





Effect of an adapted Taekwondo-based intervention on functional and motor abilities in elderly care home residents: a study protocol

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ABSTRACT

This pilot protocol study aims to evaluate the effects of an adapted Taekwondo-based intervention on upper limb strength and overall functional capacity in elderly care home residents. Considering the global trend of population ageing, physical activity interventions in care facilities are essential to mitigate functional decline and enhance well-being among this population. 20 participants will be stratified into walking and non-walking groups to reflect the diverse functional levels within the facility. The primary outcome will focus on upper limb strength, which will be assessed using the handgrip test. In contrast, secondary outcomes will evaluate functional capacity through the Short Physical Performance Battery, the Senior Fitness Test and mobility assessments. With its emphasis on arm movements, the Taekwondo-based intervention is expected to improve upper limb strength and overall functional abilities, supporting active ageing and enhancing participants' quality of life.

INTRODUCTION

Regular physical activity is fundamental for enhancing overall well-being. It plays a key role in decreasing cardiovascular disease^{1–3} and reduces the risk of chronic conditions such as obesity,^{4 5} diabetes,⁶ osteoporosis,^{7–9} sarcopenia^{9–11} and frailty.^{3 10 12 13} Additionally, staying active enhances mental well-being,^{14 15} lowers the risk of cognitive decline^{16 17} and dementia^{15 17–19} and reduces the likelihood of falls.^{7 20 21} Recognising these benefits, the World Health Organization (WHO) released guidelines recommending that individuals aged 65 and older engage in 150–300 min of moderate-intensity aerobic activity or 75–150 min of vigorous activity per week, along with muscle-strengthening exercises at least two times a week.²²

Individuals aged 65 and older (older adults) now make up 21.3% of the total population in Europe.²³ Significant advancements

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Physical activity is crucial for maintaining well-being in older adults. Still, many care home residents do not meet recommended physical activity levels, increasing the risk of falls and other correlated complications. Martial arts, particularly Taekwondo, have shown potential in improving balance, strength and mental well-being, yet have rarely been implemented in care homes.

WHAT THIS STUDY ADDS

⇒ This study will provide knowledge regarding implementing an adapted Taekwondo-based intervention tailored to elderly care home residents.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ The findings from this study may encourage the integration of martial arts programmes like Taekwondo in care homes as an effective means to promote physical activity, mitigate fall risk and limit the decline in functional capacity. This could potentially contribute to developing policies to improve care for the elderly through adapted exercise.

in healthcare have strongly influenced this increase in life expectancy.²⁴

One of the most significant challenges for older adults is maintaining functional independence.²⁵ Ageing brings numerous physical and mental implications,^{26 27} including declines in walking ability, muscle strength, balance and flexibility.^{28 29} Additionally, mental health may also be affected by factors such as cognitive decline, dementia and depression.³⁰ For this reason, older adults are often placed in care facilities.²⁸ In Italy, 356 556 individuals resided in these institutions in 2021.³¹ Unfortunately, many residents in care facilities maintain predominantly sedentary lifestyles, participating in minimal physical activity.^{22 32–35} This underscores the need for physical activity interventions to



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enhance their well-being. Various interventions have been introduced in residential care facilities,^{15 36–40} and among these, martial arts interventions have been widely recognised for their positive impact on both physical and mental well-being.^{41–52}

Recently, there has been a growing interest in the benefits of martial arts training on functional fitness in older adults.⁵³ Tai Chi and Taekwondo, in particular, have proven to be an especially effective choice, promoting active ageing and improving overall health.^{45–52}

For these reasons, this pilot study aims to assess the functional capacities of an adapted Taekwondo intervention in elderly individuals residing in a care home. It is hypothesised that the intervention will increase/maintain the functional and motor abilities.

MATERIALS AND METHODS

Study design

This pilot protocol study has a quasi-experimental, non-randomised design. The study has received approval from the Bioethical Committee of the University of Bologna (Prot. n. 0101079). It will follow the ethical standards outlined in the Declaration of Helsinki and its subsequent amendments. This study is part of the ‘Intergenerational Taekwondo: The Sport of Grandparents and Grandchildren’ project, promoted and implemented by the Italian Taekwondo Federation. The present study adhered to the Standard Protocol Items: Recommendations for Interventional Trials reporting guideline.⁵⁴

Participants of the study

The study participant recruitment will occur in a residential care home and involve residents who opt to participate in the Taekwondo programme. Eligibility criteria are age of 65 years or older and provision of signed informed consent. Exclusion criteria include the presence of any medical contraindications that would preclude participation in the programme. Participants will be stratified into two groups: walking and non-walking. This stratification will ensure that evaluations are tailored to the specific functional capacities of each group, allowing for a more accurate and meaningful analysis.

Sample size

Power computation will still have to be carried out for this study as the study design is a pilot study. The proposed sample size is 20 participants.

Intervention

The Taekwondo programme will involve two sessions per week, each lasting between 1 hour and 1.5 hours, for 6 months. The programme aims to engage elderly participants in progressively challenging movements to improve functional and motor abilities. Based on Taekwondo, the adapted intervention will be led by a qualified federal instructor who has carried out specific courses promoted by the Italian Taekwondo Federation to guarantee the safety of all participants.

Table 1 Primary and secondary outcome measures for walking participants

Time point	6-month period	
	Baseline (T0)	(T1)
Assessments		
Handgrip test	X	X
Senior Fitness Test	X	X
Short Physical Performance Battery	X	X

Primary outcome

The study's primary outcome is the assessment of upper limb strength, measured using the handgrip test.⁵⁵

Secondary outcome

The secondary outcomes of the study aim to evaluate change in overall functional capacity using the Short Physical Performance Battery (SPPB),⁵⁶ the Senior Fitness Test (SFT)⁵⁷ and mobility assessments.⁵⁸

The SPPB⁵⁶ assesses physical performance in older adults through three tests: static balance, walking over 4 m and lower limb strength. The total score ranges from 0 to 12, with lower values indicating greater functional limitations. The SFT⁵⁷ evaluates functional fitness with strength, flexibility, agility and endurance tests. Results are compared with normative values to identify strengths and areas for improvement.

The mobility assessment⁵⁸ evaluates the joint range of motion in specific upper body movements. This includes measurements of neck, shoulders and elbows.

Walking individuals will be assessed with SPPB⁵⁶ and SFT,⁵⁷ while for non-walking individuals, the following evaluations will be conducted: selected components of the SFT⁵⁷ and mobility assessments⁵⁸ of the shoulders, elbows and neck using a goniometer and a tape measure. The tests used to assess the study outcomes are detailed in [table 1](#) for walking participants and [table 2](#) for non-walking participants.

Data collection and measures

The sociodemographic parameters and information that will be collected from the participants are detailed in [table 3](#).

Each participant will be assigned an identification code, structured as follows: STUDY CODE (RSA)+NUMBER (01, 02, 03, 04, ...). In this way, all data will be collected using this code, thus ensuring the pseudo-anonymity of the search process. Only the research team can trace the participant's identity through the code, and this association will be made exclusively for research purposes. Access to data will be restricted to the research team and specifically authorised personnel. All authorised persons will be bound by confidentiality obligations, ensuring that the data are used exclusively for the stated purposes. The data will be stored in the ‘OneDrive’ repository of the University, which adopts advanced security measures, such as multifactor authentication, to prevent unauthorised access and ensure protection

Table 2 Primary and secondary outcome measures for non-walking participants

Time point	Baseline (T0)	6-month period (T1)
Assessments		
Handgrip test	X	X
Station of Senior Fitness Test		
Station 2: arm curl Test	X	X
Station 4: chair sit and reach test	X	X
Station 5: back scratch test	X	X
Mobility assessment		
Neck flexion	X	X
Neck extension	X	X
Neck right lateral flexion	X	X
Neck left lateral flexion	X	X
Neck right rotation	X	X
Global mobility of the shoulders	X	X
Right elbow flexion	X	X
Left elbow flexion	X	X
Right elbow extension	X	X
Left elbow extension	X	X

against accidental loss. The data collected in paper form will be stored in specific lockers with security locks, to which only the research team will have access. The data will be kept for a maximum of 5 years after the study's conclusion, and in the end, they will be deleted safely and permanently.

Safety

During the sessions and tests, all necessary measures were taken to ensure the safety of the participants. The

Table 3 Sociodemographic parameters and participants' information

Time point	Baseline (T0)	6-month period (T1)
Sociodemographic parameters		
Date of birth	X	X
Gender	X	X
Level of education	X	X
Civil status	X	X
Participants information		
Weight	X	X
Height	X	X
Body Mass Index (BMI)	X	X
Right/left-handed	X	X
Other diseases	X	X

research staff will provide tailored explanations of the types of tests and activities and how to correctly perform them.

Statistical analysis

The sample will first be described and characterised using descriptive statistics. The Shapiro-Wilk test will be applied to assess the normality of the outcomes. Based on the data distribution, comparisons between T0 and T1 will be performed using either a parametric paired T-test or a non-parametric Wilcoxon test. For walking participants, results will be compared against reference tables to evaluate the outcomes of the intervention. For non-walking participants, comparisons will be made using reference scales exclusively for the relevant subscales of the SFT.⁵⁷

DISCUSSION

This study aims to evaluate potential changes in functional capacities among elderly individuals (aged 65 and older) living in a care facility after participating in an adapted Taekwondo-based intervention led by a professional from the Italian Taekwondo Federation. Several studies have investigated the effects of martial arts on the well-being of older adults, providing a strong foundation for hypothesising the potential benefits of such interventions in care facilities.^{41–48} Evidence from the systematic review conducted by Valdés-Badilla *et al*⁵⁹ suggests that an adapted Taekwondo-based physical exercise programme could significantly enhance older adults' physical and functional levels. This study highlights the benefits of Olympic combat sports (OCS), including Taekwondo, which involves movements of both the upper and lower extremities. These activities improve muscle strength and functional independence, with performance gains observed in tests like the arm curl and handgrip tests. Such improvements indicate that OCS interventions may positively impact the quality of life of elderly participants by supporting the maintenance and development of upper extremity strength. In addition to physical benefits, Taekwondo-based interventions have the potential to enhance balance and coordination, which are critical factors in reducing fall risk among sedentary elderly individuals.⁶⁰ Another systematic review and meta-analysis by Li *et al*⁴⁹ supports the positive effects of Taekwondo training on cognitive and physical functions in older adults. The findings reveal significant improvements in cognitive abilities, blood markers, physical performance and symptoms of depression, with no adverse effects reported. These outcomes underscore the role of Taekwondo in promoting overall health and well-being in this demographic.

This pilot study introduces an innovative approach by implementing an adapted Taekwondo-based physical exercise intervention in a resident home, a setting rarely explored in existing research.⁵⁰ Nevertheless, several limitations of this study should be acknowledged. First, the heterogeneity of the participants, encompassing

different levels of health conditions, could introduce bias, making it challenging to draw uniform conclusions about the intervention's effects. Second, the absence of a control group makes it difficult to attribute observed outcomes solely to the Taekwondo intervention, as other factors could influence the results. Lastly, during the follow-up, the health condition of the participants could worsen. Future research could explore a more comprehensive set of outcome measures, such as psychological well-being, social connectedness and quality of life, to fully capture the holistic benefits that an adapted Taekwondo intervention might offer elderly populations.

CONCLUSION

In conclusion, this pilot study may demonstrate the effectiveness of an adapted Taekwondo intervention in mitigating the negative effects of low physical activity levels in care facilities and promoting the benefits of exercise. The findings could contribute to developing policies to improve elderly care through adapted exercise.

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Patient consent for publication Not applicable.

Ethics approval This study involves human participants, and the local bioethical committee approved this study: protocol N. 0101079. Participants gave informed consent to participate in the study before taking part. The study processes will follow the protocol, and any protocol amendments will be submitted to the University of Bologna Bioethics Committee. All documents will be kept confidential. Participants gave informed consent to participate in the study before taking part.

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