded martial art, Arnis,³⁷ not yet conducted for balance improvement in the geriatric population. Ethical approval of the review is not required because only information from publicly accessible sources will be collected.

Review findings will be disseminated through publications and paper and poster presentations in local and international conferences to inform allied health professionals, exercise experts, martial arts practitioners, and the general public regarding the strategies on how martial arts were modified and used in exercise regimens around the world to increase the balance control of older adults. The findings will also be shared through consultative meetings with government agencies, the private sector, non-governmental organizations, geriatric specialty societies, and senior citizen groups.

EXPECTED RESULTS

The expected results from this protocol will include tabulated summary of relevant methodological components of the included studies. The result will highlight the type of martial art, exercise protocol, balance outcome measures used, and main findings. As this scoping review aims to describe the extent, range, and nature of available literature on martial arts use to improve static and dynamic balance control in older adults, it is anticipated that the results of this study will inform health practitioners, the public, and associated authorities and institutions of the importance and effectiveness of martial arts-based exercise regimens. These results would reveal improved physiologic, neuromotor, and psychosocial

factors affecting static and dynamic balance in older adults. This information can educate practitioners and patients by providing valid and reliable measures for testing and exercise programming, effectively directed instructions and implementation procedures for safe and sustainable physical activity, and a broader perspective on movement and lifestyle for a better quality of life.

Strengths and Limitation of the study

The protocol describes a novel, rigorous and iterative process of doing a scoping review to map the extent of current literature on martial arts use to improve balance control in older adults. Excluding Tai chi will allow other martial arts forms to be highlighted and recognized as alternative and culturally relevant exercise options. Given the number and variety of martial arts worldwide, only those formally studied through experiments will be included. Only studies published in English are to be included; however, authors of articles in other languages will be contacted to provide an English translation of their article. As a scoping review, methodological quality, and risk of bias of included studies will not be conducted.

Individual author's contributions

DL led the design and conceptualization of this review, supervised the entire process, drafted the protocol, and edited the manuscript; DM contributed in identifying key terms for searching and establishing the eligibility criteria, and edited the manuscript; VO, JM, and SP contributed in defining key concepts and establishing eligibility criteria, and edited the manuscript. All authors read and approved the final version of the manuscript.

Disclosure statement

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

Conflicts of interest

Authors DL and DM are Associate Editors of PJAHS. However, this manuscript underwent the standard blinded peer-review process of the journal.

Supplementary Material

[Supplement A. PRISMA ScR Checklist](#)

[Supplement B. Sample Search Strategy in PubMed](#)

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