Effects of sitting Tai Chi on sitting balance and self-care ability in post-stroke older adults: a pilot study

ORIGINAL ARTICLE

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Key words: Activities of daily living; Long-term care; Postural balance; Self care; Stroke; Tai Ji

BACKGROUND

Stroke is a cause of disability and dependency in older adults. Its overall incidence in persons aged ≥45 years is about 17.5/1000 per year.[1] About 67.5% of stroke survivors have variable degrees of disability.[2] Those who cannot sustain independent living because of disability, or whose family members cannot support them at home may need long-term care (LTC) facilities. In a government survey, 32.2% of LTC residents had a stroke history and 81.6% had impaired activities of daily living.

Traditional Tai Chi improves balance.[3-5] It requires standing and turning. Frail, institutionalised older adults commonly have standing difficulties. A novel form of sitting Tai Chi has been designed to facilitate movements of the upper limbs and also assist weight shifting that involves trunk control through a series of smooth, coordinated movements. This sitting Tai Chi can improve sitting balance control by shifting weight in both anteroposterior and mediolateral directions. It was reported to improve sitting balance (by 14.6±41.5%), eye-hand coordination, and quality of life in institutionalised older adults.[6] However, the subjects were heterogeneous and effects of Tai Chi on functional improvement were not measured. In the present study, the primary objective was to assess whether the sitting Tai Chi can improve sitting balance of hemiparetic patients living in LTC facilities. The secondary objective was to test whether it could improve self-care of the studied subjects.

METHODS

The study was approved by the Survey and Behavioural Research Ethics Committee of the Chinese University of Hong Kong. Informed consent (with a witness) was obtained from each participant before the study started.

Subjects were recruited from a single care and attention home, and pre- and post-intervention assessments were conducted. Residents aged ≥65 years who were hemiplegia and required aids in walking or were wheelchair-bound but were able to sit independently or were supported sitters (equivalent to modified functional ambulatory category 2-5) were included. Those who had chronic illnesses (e.g. chronic obstructive airway disease), exercise capacity of <10 minutes in sitting tolerance, uncontrolled hypertension, cardiovascular disease, Parkinsonism, mini-mental state examination scores of ≤10, or were unable to communicate or follow simple command were excluded.

A novel sitting Tai Chi designed by a physiotherapist and an experienced Tai Chi master and studied by Hong Kong Polytechnics University was adopted.[7] The intervention continued for 3 months, with 3 sessions per week. It began with 10 minutes of warm-up activities, followed by 40 minutes of exercises (with breaks as necessary), and 10 minutes of cool-down exercises. It comprised 12 steps, including weight shifting in different sitting positions, trunk and upper limb movements, and alternate thigh lift in a smooth and coordinated manner. A physiotherapist and a programme worker trained in sitting Tai Chi conducted the training to ensure the safety of the participants.

Sitting balance was examined using the forward reach in the sitting test. Subjects were instructed to sit on a chair with their hips, knees and ankles in 90°

of flexion. Subjects then made a fist, extended the elbow fully and flexed the shoulder to 90° with the good upper limb, and then reached forward along a tape placed on the wall as far as possible without losing balance or touching the wall. A total of 3 trials were performed and the mean value was calculated. The forward reach in sitting test had been proved to be reliable and valid for assessing the sitting balance of adults.[8,9]

Among the various activities of daily living, the ability to self-dress (dressing above and below the waist as well as dressing/removing prosthesis or orthosis when applicable) was selected as a surrogate measurement of self-care ability, as it involved a lot of trunk control. This was assessed using the functional independent measure (FIM) scoring system, in which the classification was based on whether the subject could self-dress independently, or needed help and if so how much.

As only a small group of subjects were recruited and the FIM was ordinal in nature, the non-parametric Wilcoxon sign rank test was used to compare pre- and post-intervention results. Intention-to-treat analysis with priori planning by last carry forward method was used. A p value of <0.05 was considered statistically significant..

RESULTS

Of the 260 residents, 102 (39.2%) had a stroke history; only 13 (68%) of 19 residents completed the sitting Tai Chi training (**Figure**). The 6 dropouts were due to loss of interest (n=4), uncontrolled blood pressure (n=1), and uncontrolled heart problem (n=1). Comparison between dropouts and completers did not reveal any differences in baseline characteristics. Of the 19 residents enrolled, 16 were male and 12 had left hemiparesis (**Table 1**). Their mobility was poor and their functional level was fair

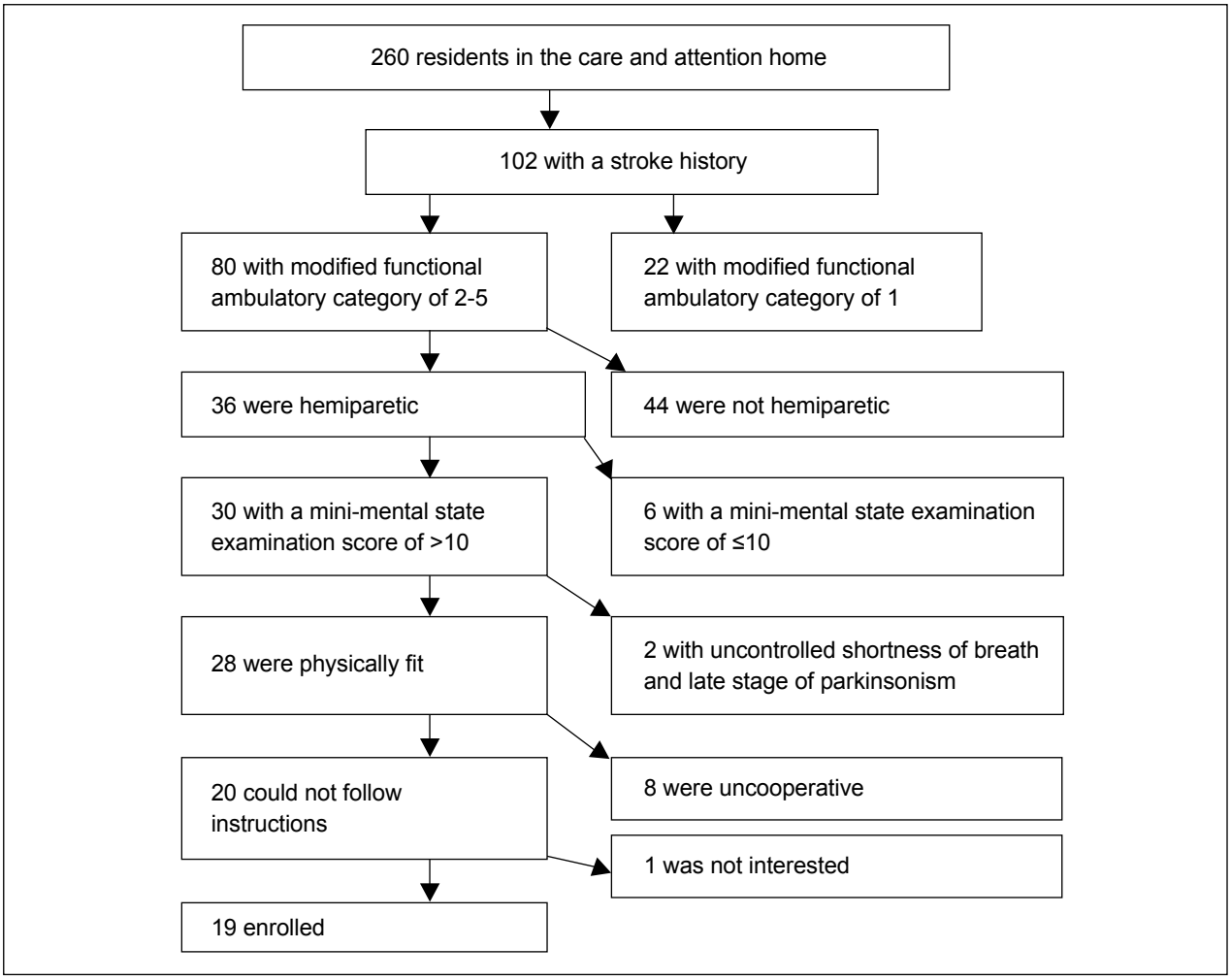

Figure. Flow of subject recruitment

Table 1
Baseline characteristics of the subjects

Characteristic	Mean (SD)	Median (IQR)	No.
Age (years)	79.3 (6.2)	80 (76, 84)	-
Male:female	-	-	16:3
Modified Functional Ambulatory Category	3.32 (1.29)	3 (2,5)	-
Mini-mental state examination score	21 (6.26)	22 (17, 26)	-
Affected side (right:left)	-	-	7:12
Forward reach	30.8 (9.8)	33 (25, 37)	-
Functional Independent Measure			
Dressing upper garment	4.37 (1.34)	4 (3,6)	-
Dressing lower garment	3.74 (1.73)	4 (2,5)	-

Table 2
Pre- and post-intervention comparison of parameters

Parameter	Median (IQR)		p Value
	Before training	After training	
Forward reaching (cm)	33 (25, 37)	32 (26, 35)	0.028
Functional Independent Measure			
Dressing upper garment	4 (3, 6)	4 (4, 6)	0.32
Dressing lower garment	4 (2, 5)	4 (2, 5)	0.32

(as intended), with a median modified functional ambulatory category of 3 and FIM score of 4 (out of 7). Wilcoxon signed-rank test showed significant differences between pre- and post-intervention in terms of forward reaching while sitting (p=0.028), but not in functional level (FIM) [**Table 2**].

DISCUSSION

Contrary to a previous study,[6] the sitting Tai Chi did not improve balance control (based on the functional arm reach at a sitting position). In fact, it was worse than before training. Besides, there was also no improvement in functional activity (based on FIM sub-scores in dressing upper and lower garments). In the previous study, about 100 subjects were selected from 4 care and attention homes who had similar functional mobility as the current study. Nonetheless, no detail on specific conditions attributed to the impaired mobility was given. A certain proportion might have been de-conditioned. Our study focused on subjects who had permanent residual disability beyond the rehabilitation period after stroke, which was not reversible, unlike deconditioning.

In the previous study, functional arm reach improved 14.6±41.5% after training.[6] Nonetheless, the baseline level was not stated and whether the improvement was significant was unknown. In our study, functional arm reach reduced significantly from a median of 33 to 32 cm after training. It is not certain if cold weather and subjects wore more clothes affected the arm reach results and gave rise to systematic measurement error, or subjects avoided reaching out too far owing to safety awareness. During the course of the study, some older adults complained of tiredness during the 1-hour training session despite interval rests were given. There was no mention of such complaint from the previous study. Training course may need to be modified to match tolerance of each older adult instead of using a standard, fixed protocol.

Sitting Tai Chi may not benefit disabled stroke patients in LTC facilities. Unable to complete Tai Chi and intensity of the training programme may account for the negative result. Further evaluations using a pragmatic approach are required before sitting Tai Chi is recommended for older adults in LTC after stroke. It is important to evaluate real-life practice rather than blindly adopting methods/results from research settings.

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