Healthy Beat Acupunch exercise program: Validation and feasibility study for older adults with reduced physical capacity or probable sarcopenia

Jones, Cindy; Chen, Kuei Min; Weeks, Benjamin; Qi, Meiling; Moyle, Wendy

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Author(s), Affiliations(s) & Email Address(es):

A/Prof Cindy Jones

Faculty of Health Sciences & Medicine, Bond University, Australia

Menzies Health Institute Queensland, Australia

Email: c.jones@bond.edu.au

Prof Kuei-Min Chen (Corresponding Author)

College of Nursing & Centre for Long-Term Care Research, Kaohsiung Medical University, Taiwan

Email: kmc@kmu.edu.tw

Dr. Benjamin Weeks

School of Allied Health Sciences, Griffith University, Australia

Menzies Health Institute Queensland, Australia

Email: b.weeks@griffith.edu.au

Dr. Meiling Qi

School of Nursing, Shandong University, China

Email: qimeiling1988@126.com

Prof Wendy Moyle

School of Nursing and Midwifery, Griffith University, Australia

Menzies Health Institute Queensland, Australia

Email: w.moyle@griffith.edu.au

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Healthy Beat Acupunch Exercise Program: Validation and Feasibility Study for Older Adults with Reduced Physical Capacity or Probable Sarcopenia

Abstract

Objectives: This research aims to validate the Healthy Beat Acupunch (HBA) exercise program, determine the feasibility of the HBA exercise program protocol and gain an understanding of the effects on well-being for older adults with sarcopenia. **Design, Setting & Intervention:** Validation of the HBA exercise program was conducted using two rounds of Delphi communication among eight experts. A one-group, pre-post experimental study was conducted with 17 older adults with probable sarcopenia and/or low gait speed at an Australian retirement village. The HBA exercise program lasted 40 minutes per session, three sessions per week for four weeks. **Outcome Measures:** Muscle mass, muscle strength, gait speed and health-related quality of life were assessed before and after the intervention. The HBA exercise program was evaluated via a questionnaire and individual interviews. **Results:** Experts validated the HBA exercise program and deemed it to be simple, safe, suitable and helpful for practice by older adults with sarcopenia. Participants enjoyed the HBA exercise program, planned to continue and would recommend to friends. Frequency, duration and size of the exercise class were appropriate, and they appreciated the trainer's support and directions when mastering the exercise motions. Improvement in participants' gait speed was found post-exercise intervention (p<.005). **Conclusion:** The HBA exercise program is appropriate for practice by older adults, particularly those with reduced physical capacity and probable sarcopenia with possible benefits of improved gait speed. Future studies need to consider and overcome the limitations (i.e. study design, sample size) and challenge (participant recruitment) encountered in this research.

Keywords: Exercise, Older Adults, Health, Well-Being, Reduced Physical Capacity, Probable Sarcopenia

1.0 Introduction

The ageing population accounts for 23% of the global burden of disease [1]. Exercise not only maintains functional independence and improves health in older adults [2], it is also a therapeutic approach to confront age-related sarcopenia [3]. Sarcopenia, which is characterised by the gradual and generalised deterioration of skeletal muscle mass and strength [4], is common in older adults [5] and leads to negative consequences such as physical disability, low quality of life and death [6]. Yet, exercise programs are commonly designed for adults at prime ages with limited consideration for reduced physical function in older adults [7].

According to World Health Organisation [8], stimulations of the acupoint and meridians in traditional Chinese medicine can enhance physical and mental functions such as cardiopulmonary function, neuromuscular performance and skeletal health, affect and sensory awareness. Meridians are channels in our body where “qi” (i.e. blood and life energy) flows, and obstruction of these channels can lead to an excess or lack of energy in a specific area that may cause health problems [9]. There are 14 meridians connected to the body surface (i.e. the skin) and up to approximately 365 acupoints that can be used to stimulate and regulate “qi” in order to promote, maintain or restore health [10].

Acupunch is a non-invasive practice where a natural parabola is produced by swinging of the relaxed wrist, elbow and shoulder joints to direct cuffing and tapping of the fist/palm onto the targeted acupoint along the meridians to transport “qi” [9]. This mechanism is akin to pumping of the heart where elasticity of the skin can pulsate meridians and produce heat, which helps to clear meridians channels and circulate “qi” [9, 11]. Designed for Chinese older adults, the newly developed Healthy Beat Acupunch (HBA) exercise program by Tsai et al. [12]. includes three phases with a total of 24 motions. Full information on HBA development and

detailed descriptions of the 24 motions have been published by Tsai et al. [12]. The HBA program was reported to be simple, safe, helpful, and suitable for older adults in a feasibility study by Tsai et al. [12]. To date, the single Taiwanese study on the HBA program revealed positive effects on the health of community dwelling older adults where improvements were found in functional fitness and cardiopulmonary function [13] as well as self-perceived sleep quality, daytime dysfunction, and physical and mental health [14]. Although preliminary research has identified benefits of acupunch in promoting blood circulation and improving chronic illnesses and health problems caused by prolonged sedentary behaviours often seen in Chinese older adults, there is limited to no evidence-based research to support its effects, especially for older adults with reduced capacity (e.g. physical impairment or sarcopenia) or from a western culture. There is a need for culturally relevant physical activity to increase the acceptance, salience, effectiveness and sustainability of the exercise program [15, 16]. The aim of this Australian study is to (a) validate the HBA program for older adults with sarcopenia; (b) determine the feasibility of the HBA program protocol; and (c) gain an understanding of the effects on well-being for older adults with sarcopenia.

2.0 Methods & Materials

2.1 Validation of the HBA Exercise Program for Older Adults with Sarcopenia

2.1.1 Design

Validation of the HBA program for older adults with sarcopenia was undertaken using a Delphi approach. Experts' feedback from each Delphi round was summarised to inform changes and then represented to the experts for their response until group consensus among experts was achieved. Ethics approval for this validation study was received from <*blinded for review*> Human Research Ethics Committee (Reference #2018/102).

2.1.2 Delphi Expert Selection

Purposive sampling was used to select and recruit a panel of experts who were known to the research team from their networks of health care professionals and organisations/providers. A total of 15 experts was invited to be a Delphi expert panellist from Australia and internationally. Panellists were either a health professional experienced with exercise and/or working with older adults with or without sarcopenia or an older adult with sarcopenia who was able to provide direct insight on the perceived pertinence of the HBA program for their condition. Recruited via email, potential expert panellists were provided with a study information sheet that explained the study's objectives, including risks and benefits, the Delphi process and expectations of their participation. Consenting expert panellists were asked to sign and email their written informed consent form back to the research team.

2.1.3 Data Collection & Analysis

Data collection consisted of two rounds of communication that took place from April to September 2018. In *Round 1*, experts were sent information that included the questionnaire as well as an information booklet and a series of four YouTube video links on the HBA program via email. They were asked to (a) read the information booklet and (b) view all of the videos to gain an understanding of the HBA program before completing the questionnaire. The questionnaire sought experts' views of the simplicity, safety, suitability and helpfulness of each exercise motion on a four-point Likert scale from '1' being difficult, dangerous, inappropriate and not beneficial and should be eliminated to '4' being easy, safe, highly appropriate and beneficial where no change was needed. Optional open text responses for each of the 24 exercise motions and each of the three phases of the exercise program were also available to give experts an opportunity to explain their ratings. Data were analysed using IBM SPSS Statistics for Windows Version 23.0. Content validity index (CVI), which is the

proportion of experts who have given a rating of 3 or 4 [17], was computed for each individual item (i.e. simplicity, safety, suitability and helpfulness of each exercise motion). Validity for each of the three phases and the overall exercise program were then established using the average CVI for all items within each phase and the entire exercise program. According to Lynn [18], a respective minimum CVI of 0.78 and 0.90 are needed to establish validity for each exercise motion, each of the three phases and the overall exercise program.

Additionally, the questionnaire sought experts' demographic information. Using a five-point Likert scale (i.e. '1' strongly disagree to '5' strongly agree) and optional open text responses, experts were asked to further comment on the theoretical basis, setting, duration, clarity of the information booklet and videos, areas of improvements (if needed) and the overall appropriateness of the current form of the HBA program for older adults with sarcopenia. Means and standard deviations for these data were computed via SPSS.

Data collected from *Round 1* were summarised, analysed and used to inform changes on the HBA program for older adults with sarcopenia. In *Round 2*, experts were sent an email that consisted of (a) a series of short videos on how the exercise motions of concern identified in *Round 1* evaluation was revised; (b) a revised information booklet with changes highlighted in red font; and (c) a questionnaire that sought their opinion for each of the revised exercise motions and the overall revised HBA program. The same data analysis approach was applied in *Round 1* and *Round 2*.

2.2 Feasibility Testing of the HBA Exercise Program for Older Adults with Sarcopenia

2.2.1 Design

Feasibility of the HBA program protocol and its effects on well-being for older adults with sarcopenia were assessed using a one-group pre- and post-test quasi experimental study that was conducted at a retirement village in Brisbane, Australia. Ethics approval for this feasibility

study was received from <*blinded for review*> Human Research Ethics Committee (Reference #2018/992).

2.2.2 Participants & Recruitment

Convenience sampling was used to recruit participants who were aged 65 years and older with sarcopenia according to the guidelines of the European Working Group on Sarcopenia in Older People 2 (EWGSOP2) (i.e. experiencing low muscle strength and low muscle mass) [4]. They must also be able to stand and were not wheelchair-bound; as well as able to speak and understand English. Participants with health issues that prevented them from engaging in exercises, cognitive impairment as well as those who are unable to give consent or have a diagnosis of osteopenia were excluded from the study.

Permission was obtained from the management of a retirement village in Brisbane. Staff at the retirement village (e.g. an Exercise Physiologist) assisted with the identification of potential participants according to the study inclusion and exclusion criteria. Potential participants were invited to an information session conducted at the retirement village. The lead Chief Investigator (CI) distributed study information sheets and consent forms, presented the aims and the requirements of the study as well as answered questions posed by potential participants. With the assistance of a Research Assistant (RA), potential participants who were interested in taking part in the study were then screened according to the inclusion and exclusion criteria. Those who met the criteria and wished to partake in the study were then asked to return a signed consent form directly to either the CI or RA at the information session or via a dropbox placed on the reception counter at the retirement village.

2.2.3 Exercise Intervention

Participants were required to attend the HBA group exercise program for 40 minutes per session, three sessions per week for four weeks. Two sessions were conducted (i.e. one in the

morning and one in the afternoon for participants' selection) on Monday, Wednesday and Friday in a large room that could comfortably accommodate up to 15 participants. Participants were checked for any balance problems before the exercise program commenced. Those who experienced balance problems were provided with a chair to hold for balance support. Participants were trained in the HBA exercise motions, and practice occurred under the instruction, demonstration and guidance of the *Professional Exercise Trainer*, who was an experienced and Master degree qualified exercise trainer for older adults. Two exercise activity personnel or volunteers were also present to supervise each session and to ensure participants' safety.

HBA exercise motions were taught incrementally over the first three sessions in the first week with consideration for participants' stamina and ability (refer to Table 1). Clear directions were also provided by the trainer on how to use the chair for balance support if needed, when performing the HBA exercise motions. Participants were informed that they could stop and rest when needed at any time during the session. As requested by participants, at the end of the four-week exercise intervention, a DVD recording of the HBA program was given to participants so that they could continue to practise the HBA exercise at home.

Table 1. HBA Exercise Program – Session Schedule

Weeks & Sessions	Motions Taught/Recapped
Week 1, Session 1 (trainer only, no video)	Warm-up motions 1-5 Main motions 1-6 Cool-down motions 1-5
Week 1, Session 2 (trainer only, no video)	Warm-up motions 1-5 Main motions 1-6 plus 7-9 Cool-down motions 1-5
Week 1, Session 3 (trainer only, no video)	Warm-up motions 1-5 Main motions 1-9 plus 10-14 Cool-down motions 1-5
Week 2, Sessions 1-3 (trainer only, no video)	Warm-up motions 1-5 Main motions 1-14 Cool-down motions 1-5

Weeks 3 & 4, Sessions 1-3 (trainer with video)	Warm-up motions 1-5 Main motions 1-14 Cool-down motions 1-5

Abbreviation: HBA = Healthy Beat Acupunch

2.2.4 Data Collection & Analysis

At baseline, participants were screened for any health issues that prevented them from partaking in the HBA program using the Physical Activity Readiness Questionnaire (PAR-Q) [19]. Participants were also screened for sarcopenia. According to the EWGSOP2 criteria on sarcopenia [4], muscle strength, muscle mass and physical performance (gait speed) were assessed respectively by a Takei TKK5401 digital hand dynamometer, a Tanita BC587 bioelectrical impedance analysis (BIA) scale and the gait speed test (i.e. < 0.8m/s) within the Short Physical Performance Battery Assessing Lower Extremity Function [20].

Demographic information such as age, gender, medical and health conditions as well as health-related quality of life (HRQoL) using the 12-item Short Form health survey (SF-12) [21] was collected prior to the commencement of the exercise intervention. The SF-12 is psychometrically sound[21] and has been used with older people [22, 23]. It is designed to assess (a) physical health (i.e. perceptions of general physical health, physical function, role limitation from physical problems and body pain); as well as (b) mental health (i.e. perceptions on general mental health, social function, role limitation from emotional problems and vitality. Participants' muscle strength, muscle mass, physical performance and HRQOL were collected again after the exercise intervention. At the end of the four-week exercise intervention, feedback on the HBA program was sought where all participants were asked to complete an evaluation questionnaire.

Data were analysed using IBM SPSS Statistics for Windows Version 23.0. Descriptive data (i.e. frequencies, percentages, means and standard deviations) were computed to report on the feasibility of the study. Paired sample t-tests, with statistical alpha level set at 0.05, were conducted to examine the change in muscle strength, muscle mass, physical performance and HRQOL of participants before and after the exercise intervention. Specifically, for HRQoL, the raw scores of each item were coded, weighted, and summed into two scales: physical component summary score (PCS) and mental component summary score (MCS) with higher scores indicating better quality of life [21, 23].

3.0 Results

3.1 Validation of the HBA Exercise Program for Older Adults with Sarcopenia

Of the 15 invited experts, seven declined to participate due to competing time commitments of their busy schedule. A total of 8 experts participated in Round 1 Delphi. They were geriatricians (*n*=2), gerontological nurses (*n*=2), a wellness and lifestyle manager (*n*=1), an exercise physiotherapist (*n*=1) and older adults with sarcopenia (*n*=2). They were mostly female (*n*=5) with the majority having experience working with older adults with or without sarcopenia (refer to Table 2).

Table 2. Demographic Characteristics of Experts (*n* = 8)

	(%)
Age	
21-30	25%
45-50	25%
51-60	25%
Over 70	25%
Gender	
Female	62.5
Male	37.5
Highest Education Level	
Secondary School	12.5
Graduate Diploma of Certificate	37.5
Masters	12.5

PhD	37.5
Work Status	
Currently Working	75.0
Retired	25.5
Currently Working or Have Worked With (Yes/No)	
Older adults	75.0
Older adults with sarcopenia	62.5

Results from the *Round 1* evaluation demonstrated that the expert panel members were generally supportive of the HBA program. Besides agreeing or strongly agreeing with the setting (*M*=4.63; *SD*=0.52) and frequency (*M*=4.13; *SD*=0.84) of the HBA program, they also indicated that the theoretical basis of the HBA program was sound (*M*=4.13; *SD*=0.99) and that the movements were easy to follow (*M*=4.50; *SD*=0.54) with the information booklet clearly and succinctly written (*M*=4.43; *SD*=0.79). However, support of the current form of HBA exercise being appropriate for older adults with sarcopenia was not strong (*M*=3.25; *SD*=0.46). The areas of concern highlighted from the *Round 1* evaluation were the:

- overall length of the HBA program and the ability of older adults to complete the exercise program;
- appropriateness of the HBA program for older adults with limited mobility (or in a wheelchair); and
- suitability of several motions in the HBA program for older adults experiencing problems with balance.

Furthermore, as reflected in Table 3, there were 12 specific motions that did not reach the minimum I-CVI of 0.78 across the four areas of simplicity, safety, suitability and helpfulness. These were also reflected in the average I-CVI for each of the three phases and the overall HBA program (i.e. average I-CVI was below the cut-off of 0.90). These concerns were

subsequently addressed in the revised HBA program by providing clearer instructions in the information booklet that indicated that:

- the exercise trainer will oversee the learning of the HBA exercise program, and the motions will be taught incrementally over the sessions depending on the stamina and ability of the older adults with rest time (break) provided;
- a chair for balance support will be provided for older adults with balance problems; and
- the HBA program is targeted at older adults with sarcopenia who are able to stand and are not wheelchair-bound.

A series of short videos on how the motions of concern identified in the *Round 1* evaluation, can be completed with the use of a chair (i.e. holding on for balance support) was also prepared.

In *Round 2* Delphi, one expert withdrew citing time concerns due to a demanding work schedule. Experts reported that the revisions made to the HBA program information booklet were appropriate (*M*=4.71; *SD*=0.49). They felt that the content of the revised HBA program information booklet was clearly and succinctly written (*M*=4.86; *SD*=0.38). In addition, they indicated that the video demonstration of how the motions of concern identified in the *Round 1* evaluation, can be completed with the use of a chair for support was clear (*M*=4.86; *SD*=0.38). Importantly, the overall revised form of HBA program, with the inclusion of a chair for support where required, was deemed to be appropriate for older adults with sarcopenia (*M*=4.71; *SD*=0.49). The I-CVI for each exercise motion and the average I-CVI for each of the three phases and revised HBA program met the minimum required cut-off across the four areas of simplicity, safety, suitability and helpfulness, reflecting a consensus among the experts.

Table 3. Content Validity Index for HBA Exercise Program (Rounds 1 & 2)

		Simplicity (I-CVI)		Safety (I-CVI)		Suitability (I-CVI)		Helpfulness (I-CVI)	
		Round 1	*Round 2*	*Round 1*	*Round 2*	*Round 1*	*Round 2*	*Round 1*	*Round 2*
Phase 1									
	Motion 1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Motion 2*	0.88	1.00	**0.63**	1.00	**0.63**	1.00	0.75	1.00
	Motion 3	1.00	1.00	0.88	0.88	1.00	1.00	0.88	0.88
	Motion 4	0.75	0.75	0.88	0.88	0.88	0.88	0.88	0.88
	Motion 5*	**0.38**	1.00	**0.25**	1.00	**0.38**	1.00	**0.50**	1.00
	Average I-CVI	**0.80**	**0.95^**	**0.73**	**0.95^**	**0.78**	**0.98^**	**0.80**	**0.95^**
Phase 2									
	Motion 1	1.00	1.00	0.88	0.88	0.88	0.88	0.88	0.88
	Motion 2	1.00	1.00	0.88	0.88	0.88	0.88	0.88	0.88
	Motion 3*	0.38	0.86	0.50	0.86	0.50	0.86	0.63	1.00
	Motion 4	0.75	0.75	0.88	0.88	0.88	0.88	0.88	0.88
	Motion 5	0.75	0.75	0.75	0.75	0.75	0.75	0.88	0.88
	Motion 6	0.88	0.88	0.88	0.88	0.88	0.88	0.75	0.75
	Motion 7	0.75	0.75	0.75	0.75	0.75	0.75	0.88	0.88
	Motion 8*	0.75	1.00	0.75	1.00	0.63	1.00	0.88	1.00
	Motion 9*	0.38	0.86	0.50	1.00	0.38	1.00	0.50	1.00
	Motion 10*	0.25	1.00	0.38	1.00	0.38	1.00	0.38	1.00
	Motion 11*	0.25	1.00	0.25	1.00	0.38	1.00	0.25	1.00
	Motion 12*	0.63	1.00	0.50	1.00	0.50	1.00	0.63	1.00
	Motion 13*	0.75	1.00	0.63	1.00	0.63	1.00	0.63	1.00
	Motion 14*	0.88	1.00	0.75	1.00	0.63	1.00	0.75	1.00
	Average I-CVI	**0.67**	**0.92^**	**0.66**	**0.92^**	**0.64**	**0.92^**	**0.70**	**0.94^**
Phase 3									
	Motion 1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Motion 2	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Motion 3	0.88	0.88	1.00	1.00	0.75	0.75	0.75	0.75
	Motion 4*	0.88	1.00	0.88	1.00	0.50	0.86	0.38	0.86
	Motion 5*	0.38	1.00	0.38	1.00	0.38	0.86	0.38	0.86
	Average I-CVI	**0.83**	**0.98^**	**0.85**	**1.00^**	**0.73**	**0.89^**	**0.70**	**0.89^**
Total Average I-CVI		**0.73**	**0.94^**	**0.71**	**0.94^**	**0.69**	**0.93^**	**0.72**	**0.93^**

Abbreviation: HBA = Healthy Beat Acupunch; I-CVI = Item Content Validity Index

** Motions identified in Round 1 Delphi to be below the acceptable minimum I-CVI*

^ Achieving the required average I-CVI

3.2 Feasibility Testing of the HBA Exercise Program for Older Adults with Sarcopenia

3.2.1 Feasibility

248 A total of 38 potential participants attended the recruitment information session held two
249 weeks prior to the commencement of the exercise intervention. Of these, 23 (60.5%)
250 expressed interest to partake in the study and were subsequently screened for participation.
251 None of them met the criteria for sarcopenia and for one participant, her doctor did not
252 recommend participation in the study based on her poor physical health. However, seven
253 participants met the criteria for probable sarcopenia (i.e. low muscle strength). Furthermore,
254 these seven participants plus another 11 participants (totalling 18 participants) had low gait
255 speed (i.e. < 0.8m/s; ranging from 0.48 to 0.80). As this was a feasibility study, the research
256 team agreed to include all 18 participants in the study given their diagnosis of probable
257 sarcopenia and/or low gait speed according to EWGSOP2 guidelines [4]. The reasons being
258 that (a) these participants would have reflected severe sarcopenia if they also had low muscle
259 strength and mass; and (b) gait speed has been suggested to be a mediating factor for the
260 effect of sarcopenia in older adults and all-cause mortality [24, 25]. For reasons unknown, one
261 participant later declined to complete baseline assessment leaving a participant enrolment
262 rate of 73.9% (i.e. 17 out of 23 participants).

263 Two participants withdrew from the study at the end of week two as one reported
264 being uncomfortable with feelings of shakiness in their legs and feet when doing the exercises
265 and the other experienced low back pain unrelated to the exercise intervention. This reflected
266 a participant retention rate of 88.2% (i.e. 15 out of 17 participants). Session attendance was
267 recorded for the four-week intervention where participants signed the attendance sheet at
268 the beginning of each session. A follow-up phone call was made to participants who missed
269 two consecutive sessions without any explanation or prior notification to encourage their
270 attendance. Across all 17 participants, an overall average attendance rate of 71.6% was
271 recorded, with higher attendance in the afternoon than morning sessions. The average

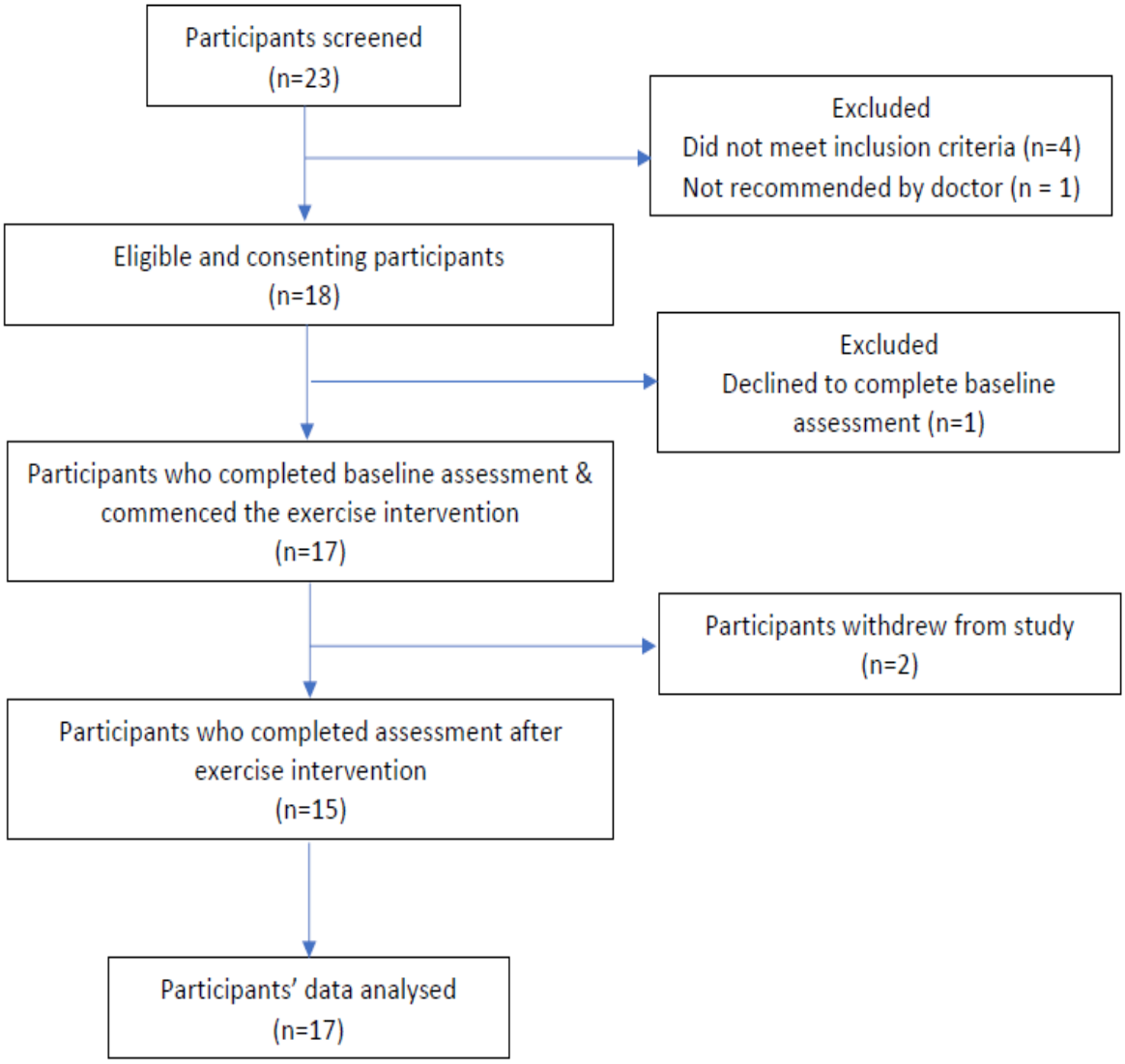
attendance rates each week were 74.5%, 64.7%, 72.5%, and 74.5% respectively. Reasons reported by participants for not attending exercise sessions included being away for holidays, doctor appointments, other commitments, family issues, and health issues.

No adverse events or effects were reported during the four-week exercise intervention. At the end of week 2, participants' learning was reviewed where all participants could execute the HBA exercise motions with reminders from the trainer. At the start of week 3 where the HBA exercise video with music was introduced, the trainer observed and reported that participants initially found it a little difficult to keep up with the speed of the exercise motions set in the video. However, they changed their mind by the end of the week, stating that the pace of the HBA exercise in the video was appropriate. There were no missing data except for the single participant who declined to complete the baseline assessment after returning the signed consent form as well as two participants who withdrew at the end of week two for which the intention to treat using the last known data carried forward approach was used to manage their missing data. A participants' flowchart for the feasibility study is presented in Figure 1.

3.2.2 Participant Characteristics & Study Outcomes

The 17 participating older adults were aged between 71 and 88 years (*M*=81.18; *SD*=5.08). The majority of participants were female (*n* = 14; 82.4%) and right-handed (*n* =14; 82.4%). Of the 17 participants, 15 reported that they were experiencing a range of medical and health conditions including high blood pressure, osteoarthritis, chronic obstructive pulmonary disease, hypertension, diabetes, leaking heart valve, lung infection and minor heart problem, but were still engaging in exercises. Among these 15 participants, one participant had a hip replacement over 10 years ago, and another had received treatment for heart disease. However, they were approved by their doctor to partake in light-moderate intensity exercise,

296 including HBA exercise. Study outcomes of the exercise intervention on upper limb strength,
297 muscle mass, gait speed and HRQoL are presented in Table 4. A significant difference in gait
298 speed was found in participants (p <. 005) with an improved gait speed gait of 0.90m/s post-
299 intervention compared to their pre-intervention gait speed of 0.68m/s.



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301 **Figure 1.** Participant Flowchart

Table 4. HBA Exercise Program - Pre- and Post-Exercise Intervention Outcome on Upper Limb Strength, Muscle Mass, Gait Speed & HRQoL (*n* = 17)

	Pre-intervention	Post-intervention	*P* value
Muscle Strength			
Right upper limb (kg)	19.31 (7.36)	20.07 (7.54)	.09
Left upper limb (kg)	18.11 (8.16)	18.82 (8.15)	.21
Muscle Mass (kg/m^2)	15.90 (2.52)	15.88 (2.36)	.88
Gait speed (m/s)	0.68 (0.13)	0.90 (0.20)	.00
HRQoL			
MCS	56.59 (5.73)	55.47 (6.66)	.42
PCS	41.00 (9.97)	42.59 (7.26)	.40

Abbreviation: HBA = Healthy Beat Acupunch; HRQoL = Health Related Quality of Life; MCS - mental component score on SF-12; PCS - physical component score on SF-12.

Table 5. HBA Exercise Program Evaluations (*n* = 15)

	Disagree *n*(%)	Neither Disagree nor Agree *n*(%)	Agree *n*(%)	Strongly Agree *n*(%)
The frequency of the exercise classes (i.e., 3 times per week) was good	-	1 (6.7)	9 (60.0)	5 (33.3)
The duration of each exercise class was good	-	-	10 (66.7)	5(33.3)
The overall length of the exercise program (i.e., 4 weeks) was good	-	2 (11.8)	9 (60.0)	4 (26.7)
The size of the exercise class was appropriate	-	-	8 (53.3)	7 (46.7)
The pace of the exercise was good	-	2 (13.3)	6 (40.0)	7 (46.7)
The trainer was clear in her instruction and clearly demonstrated the exercise motions	-	-	6 (40.0)	9 (60.0)
The instructor supported or helped me in learning the movements	-	-	6 (40.0)	9 (60.0)
The exercise movements were easy to learn	1(6.7)	1(6.7)	7(46.7)	6(40.0)
I was able to master the exercise at the end of the program	-	1 (6.7)	7 (46.7)	7 (46.7)

I enjoyed taking in the exercise program	-	-	3 (20.0)	12 (80.0)
I would continue with the exercise program	-	1 (6.7)	7 (46.7)	7 (46.7)

Abbreviation: HBA = Healthy Beat Acupunch

The majority of participants agree or strongly agree with the appropriateness of the length of exercise program as well as the frequency, duration and size of exercise class with the majority suggesting ten to twelve people per class would be ideal (refer to Table 5). Only one participant felt the exercise motions were difficult to learn while the majority of participants indicated that they were able to master the exercise at the end of the program and the pace of the exercise was good. The trainer was highly regarded by all participants who felt that not only was she clear in her instructions and demonstrations of the exercise motions, she supported and helped them in their mastery of the exercise motions. All participants enjoyed the exercise program, and the majority of them would continue or recommend it to their friends. They also felt that their health has improved after completing the HBA exercise.

4.0 Discussion

Exercise is important to maintain functional independence and improve health and well-being in older adults [2], particularly when combating age-related sarcopenia [3]. However, reduced physical capacity of frail older adults and those with sarcopenia is not always considered in the design of exercises [7, 26]. The Healthy Beat Acupunch (HBA) exercise program has been developed based on acupoint stimulation and the exercise principles of acupunch while taking into account the physical exercise guidelines for older adults [12]. However, the evidence to support its appropriateness, particularly for older adults with reduced capacity (e.g. physical impairment or sarcopenia) or from a western culture has yet to be established. Therefore, in

our Delphi study, we sought first to validate the HBA program for older adults with sarcopenia using a group of experts. The main concern highlighted during the Delphi study was with regards to the execution of the HBA exercise motions by older adults with balance problems. This concern was satisfactorily resolved with the inclusion of a chair for balance support if required, when practising the motions. Following two rounds of Delphi communication, experts' consensus was attained where the HBA program was validated and deemed to be simple, safe, suitable and helpful for practice by older adults with sarcopenia.

Second, with the exception of recruitment *(which will be discussed in the next section)*, feasibility in terms of retention, adherence, safety, mastery and data collection were established for the HBA exercise protocol in our Australian study. Participants affirmed the HBA program and supported the frequency, duration and size of the exercise class. They were appreciative of the trainer's support and instructions in learning the exercise which they generally found easy to master. Not only did participants enjoy the HBA program, they indicated that they plan to continue and recommend it to their friends. Importantly, improvement in participants' gait speed was found post-exercise intervention, which is congruent with participants' self-reported health improvement upon their completion of the HBA program. The outcomes of our feasibility study are in line with the results from a preliminary feasibility study of community older adults [12-14] where positive health outcomes were reported. Overall, there appears to be preliminary evidence to suggest support for the HBA program to improve gait speed of older adults, particularly those with reduced physical capacity and probable sarcopenia or from a western culture.

4.1 Feasibility of Recruitment

A significant challenge in recruiting participants with sarcopenia was encountered. None of our potential participants met the sarcopenia criteria in accordance with the EWGSOP2

354 guidelines [4], but could be considered to have probable sarcopenia and/or exhibiting low
355 gait speed that reflects frailty. Thus, several issues were taken into consideration when
356 determining their eligibility to participate in the feasibility study. First, the relationship
357 between sarcopenia and functional dependence is influenced by gait speed [24, 25]. Second,
358 even though the application of EWGSOP2 criteria for sarcopenia may be more cost and
359 resource effective than the use of EWGSOP1, there are suggestions that the number of
360 sarcopenia cases detected (i.e. sensitivity) can be lower when using EWGSOP2 in the geriatric
361 population, especially for men [28]. Third, lower gait speed in older adults may be explained
362 by the greater loss of muscle strength and mass in the legs (i.e. lower body) [29] than the
363 upper body due to a decrease in weight-bearing physical activities such as walking and
364 running affecting the lower limbs [30-34]. Consequently, older adults with weaker lower limbs
365 are then likely to compensate with upper limb effort when rising from a chair, or altering their
366 behaviour, such as using an elevator or lift instead of climbing the stairs, or parking close to
367 an entrance to avoid walking a long distance [35]. These would result in the regular and
368 consistent use of the upper body muscle groups and may help maintain muscle mass and
369 strength in the upper rather than lower body [36]. The BIA scale used, while generally a valid
370 measure of body composition, only detects overall body muscle mass and does not
371 differentiate between muscle mass in the upper and lower body and can be influenced by
372 various factors including environment and individual characteristics such as nutrition and
373 ethnicity that were not accounted for in the feasibility study. Therefore, potential participants
374 who had probable sarcopenia or low gait speed were included in the feasibility study.

375 **4.2 Limitations**

376 Validation of the HBA program may be limited by the small number of experts involved in the
377 Delphi study. Nevertheless, experts in our study reflected a range of professions and

experience including older adults with sarcopenia, where responses in *Round 1* Delphi were mostly congruent with a consensus readily achieved in the *Round 2* Delphi. It should also be noted that the HBA program is only validated for older adults with sarcopenia who are able to stand and are not wheelchair-bound. Maeda and his colleagues [27] reported a high prevalence of sarcopenia in older adults who are walking with aids (76.1%), wheelchair-bound (89.4%) or immobile (91.7%). Hence, a different version of the HBA program, suitable for practice by older adults with sarcopenia who are unable to stand or walk independently without assistive devices, or are wheelchair-bound, is therefore needed.

Lastly, the improvement found in gait speed for participants following completion of the HBA program needs to be cautiously interpreted given the shortcomings of the study design, such as an inability to establish cause and effect with the small sample size as well as the lack of consideration given to participants' exercise habits in the analysis.

5.0 Conclusions

The HBA exercise program was found to be an appropriate (i.e. simple, safe, suitable and helpful) exercise program for practice by older adults, particularly those with reduced physical capacity and probable sarcopenia or from a western culture. Reported research limitations (i.e. study design, sample size) and challenge (i.e. participant recruitment) should be considered when planning future studies assessing the effects of the HBA program.

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