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The effects and mechanism of whole body vibration training on muscle performance, physical performance and balance in the older people with age-related loss of muscle mass

Submission date
13/01/2017

Recruitment status
No longer recruiting

Registration date
16/01/2017

Overall study status
Completed

Last Edited
16/07/2019

Condition category
Musculoskeletal Diseases

[ ] Prospectively registered
[ ] Protocol
[ ] Statistical analysis plan
[X] Results
[ ] Individual participant data

Plain English summary of protocol

Background and study aims
Sarcopenia is a term used to describe the gradual loss of muscle mass and strength with age. Over time, this can lead to problems with balance, gait (the way a person walks) and overall ability to perform tasks of daily living. Exercise training has been proven to be effective at improving the symptoms of sarcopenia. In the last ten years, a new style of training called whole-body vibration (WBV) has been reported as an effective approach to improve the physical condition of healthy older adults. The effects of WBV on those with sarcopenia are unknown however. The aim of this study is to look at three regimes of WBV to find out which is most effective for improving muscle size and strength.

Who can participate?
Adults aged 65 years and over with sarcopenia.

What does the study involve?
Participants are randomly allocated to one of four groups. Those in the first three groups receive whole-body vibration training over a course of 36 sessions, each at a different frequency (the higher the frequency, the more muscle activity there is). Those in the first group receive low frequency training, those in the second receive medium frequency training and those in the third group receive high frequency training. The training sessions involve four sets (periods of training) and last for around 20 minutes. They involve standing on the WBV platform for between 60 seconds (for the high frequency group) and 180 seconds (for the low frequency group) with bent knees, five minute rests between each set. Participants in the final group continue as normal and take part in no addition exercise. At the start of the study and then again after 6, 12, 18 and 24 weeks, participants are assessed to find out if their muscle mass, strength and physical performance have changed.

What are the possible benefits and risks of participating?
Participants who are allocated to one of the training groups benefit from receiving whole body

vibration training and all participants benefit from receiving a free health consultation. There are no notable risks involved with participating in this study.

Where is the study run from?
Lek Yuen Health Centre (Hong Kong)

When is the study starting and how long is it expected to run for?
January 2010 to December 2015

Who is funding the study?
Hong Kong Government Health Services Research Fund (Hong Kong)

Who is the main contact?
Dr Ning Wei

Contact information

Type(s)
Scientific

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Protocol serial number
CSR524

Study information

Scientific Title
The effects and mechanisms of whole body vibration training on muscle, balance and physical performance in community dwelling individuals with sarcopenia

Study objectives
1. The WBV exercise is effective for training muscle size, strength and mobility in participants with sarcopenia
2. Different vibration frequencies would affect the muscle performance and physical condition in participants with sarcopenia

3. The changes associated with WBV training could be maintained for 3 months after cessation of training
4. There is an effect of WBV exercise on the voluntary activation of quadriceps muscle

Ethics approval required
Old ethics approval format

Ethics approval(s)
1. Department of Health of HKSAR government, 02/03/2011 ref: CSR524
2. Department of RS of PolyU, 19/06/2013

Primary study design
Interventional

Study design
Four-arm randomised controlled trial

Study type(s)
Treatment

Health condition(s) or problem(s) studied
Sarcopenia

Interventions
Participants are randomly allocated to one of four groups.

Low-frequency group: Participants receive whole body vibration training with 20Hz and 4mm for 720s per session.

Medium-frequency group: Participants receive whole body vibration training with 40Hz and 4mm for 360s per session.

High-frequency group: Participants receive whole body vibration training with 60Hz and 4mm for 240s per session.

Control group: Participants receive no extra exercise.

One session of WBV training is consisted of four sets. There is a five-minute rest time after each set, which means 15 minutes rest in total. The session therefore lasts for approximately 20 minutes. During the training, the participants only stand on the WBV platform with knees flexed at 60 degrees. No extra exercises are performed.

The study consists of 36 training sessions. All assessments except twitch interpolation test are conducted at baseline, mid-intervention (6 weeks of WBV), post-intervention (12 weeks of WBV), 6 and 12 weeks after cessation of training. Twitch interpolation is only conducted at baseline and post-intervention.

Intervention Type
Device

Primary outcome(s)

1. Muscle mass (cross-sectional area of vastus medialis) was measured by ultrasound at baseline, 6 (18 training sessions), 12 (36 training sessions), 18 and 24 weeks
2. Muscle strength (peak torque of knee extension) was measured by Cybex with isokinetic (180 and 60 degrees per second) and isometric (knee flexed at 90 degrees) contractions at baseline, 6 (18 training sessions), 12 (36 training sessions), 18 and 24 weeks
3. Physical performance was measured by five-repetition sit-to-stand, timed-up-and-go test and 10-meter walking test at baseline, 6 (18 training sessions), 12 (36 training sessions), 18 and 24 weeks

Key secondary outcome(s)
1. Proprioception was measured by knee joint repositioning test at baseline, 6 (18 training sessions), 12 (36 training sessions), 18 and 24 weeks
2. Balance was measured by tandem, one-leg stand with eyes open and closed at baseline, 6 (18 training sessions), 12 (36 training sessions), 18 and 24 weeks
3. Voluntary activation was measured by twitch interpolation test at baseline and 12 weeks (36 training sessions)

Completion date
30/12/2015

Eligibility

Key inclusion criteria
1. Aged 65 years and over
2. Skeletal mass index less than 8.87kg/m2 and 6.42kg/m2

Participant type(s)
Patient

Healthy volunteers allowed
No

Age group
Senior

Sex
All

Total final enrolment
80

Key exclusion criteria
1. Participants with metal implants
2. Severe heart problem
3. Neurodegenerative diseases
4. Peripheral vascular disease
5. Vestibular disorders
6. Severe osteoporosis with fractures within one year prior to the study

Date of first enrolment

08/01/2012

Date of final enrolment
30/06/2015

Locations

Countries of recruitment
Hong Kong

Study participating centre
Lek Yuen Health Centre
9 Lek Yuen Street
Shatin
Hong Kong
999077

Sponsor information

Organisation
The Hong Kong Polytechnic University

ROR
https://ror.org/0030zas98

Funder(s)

Funder type
Government

Funder Name
Hong Kong Government Health Services Research Fund

Results and Publications

Individual participant data (IPD) sharing plan
The datasets generated during and/or analysed during the current study are/will be available upon request from 11902302r@connect.polyu.hk

IPD sharing plan summary

Available on request

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Results article	results	01/10/2017		Yes	No
Results article	results	11/10/2018	16/07/2019	Yes	No