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The impact of artificial intelligence-assisted physical exercise on the health of older adults

Submission date
06/11/2025

Recruitment status
No longer recruiting

Registration date
08/11/2025

Overall study status
Completed

Last Edited
07/11/2025

Condition category
Musculoskeletal Diseases

[ ] Prospectively registered
[ ] Protocol
[ ] Statistical analysis plan
[ ] Results
[ ] Individual participant data
[ ] Record updated in last year

Plain English summary of protocol

Background and study aims
As people get older, elderly women often face health problems like knee osteoarthritis (a condition that causes knee pain and stiffness) and trouble with balance. Traditional ways to help with these issues, such as in-person exercise classes or general health advice, can have problems: people might not stick with them, they can be expensive, or they don't fit everyone's needs. Artificial intelligence (AI) technology, like smart apps that guide exercise, could be a new way to solve these problems. This study aims to:
1. Create an AI-based Baduanjin (a gentle, traditional Chinese exercise) program for elderly women
2. Test if this AI program, in-person Baduanjin classes, or just health education works better to improve elderly women's balance and knee function
3. Find out which of these three methods is best for women living in cities, suburbs, or rural areas.

Who can participate?
Women aged 60 to 74 years old can join if they:
1. Are in general good health (no serious heart, lung, or other diseases that make exercise unsafe);
Have a clear mind (no problems like dementia)
2. Can move without major restrictions (no severe joint pain or recent injuries/surgeries that stop them from exercising)
3. Do not have serious mental health issues, drug/alcohol addictions, or need to stay in bed for a long time

What does the study involve?
First, researchers will check your health to make sure you're eligible, and you'll sign a form saying you agree to take part. Then you'll be randomly put into one of three groups (like flipping a coin to choose fairly):
AI group: You'll use a phone app called "Tiantian Baduanjin" (part of the Migu Game+ platform) to do Baduanjin. The app uses your phone's camera to check your movements, gives you real-time feedback (like telling you if your posture is wrong), and scores how well you do each exercise.

Offline group: You'll attend in-person Baduanjin classes led by a professional instructor. The instructor will correct your movements and make sure you exercise safely (only 6 people per class to get enough attention).
Education group: You'll get general health advice but no Baduanjin guidance.
All groups will take part for 12 weeks, doing 3 sessions a week, each lasting 45 minutes (including warm-up and cool-down). During the study, researchers will check your balance (by asking you to stand on one leg with eyes open/closed) and knee function (by asking you to fill out a survey about knee pain and stiffness) at the start, 6 weeks in, and after 12 weeks.

What are the possible benefits and risks of participating?
You may improve your balance (which can lower your risk of falling) and reduce knee pain /stiffness.
You'll learn a gentle exercise (Baduanjin) that you can keep doing after the study.
You'll get useful health information.
There is a small risk of mild muscle soreness from exercising (like with any new physical activity). No serious side effects were reported in similar studies, and researchers will monitor your safety throughout.

Where is the study run from?
The study is run in Jiaozuo City, Henan Province, China. Participants are recruited from community centers, senior activity centers, and medical institutions in Jiaozuo, and knee function assessments are done at Jiaozuo Maternal and Child Hospital.

When is the study starting and how long is it expected to run for?
March 2025 to November 2025

Who is funding the study?
Investigator initiated and funded

Who is the main contact?
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Contact information

Type(s)
Public, Scientific, Principal investigator

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Additional identifiers

Protocol serial number
2025-KY-0626

Study information

Scientific Title
Effects of AI-assisted physical exercise on the health of elderly women: a randomized controlled trial based on smart devices and personalized exercise guidance

Study objectives
1. To develop a set of Baduanjin exercise intervention programs tailored to the needs of elderly women, based on artificial intelligence (AI) technology.
2. To evaluate the effects of three different intervention methods (AI-assisted Baduanjin exercise, offline instructor-led Baduanjin exercise, and health education) on improving the physical health (including balance ability and knee joint function) of elderly women, with a specific focus on elderly women with knee osteoarthritis (KOA).
3. To compare the efficacy of AI-assisted Baduanjin exercise and offline instructor-led Baduanjin exercise with that of conventional health education in enhancing postural stability (assessed via the unipedal stance test) and knee function (assessed via the Western Ontario and McMaster Universities Osteoarthritis Index, WOMAC) in elderly women (aged 60-74 years) over a 12-week intervention period.
4. To explore the suitability of different intervention methods for elderly women in different geographical scenarios (urban, suburban, rural) and provide evidence for formulating region-specific, personalized exercise intervention strategies to improve the rehabilitation efficacy of elderly women's physical health.

Ethics approval required
Ethics approval required

Ethics approval(s)
Approved 26/06/2025, Jiaozuo Maternal and Child Health Care Hospital Medical Ethics Management Committee (No. 158, Jiaozuo Municipal People's Middle Road, Jiaozuo City, 454000, China; +86 (0)391 5355666; jzsfybjybgs@163.com), ref: 2025-KY-0626

Primary study design
Interventional

Study design
Single-centre interventional randomized controlled trial

Study type(s)
Efficacy

Health condition(s) or problem(s) studied
Knee osteoarthritis (KOA) and balance disorders

Interventions

A total of 79 eligible elderly women (aged 60-74 years, without serious cognitive impairment, exercise contraindications, and with basic autonomous activity ability) are randomly allocated into three groups via stratified randomization (stratified by age: 60-64, 65–69, ≥70 years; baseline Berg Balance Scale score: <45, ≥45; and knee joint function assessed by WOMAC: mild /moderate, severe) managed by independent third parties. The random allocation uses a sealed envelope method, delayed disclosure, and a centralized web-based platform (e.g., Research Randomizer 4.0) to generate allocation sequences, with data collectors and analysts masked to group allocation.

The three intervention arms and their details are as follows:
AI-assisted Baduanjin group (AI group): Participants receive Baduanjin training via the "Tiantian Baduanjin" function in the Migu Game+ app (a cloud gaming platform with AI capabilities). The app uses the front camera of Android smartphones to track 18 joint parts, provide real-time movement monitoring, voice feedback for correction, and personalized training suggestions, and gives points based on movement completion. The intervention lasts 12 weeks, with three 45-minute sessions weekly (including warm-up, body exercise, and relaxation), following the guidance materials of the State General Administration of Sport of China.

Offline instructor-led Baduanjin group (Offline group): Participants receive face-to-face Baduanjin teaching from a professional instructor (with a valid certificate). The instructor corrects errors in real time, focuses on training safety, and teaches no more than 6 participants at a time. The intervention duration, frequency, and session structure are the same as those of the AI group, and the teaching content also follows the guidance materials of the State General Administration of Sport of China.

Health education group (Education group, control group): Participants only receive health education without Baduanjin exercise guidance. The intervention lasts 12 weeks, with the same frequency of three sessions weekly (each 45 minutes) to maintain consistency in participant engagement.

All groups implement a supervision mechanism to ensure intervention compliance and safety, and no placebo is used in the study.

Intervention Type
Behavioural

Primary outcome(s)
Postural stability assessed using the unipedal stance test (with both eyes open and closed) at baseline (0 week), 6 weeks, and after the 12-week intervention

Key secondary outcome(s)
Knee function measured using the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) at baseline (0 week), 6 weeks, and after the 12-week intervention

Completion date
24/11/2025

Eligibility

Key inclusion criteria

1. Women aged between 60 and 74 years. The World Health Organization(WHO) has published a report that the age group of 60-74 years old is defined as young-old, and this group of people has better adaptive ability and is suitable for regular physical activities to delay the decline of physiological functions
2. In general good health, without serious cardiovascular disease (such as uncontrolled hypertension or heart failure), respiratory disease or other diseases that endanger the safety of exercise, and the participant's health condition is suitable for low to moderate intensity physical activity
3. Good mental state, no cognitive dysfunction (such as dementia)
4. No movement contraindications

Participant type(s)
Healthy volunteer

Healthy volunteers allowed
No

Age group
Senior

Lower age limit
60 Years

Upper age limit
74 Years

Sex
Female

Total final enrolment
79

Key exclusion criteria
1. Having severe cardiopulmonary dysfunction (such as heart failure, COPD) and being unable to perform physical activity
2. Suffering from serious bone and joint diseases (such as serious degeneration of the knee after hip replacement) that affect the performance of sports, or having recently undergone serious trauma or surgery and not having recovered yet
3. Having chronic diseases requiring long - term bed rest
4. Suffering from Alzheimer's disease or other dementias
5. Having serious mental disorders (such as schizophrenia, bipolar disorder)
6. Having severe depression and being unable to cooperate with the research process
7. Being elderly individuals who are dependent on drugs or having bad habits such as alcoholism and drug addiction
8. Being unable to complete the entire questionnaire due to personal reasons

Date of first enrolment
01/07/2025

Date of final enrolment

24/09/2025

Locations

Countries of recruitment
China

Study participating centre
Women's Health Care Department of Jiaozuo Women and Children's Hospital
No. 158, Jinyang Middle Road
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Sponsor information

Organisation
Hang Zhou Yuan Li Tech Co.

Funder(s)

Funder type
Other

Funder Name
Investigator initiated and funded

Results and Publications

Individual participant data (IPD) sharing plan
Based on the content of the study protocol and common ethical, legal, and practical considerations in clinical research, the following are valid reasons for not providing the datasets generated and/or analyzed during the current study period:
Protection of participants' privacy and personal informationThe dataset contains sensitive personal data of elderly women participants, such as demographic details (age, residence, education level, income), health indicators (BMI, chronic disease status), and clinical assessment results (WOMAC scores, unipedal stance test data). Disclosing such data may lead to the identification of individual participants, violating the informed consent commitments (participants were not informed that their personal data would be publicly shared) and relevant privacy protection regulations (e.g., medical data security laws).

IPD sharing plan summary

Not expected to be made available