Original Article

The effects of Tai-Chi-Soft-Ball training on physical functional health of Chinese older adult

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ABSTRACT

Lam MHS, Cheung SY, Chow BC. The effects of Tai-Chi-Soft-Ball training on physical functional health of Chinese older adult. *J. Hum. Sport Exerc.* Vol. 6, No. 3, pp. 540-553, 2011. This study was designed to investigate a 10-week training effects of Tai-Chi-Soft-Ball (TCSB), a novel Chinese exercise which combined the elements of Tai Chi and badminton, on physical functional health of private institutionalized older adults. Thirty-four participants were recruited in the training group with 60 minutes per session and two sessions per week TCSB training. Thirty-two participants were recruited simultaneously in the control group (no training). The measurements included the Senior Fitness Test (SFT), AAHPERD Soda Pop Test, self perceptive functional health. Two-way ANOVA/ ANCOVA with repeated measure in one factor was conducted to examine the testing factor (pre-test and post-test of TCSB training) and the effect of groups (training and control group) as well as their interaction effects. The significant training effects were found in training group (six out of eight items of SFT, AAHPERD Soda Pop Test and self perceptive functional health). In control group, significant functional deteriorations were found in SFT (back scratch test, 8-foot up-and-go) and self perceptive functional health. The previous findings showed that TCSB was not only effective in improving; but also in maintaining and decelerating the deterioration of physical functional health of sedentary Chinese older adult. **Key words**: TAI-CHI-SOFT-BALL, PHYSICAL FUNCTIONAL HEALTH, OLDER ADULT.

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Submitted for publication August 2011.
Accepted for publication September 2011.
JOURNAL OF HUMAN SPORT & EXERCISE ISSN 1988-5202

doi:10.4100/jhse.2011.63.08

INTRODUCTION

The global ageing population of 65 years and above would increase to 16.2% in 2050 (United Nations, 2002). The number of ageing population in Hong Kong, however, will surpass the mean age of the world. According to the Census and Statistics Department HKSAR (2007), the population of 65 years and above would increase from 12.2% in 2010 to 26% in 2036. The surge in the number of ageing population reflects the current medical care system will be difficult to meet the needs (Chan & Phillips, 2002). All the older adults face the biological ageing like chronic diseases and physical functional declines inevitably (incapability in bathing, dressing, toileting, etc) (Classen et al., 2005). Biologically, the muscular strength (Hunter et al., 2001) and the strength per unit of muscle mass or muscle cross section (Kallman et al., 1990; Activity & Health Research, 1992) decreased. Moreover, muscular endurance (Clarke et al., 1992), the cardiovascular system (Wilmore & Costill, 1999) the eye-hand coordination (Goggin & Stelmach, 1990; Morgan et al., 1994) and the flexibility degraded while the Body Mass Index (BMI) increased (Rikli & Jones, 1999). All these biological changes, however, directly and negatively affected the physical functional health of older adult to handle their daily activities like eating, bathing, ability to use phone, ability to get places, ability to go shopping, ability to prepare meals, ability to do housework, ability to take medicine and the ability to handle money (Katz et al., 1963; Fillenbaum, 1988). Finally, the older adult will be incapable to take care of themselves and lead to institutionalization, hospitalization and mortality (Aliyu et al., 2003; Fried et al., 2004).

According to the Modified Disability Model (Morey et al., 1998; Rikli & Jones, 1997), the consequences of disability not only started from the biological ageing but also from the inactive life-style. Be physically active should therefore be advocated. Generally, regular physical activity was supported to be a good instrument to improve, maintain and to decelerate the deterioration of the functional health of older adult (Rose, 2007; Resnick, 2000). Many studies, including the high quality studies in the databases of PubMed, EMBASE and CENTRAL, found that the regular physical activities promoted the muscle strength, aerobic capacities, balance, and agility of older adult which indirectly affected the functional autonomy of older adult (Stiggelbout et al., 2008; Chin et al., 2008; Fiatarone et al., 1994). Though Physical activities training had no negative effect on functional health, among eleven randomized controlled trial researches about the exercise and functional health from the databases of PubMed, EMBASE and CENTRAL, four out of them showed that the training had no effects on the functional health of older adult. The types of activities, frequency, duration and intensity were therefore the key factors affecting the effectiveness of the trainings (Chin et al., 2008).

Compared to United States and other Asian countries, the functional problem of older adult in Hong Kong is not the most serious (Chau & Woo, 2008), however, there is a huge difference between the figure of non-institutional and institutional older adult (Census and Statistics Department of HKSAR, 2005).

Tai Chi, the most popular sport for older adult in Hong Kong and China (Disease Prevention and Control Division and Older adult Health Services, 2004; Channer et al., 1996), has long been supported to be an excellent instrument maintaining, rectifying the physical function of older adult. The static and dynamic postural control (Wolf et al., 2006; Gatts, & Woollacott, 2006; Hass et al., 2004), functional balance, lower extremity strength and endurance, dynamic gait index, dynamic balance, agility, flexibility and self perceptive functional health (Li et al., 2005; Ramachandran et al., 2007) were significantly improved by various experiments in various countries. TCSB, a new popular sport for older adult with more than two millions players in China, spreading to more than 20 countries in Europe, Asia, Australia and America, possesses the elements of Chinese Tai Chi (the principle of Yin and Yang, Circularity, Continuity,

Evenness, Softness, Gentleness and Cultivating internal energy rather than external strength) and the racquet sport skills (Bai, 2008). TCSB possessing extra elements of racquet sport like the manipulative skills and the hand-eye coordination would be an effective instrument in developing the physical functional health of older adult as nearly all of the components physical functional health like eating, bathing, dressing, transferring and toileting required manipulative skills, grips movement and strength and eye hand coordination. All these are therefore essential for older adult to carry out daily activities and self care (Pei et al., 2008). Though TCSB was not well documented in older adult sector, studies showed that it could increase upper body and lower body flexibility, balance, cardiovascular fitness and to decrease the body fat percentage, BMI, etc (Qi et al., 2009; Yao, 2008).

This study was designed to investigate the training effects of a 10-week TCSB training programs of moderate exercise intensity (RPE=12-14, somewhat hard) on physical functional health of private institutionalized Chinese older adults.

MATERIAL AND METHODS

The design of this study is quasi-experimental trial with control group intervention.

Participants

The participants were a convenience sample of 66 Sedentary elderly aged 65 to 75 from private older adult centers. Thirty-four participants were assigned to TCSB training group while thirty-two participants were assigned to non-training group.

Instrumentation

Older American Resources and Services Multidimensional Functional Assessment: Instrumental Activities of Daily Living Scale (OARS-IADL).

Fillenbaum (1988) modified the Lawton & Brody IADL (1969), an indicator of the capacities for autonomous function of elderly within society, and included it into the scale of Older American Resources and Services Multidimensional Functional Assessment. All the seven items (ability to use phone, ability to get places, ability to go shopping, ability to prepare meals, ability to do housework, ability to take medicine and the ability to handle money) of the scale of IADL are to be used with both men and women.

Senior Fitness Test (SFT)

SFT measures the physical capability of older adults to perform normal everyday activities and see whether they are able to do everything safely and independently without fatigue (Rikli & Jones, 2001). All the components were validated and reliable (Rikli & Jones, 1999).

1. *Chair stand test (lower body strength)* measures the number of full stands from a seated position with arm folded across chest for 30 seconds (Rikli & Jones, 2001).
2. *Arm curl test (upper-body strength)* measures the number of biceps curls in 30 seconds (5 lbs or 2.27 kg for women, 8 lbs or 3.63 kg for men) (Rikli & Jones, 2001).
3. *2-minute step test (aerobic endurance)* measures the number of full steps of the knee rose to a point midway between the patella (kneecap) and iliac crest (top hip bone). The number of the right knee reaches the require height within 2 minutes is calculated as the score (Rikli & Jones, 2001).
4. *Chair sit-and-reach test (lower body flexibility).* In this test, the participants sit on a chair with leg extended and hands reaching toward the toes. The number of inches (plus or minus) between the

extended fingers and the tip of toe was measure (Rikli & Jones, 2001).

5. *Back scratch test (upper body flexibility).* In this test, the participants use one hand to reach over the shoulder and one hand to reach up to the middle of the back and the number of inches (plus or minus) between the two extended middle fingers was measured (Rikli & Jones, 2001).
6. *8-foot up-and-go test (agility/dynamic balance)* measures the number of seconds required to get up from a seated position, to walk 8 feet (2.44 meters), to turn and to return to the seated position (Rikli & Jones, 2001).
7. *Height and Weight-BMI (Body composition)* measures the body mass index through dividing the weight (kg) by the Height (M^2) (Rikli & Jones, 2001).

Handgrip Strength Test

As carrying the basic daily activities required handgrip strength equal to at least 20% of body weight (Activity & Health Research, 1992), seeing that Saxton (2007) advocated that the maximum grip strength should be included in the elderly functional fitness test battery as an index of upper-limb strength. Dynamometers were employed to test the static strength of left and right handgrip of elderly for two times each hand (average was recorded). The handgrip of the dynamometers was adjustable and the scales were between 0 to 100 kilograms (kg), in 1-kg increments. The participants should stand erectly with elbow flexed at 90 degree, forearm in neutral position and wrist in slight extension (1 degree to 30 degree) (Heyward, 2006).

Hand Eye Coordination (AAHPERD Soda Pop Test)

Eye hand coordination is essential component of the manipulative skill which is important for elderly to carry out daily activities and self care (Pei et al., 2008). The participant is requested to sit on a chair facing the table, lifting an unopened (12-oz) soda can, turning the can, and placing it on the target taped on the table. 6 crosses (number 1 to 6) were placed on the 30-inch strip with each cross set 5 inches apart. The participant was asked to turn the can on number 1, 3 and 5 over and placed it on the crosses of 2, 4 and 6 respectively. Once the last can of 6 was placed, the participant should return the cans to the original crosses of 1, 3 and 5. After that the participant was requested to do the whole process once more immediately. Therefore, the total lifting, turning and moving the cans should be 12 times. Two trials were counted after two practice trials. The trial scores will be counted to the nearest 0.1 seconds and the best score of the two trials was recorded (Osness et al., 1996).

Procedure

This study was approved by Institutional Thesis Committee of Hong Kong Baptist University before data collection.

Elderly who were interested were required to complete an informed consent form combined in the questionnaire of self perception of physical functional health and a Chinese translated Physical Activity Readiness Questionnaire (PAR-Q). Elderly who had one or more acute illness or who were not recommended to do exercise by the doctors and physicians were excluded. They were also informed that they could leave the program at any stage without providing any reason. A meeting about the procedure of the tests, TCSB trainings and the ethical concerns was called for the 3 elderly centers which have older adults taking part of this study.

Participants were advised not to do any form of exercise at least 24 hours before the Pre-intervention and the Post-intervention test. They were also advised to sleep earlier on the day before the tests. Each test consisted of two parts. The first part of the test was a survey on their self perception about their physical functional health (IADL). The second part of the test was the physical functional health test based on the Senior Fitness Test (SFT) to check the lower body strength, lower body flexibility, upper body strength, upper body flexibility, agility and dynamic balance, aerobic endurance, height and weight of elderly (Rikli & Jones, 2001). Moreover, the handgrip strength test (Canadian Society for Exercise Physiology, 2003) and the AAHPERD Soda Pop Test, an hand-eye coordination test of elderly developed by Osness et al. (1996), were used as the additional tests to check the physical functional health of elderly. The two health tests were conducted within one week before and after the 10-week TCSB program (Pre-test) respectively. Fifteen trained test administrators were recruited in this study. The participants were gathered in an uncovered playground (approximately 20 meters times 25 meters). As the elderly centers were very concentrated, the time required to walk from the distal elderly center to the training venue was around 2 minutes. The temperature and the humidity were very similar on the day of pre test and post test. The whole testing procedure lasted half an hour for every single participant and no accidents were recorded.

A male certified TCSB coach with two assistants (experienced in training elderly in Hong Kong Health City Program organized by the district counsels) from Hong Kong Rouliqiu (TCSB) Association was recruited to conduct the training program. A registered enrolled nurse was provided by one of the private elderly centers to supervise the whole training and testing process. A 10-week free of charge TCSB training program of two sections per week and one hour per section (the warm up and cool down period were excluded) was provided for all elderly of training group at the same time in an uncovered playground. Thirty-four sedentary elderly were recruited to the training group while thirty-two sedentary elderly were recruited to the control group (no training). Older adults in training group were instructed the basic TCSB skills including basic skill movement (ready position and standing position, right/left swing, right / left swing with sliding movement, right/left turning, up and down motion, forward turning motion, turning like drawing "8" and right/left trunk rotation), pattern techniques and cooperative TCSB techniques. The participants of training group were told to report the intensity of exercise on the scale of RPE 12-14 (6-20 RPE Scale), which is approximately 70% of VO_2max (ACSM, 1990) every 15 minutes. The training period started from November, 2009 to January, 2010. As the training was arranged in the early afternoon, the changes of humidity, temperature and UV index were small and there were no rains during our training (Hong Kong Observatory, 2010).

Participants who could not meet the 80% attendance rate (16 lessons or less) or who engaged in other activities more than 60 minutes a week were excluded. A conservative approach, Intention To Treat approach (ITT), will be employed as attempting to account for noncompliance by excluding noncompliant subjects can bias the treatment evaluation and the technique using the last available measurement after dropout to be the missing result, was utilized to analyze the result (Portney & Watkins, 2009).

Data Analysis

Statistical package for social sciences 16.0 was used to analyze the results. A two-way ANOVA with repeated measure in one factor was conducted to examine the testing factor (within group effect: pre-test and post-test of a training) and the effect of groups (between group effect: training and control group) as well as their interaction effects on Self-perceptive Physical Functional Health parameters and Physical Functional Health Parameters. A two-way ANCOVA with repeated measure in one factor was conducted to the previous parameters if unequal baseline measures were found (Fiatarone et al., 1994).

RESULTS

Thirty-four sedentary elderly with eighteen (52.9%) aged from 65 to 69 (M=67.45; SD=1.27) and sixteen (47.1%) aged from 70 to 75(M=74.12; SD=0.79) participated in the training group. Twelve (35.3%) were male and Twenty-two (64.7%) were female. Thirty-two sedentary elderly with ten (29.4%) aged from 65 to 69(M=66.34; SD=1.38) and twenty-two (70.6%) aged from 70 to 75(M=72.59; SD=1.31) participated in the control group. Fifteen (44.1%) were male and seventeen (55.9%) were female. Three in training group and one in non-training group dropped out due to hospitalization. All drop-out cases were treated as failed cases statistically by a conservative approach, ITT approach (Portney & Watkins, 2009), the dropped out cases were therefore included in the process of analysis.

With the different baselines, a two-way ANCOVA with repeated measure in one factor was conducted to examine the testing factor (pre-test and post-test of a training) and the effect of groups (training and control group) as well as their interaction effects on IADL, selected self-perceptive parameters. Firstly, significant interaction effects (testing factor x effect of groups) were found in Sum of IADL ($F(1,1)=276.68$, $p<0.01$). Secondly, there were significant mean differences within group effects (testing factor: pre-test and post-test of a training) on Sum of IADL ($F(1,1)=15.82$, $p<0.00$). The effect sizes, partial eta squared was 0.55, which was regarded as a large effect in Cohen's guideline (1988). To distinguish the within group effects on training group and control group, One Way ANCOVA with repeated measure in one factor was performed. Significant within group effects of training and control group on Sum of IADL ($F(1,1)=22.29$, $p<0.01$) were found (see Table 2). Thirdly, there was a significant mean differences between group effects (effect of groups: training and control group) on Sum of IADL ($F(1,1)=29.67$, $p<0.00$) (see Table 1).

Table 1. *Two Way ANCOVA with repeated measure in one factor on selected self-perceptive parameters (IADL) between control group and training group.*

		SS	*df*	*MS*	*F*	*p*
Sum of IADL#	Between (Groups)	1.03	1	1.03	29.67	0.00***
	Within (PrePostTest)	0.55	1	0.55	15.82	0.00***
	Interaction(PrePostTest*ExpCont)	9.61	1	9.61	276.68	0.00***

*#Different baselines were adjusted by 2-way ANCOVA with repeated measure in one factor. ***p<0.01.*

Table 2. *One Way ANCOVA with repeated measure in one factor on within-group differences of selected self-perceptive parameters (IADL) between control group and training group.*

	Pre-Test		Post-Test		Within Group Difference	Pre-Test		Post-Test		Within Group Difference
	Training Group		Training Group			Control Group		Control Group		
	M	SD	M	SD	*F (1)*	M	SD	M	SD	*F (1)*
Sum of IADL#	16.59	2.38	19.03	2.08	22.29***	18.66	2.38	17.59	2.59	47.56***

*#Different baselines were adjusted by 1-way ANCOVA with repeated measure in one factor. ***p<0.01.*

A two-way ANOVA / ANCOVA with repeated measure in one factor was conducted to examined the testing factor (pre-test and post-test of a training) and the effect of the groups (training and control group) as well as their interaction effects on Selected Physical Functional Health parameters (SFT, Hand Eye Coordination and Arm Muscle Strength). All the variances in Selected Physical Functional Health parameters (SFT, Hand Eye Coordination and Arm Muscle Strength) were homogenous, so parametric analysis was performed.

Firstly, significant interaction effect (testing factor x effect of groups) were found in all the physical functional health tests of Senior Fitness Test, AAHPERD Soda Pop Test (hand eye coordination) and Handgrip Strength Test (Arm Muscle Strength) including SFT [Chair Stand Test ($F(1,1)=1119.18$, $p<0.01$); Arm Curl Test ($F(1,1)=115.17$, $p<0.01$); 2 Minute Step Test ($F(1,1)=44.60$, $p<0.01$); Chair Sit and Reach Test ($F(1,1)=23.07$, $p<0.01$); Back Scratch Test ($F(1,1)=7.37$, $p<0.01$); 8 Foot Up and Go ($F(1,1)=36.81$, $p<0.01$); BMI ($F(1,1)=31.40$, $p<0.01$)]; AAHPERD Soda Pop Test ($F(1,1)=14.87$, $p<0.01$) and Handgrip Strength Test ($F(1,1)=19.64$, $p<0.01$) (see Table 3). Secondly, there were significant mean differences within group effects (testing factor: pre-test and post-test of a training) on SFT [Chair Stand Test ($F(1,1)=8.71$, $p<0.01$); Chair Sit and Reach Test ($F(1,1)=17.26$, $p<0.01$); Back Scratch Test ($F(1,1)=20.59$, $p<0.01$); 8 Foot Up and Go ($F(1,1)=6.41$, $p<0.01$)] and Handgrip Strength Test ($F(1,1)=10.04$, $p<0.01$) (see Table 3).The effect sizes, partial eta squared were all over 0.12 (Chair Stand Test=0.12; Chair Sit and Reach Test=0.23; Back Scratch=0.25; 8-Foot Up and Go=0.37 and Handgrip Strength Test=0.14), which were regarded as a very high effect in Cohen's guideline (1988). To distinguish the within group effects on training group and control group, One Way ANOVA (ANCOVA if the baselines are significantly different) with repeated measure in one factor was performed. In training group, significant within group effects on SFT [Chair Stand Test ($F(1,1)=15.83$, $p<0.01$); Chair Sit and Reach Test ($F(1,1)=26.56$, $p<0.01$); Back Scratch Test ($F(1,1)=18.69$, $p<0.01$); 8 Foot Up and Go ($F(1,1)=30$, $p<0.01$)] and Handgrip Strength Test ($F(1,1)=18.61$, $p<0.01$) were found. In control group, significant within group effects on SFT [Back Scratch Test ($F(1,1)=22.76$, $p<0.01$); 8 Foot Up and Go ($F(1,1)=8.52$, $p<0.01$)] were found (see Table 4). Thirdly, there were significant mean differences between group effects (effect of groups: training and control group) on SFT [Chair Stand Test ($F(1,1)=1119.18$, $p<0.00$); Arm Curl Test ($F(1,1)=3565.09$, $p<0.01$); 2 Minute Step Test ($F(1,1)=352.13$, $p<0.00$); Chair Sit and Reach Test ($F(1,1)=366.85$, $p<0.00$) and Back Scratch Test ($F(1,1)=2032.43$, $p<0.00$)] and Hand Eye Coordination ($F(1,1)=1086.49$, $p<0.00$). The effect sizes, partial eta squared were all over 0.14 (Chair Stand Test=0.95; Arm Curl Test=0.94; 2 Minute Step Test=0.85; Chair Sit and Reach Test=0.85; Back Scratch Test=0.97 and Hand Eye Coordination=0.95), which was regarded as a tremendous effect in Cohen's guideline (1988) (see Table 3).

Table 3*.Two Way ANOVA / ANCOVA with repeated measure in one factor on selected physical functional health parameters (SFT, Hand Eye Coordination and Arm Muscle Strength) between control group and training group.*

		SS	*df*	*MS*	*F*	*p*
Chair Stand Test (SFT)#	Between (Groups)	2667	1	2667	1119.18	0.00***
	Within (PrePostTest)	20.75	1	20.75	8.71	0.00***
	Interaction (PrePostTest*ExpCont)	158.30	1	158.30	66.43	0.00***
Arm Curl Test (SFT)#	Between (Groups)	3565.09	1	3565.09	984.63	0.01***
	Within (PrePostTest)	8.96	1	8.96	2.48	0.12
	Interaction (PrePostTest*ExpCont)	417	1	417	115.17	0.00***
2-Min Step Test (SFT)#	Between (Groups)	48084.71	1	48084.71	352.13	0.00***
	Within (PrePostTest)	288.25	1	288.25	2.11	0.15
	Interaction (PrePostTest*ExpCont)	6090.59	1	6090.59	44.60	0.00***
Chair Sit and Reach Test (SFT)#	Between (Groups)	1435.97	1	1435.97	366.85	0.00***
	Within (PrePostTest)	75.39	1	75.39	17.26	0.00***
	Interaction (PrePostTest*ExpCont)	90.30	1	90.30	23.07	0.00***
Back Scratch Test (SFT)#	Between (Groups)	3395.05	1	3395.05	2032.43	0.00***
	Within (PrePostTest)	34.40	1	34.40	20.59	0.00***
	Interaction (PrePostTest*ExpCont)	12.32	1	12.32	7.37	0.01***
8 Foot Up and Go (SFT)	Between (Groups)	4.84	1	4.84	0.04	0.85
	Within (PrePostTest)	32.35	1	32.35	6.41	0.01***
	Interaction (PrePostTest*ExpCont)	185.80	1	185.80	36.81	0.00***
BMI (SFT)	Between (Groups)	12.12	1	12.12	0.55	0.46
	Within (PrePostTest)	0.10	1	0.10	0.14	0.71
	Interaction (PrePostTest*ExpCont)	22.99	1	22.99	31.40	0.00***
AAHPERD Soda Pop Test (Hand Eye Coordination)#	Between (Groups)	3112.14	1	3112.14	1086.49	0.00***
	Within (PrePostTest)	1.79	1	1.79	.63	0.43
	Interaction (PrePostTest*ExpCont)	42.60	1	42.60	14.87	0.00***
Handgrip Strength Test (Arm Muscle Strength)	Between (Groups)	12.48	1	12.48	0.16	0.69
	Within (PrePostTest)	48.57	1	48.57	10.04	0.00***
	Interaction (PrePostTest*ExpCont)	95.07	1	95.07	19.64	0.00***

*#Different baselines were adjusted by 2-way ANCOVA with repeated measure in one factor. Pre: pre-test; Post: post-test; Exp: training group; Cont: control group; SFT: Senior Fitness Test. ***p<0.01.*

Table 4. *One Way ANOVA / ANCOVA with repeated measure in one factor on within-group differences of selected physical functional health parameters (SFT, Hand Eye Coordination and Arm Muscle Strength) between control group and training group.*

	Pre-Test		Post-Test		Within Group Difference	Pre-Test		Post-Test		Within Group Difference
	Training Group		Training Group			Control Group		Control Group		
	M	SD	M	SD	*F (1)*	M	SD	M	SD	*F (1)*
Chair Stand Test (SFT)#	9.85	4.33	13	4.54	15.83***	12.63	5.70	10.81	4.85	0.30
Arm Curl Test (SFT)#	12.71	4.87	17.85	5.86	---	17.09	6.17	14.16	5.48	---
2-Minute Step Test (SFT)	59.68	11.30	85.12	27.37	---	71.47	10.43	66.94	20.44	---
Chair Sit and Reach Test (SFT)#	-5.19	4.11	-1.37	3.39	26.56***	-1.91	4.11	-2.87	4.18	0.28
Back Scratch Test (SFT)#	-8.14	5.89	-6.74	4.76	19.69***	-4.17	5.43	-4.79	5.19	22.76***
8-Foot Up and Go (SFT)	16.40	9.49	13.03	8.28	30***	13.64	7.26	15.02	8.61	8.52***
BMI (SFT)	23	3.70	22.11	3.30	---	22.78	3.16	23.56	3.31	---
AAHPERD Soda Pop Test (Hand Eye Coordination)#	11.67	4.10	11.10	4.53	---	9.18	5.47	10..85	6.51	---
Handgrip Strength Test (Arm Muscle Strength)	16.51	7.43	19.43	7.98	18.61***	18.83	5.17	18.34	4.44	2.15

*#Different baselines were adjusted by 1-way ANCOVA with repeated measure in one factor. ***p<0.01.*

DISCUSSION

The present study successfully showed the effectiveness of the traditional Chinese exercise, TCSB, on physical functional health of elderly. The findings in within training group (pre-test and post-test) were encouraging, four out of seven tests in SFT were found to have significant improvements after the TCSB training, namely chair stand test (lower body strength), chair sit and reach test (lower body flexibility), back scratch test (upper body flexibility), 8 foot up and go (agility/ dynamic balance) and Handgrip test. Though significant improvement were not found in two items of SFT [arm curl test (upper body strength), 2 minute step test (aerobic endurance)] and AA HPERD Soda Pop Test (hand eye coordination), significant mean differences were found between the training group and the control group. This implied that even though the TCSB training cannot improve the said physical abilities significantly, it could at least maintain and decelerate the degradation of the physical functional health of elderly as the capabilities of the elderly in the said areas dropped in control group.

When comparing to control group, significant mean differences were found in five out of seven tests of SRT [chair stand test (lower body strength), arm curl test (upper body strength), 2 minute step test (aerobic endurance), chair sit and reach test (lower body flexibility), back scratch test (upper body flexibility)] and AAHPERD Soda Pop Test (hand eye coordination). Notwithstanding, BMI was the only factor which was found to have no within group (pre-test and post-test) and between group (training and control group) improvement, the duration of training really mattered as BMI was normally sensitive to change with trainings lasted for more than four months (Kallinen, 2005; Wolf et al., 2006). However, significant interactions were found in all of the tests in SFT, AAHPERD Soda Pop Test (hand eye coordination) and Handgrip test. This implied that the differences between training group and control group enlarged after the training and the effectiveness of the TCSB increased while the degradation of control group continued. The results of physical functional tests matched the findings of Self-perceptive parameters of physical functional health, IADL, the first identifiable marks or indicators of deterioration in physical functioning (Wang et al., 2005). These phenomena revealed the picture of deterioration and the deprivation of functional health due to the biological ageing (Cheng et al., 2007; Classen et al., 2005; Schnohr et al., 2003; Kohl, 1997). The findings also coincided with the Modified Disability Model (Morey et al., 1998) that the inactive lifestyle worsened the physical functional health. Of cause, the other possibilities like the fading of novelty in posttest testing and the lack of motivation to put in all efforts of elderly accounted to these phenomena.

The confirmation of the effectiveness can be retraced from a very similar traditional Chinese exercise, Tai Chi, which has been supported to be an effective tool to improve the static and dynamic postural control (Wolf et al., 2006; Gatts & Woollacott, 2006; Hass et al., 2004), functional balance, lower extremity strength and endurance and flexibility (Li et al., 2005; Ramachandran et al., 2007), in various countries. Moreover, the present findings dovetailed with the two Chinese studies about TCSB and physical health of elderly on the upper body and lower body flexibility, balance, cardiovascular fitness (Qi et al., 2009; Yao, 2008).

An important contribution of present study was to include the physical functional tests which were useful in testing the daily-activity manipulative skills like eye hand coordination (AA HPERD Soda Pop Test) and arm muscle strength (Handgrip Test) that the SFT didn't embraced, because nearly all the daily activity listed in IADL like using telephone, preparing meal, doing housework, taking medicine, etc. required manipulative skills and ability (Pei et al, 2008; Saxton, 2007), which dropped constantly after age 65 years (Shiffman, 1992). The present findings assured the effectiveness of TCSB training on promoting and maintaining the hand eye coordination and arm muscle strength. However, the present study has not gone into details about the gender effects, education standard effects, marital status effects and the effects of age which might affect the effectiveness of TCSB Training on physical functional health (Nagi, 1976; Strawbridge et al., 1996; Ng et al., 2006; Tajvar et al., 2008).

CONCLUSIONS

TCSB is not only proved to be a possible effective tool to strengthen the physical functional health, the manipulative skills and the self-perceptive functional health of older adults, but also could serve as a tool to slow down the biological degradation which is not avoidable when we are getting older. This study could be repeated and extended to the older adults with different level of disabilities, different kind of chronic diseases with different training intensities and duration.

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