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Original Article

The Effect and Adherence of a Volunteer-Led Community Care Station Program on Physical Function among Community Older Adults: A One-Year Observational Study

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SUMMARY

Background: This study investigated the effect of a volunteer-led community care station (CCS) program and adherence to the program on physical function among the community-dwelling older adults.
Methods: Fifty-nine community-dwelling older adults participated in a CCS program held in the local community settings with three-hour activity programs, twice weekly. A physical therapist evaluated all the physical performance tests before and after one year. Adherence was defined as the percentage of attended sessions relative to total number of sessions in one year.
Results: Fifty-six participants (age 76.5 ± 6.5 years) completed the study and showed significant improvement in performance tests except for flexibility following one year. The median adherence was 71% (average 68.9%). Gains in most tests were significantly related to adherence. Participants with an adherence rate ≥ 70% gained more significant improvements in tests than those with < 70%.
Conclusions: Community older adults may improve in physical function after participating in a volunteer-led CCS program for one year, especially those with an adherence rate ≥ 70%.

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1. Introduction

With advancing modern medical technology, the average life span of people in many developed countries has increased and the aged society phenomenon has become common.[1] These conditions have forced governments to implement public and health promotion strategies or programs on how to help older adults maintain physical activity for good health span. Considering different cultures and lifestyles of older populations in various countries, these strategies and programs for older adults could not be used as a "one size fits all." Programs for elderly include Enhance® Fitness program in the USA,[2] community-based integrated care and the public health approach in Japan,[3] community-based home healthcare project in Korea,[4] and the community care station (CCS) in Taiwan.[5,6]

The CCS program was initiated by the Taiwanese government in 2005.[5–7] Most CCS services are held in local community (senior) centers, churches, temples, unused schools, etc. and conducted with the assistance of local trained volunteers or retired older adults living in the community. The CCS is held for half a day, twice a week. It provides multidimensional services including basic elderly care, delivering the public health-related information from the government, counseling care by telephone and home visits, health promotion exercises, recreational activities, and finally ending with a hot meal for the local community older adults. The service model is supported substantially by the local government, nonprofit organizations, charitable grants, etc.[5–7] and is accessible and convenient. To implement the community eldercare and aging strategies, the CCSs have been disseminated on a large scale throughout Taiwan, expanding from an initial 300 to the current 4000 locations.[5] Moreover, through the health promotion exercises or physical activities without sophisticated equipment in CCS, the Taiwanese government hopes the program will provide basic care for community older adults with either healthy or sub-healthy statuses and delay their functional declination with aging.[5–8]

Although studies have indicated that participating in community-based physical activity or exercise benefits the physical function of older adults,[2,8–15] many of them were either based on a short-term period or conducted by a health professional.[7–12] However, one of the particularly important contributors to positive physical outcomes could be a high attendance rate among the participants while undertaking community-based physical activity.[7,9,13–17] Previous studies reported that participation declined when the intervention lasted longer and that even long-term effectiveness was either not significant or absent between the study groups.[13,14] Fielding et al. indicated the relationship between adherence to physical activity and improvements in physical functioning in older individuals at risk for mobility disability.[15] Additionally, the "training period" could have a dose-response relationship in physical mobility improvement among community older adults.[13,18] Therefore, the adherence to participation in the community-based physical activity, especially for a longer period, could have a cause-effect on physical performance improvement among the participants.

The CCS service program has been implemented over a decade in Taiwanese communities and is markedly propagated by the government.[5–7] Only few studies concerning the CCS program have

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been conducted, with either a high attendance or involving a health professional, or both.[7,8] So far, no study investigates the long-term adherence and effect on the physical performance among the community-dwelling older adults when using a service program only led by community volunteers.

2. Methods

The study was conducted in Hualien County in eastern Taiwan from June 2018 to May 2019. We chose the CCSs through a convenience sampling method according to their proximity to this study's researchers. By means of flyers, community center bulletin boards, and notifications by center administrators, the older adults living in the same community or near registered for the CCS service program were invited to the study. The inclusion criteria were: (1) age ≥ 65 years and living in the community; and (2) can follow our assessment command; (3) able to walk independently with or without a device. The exclusion criteria were: (1) psychiatric illness, epilepsy, or related medical history; (2) unstable conditions or potential risks related to heart diseases evaluated by the physician; (3) receiving other additional physical activities such as Tai Chi or Yuan Chi during the study.

The CCS service program was conducted from 8:20 A.M. to 11:50 A.M., twice weekly, and included basic elderly care, delivering the public health-related information from the government, counseling, etc. in the first half hour, and health promotion exercises, recreational, or handcraft activities for the next two hours, each session ending with a hot meal. The health promotion exercises lasted for 1–1.5 hours in each session and were held by the trained local community volunteers with a ratio of one volunteer to approximately 6–8 participants. Before the study, the local community volunteers received at least 24-hour education training from the local government on basic eldercare, how to lead promotion exercises, arrange the recreational activities, etc. The health promotion exercises included flexibility with the extremities stretching, muscle strengthening using Thera-band, balancing by dancing slightly or coordination with rhythm movement combining a music, etc.[7,8] Recreational activities, such as kicking or throwing and picking a ball with different sizes, ringing toss game or painting; or easy handcraft activities using recycled materials, like cardboards, papers, plastic or aluminum bottles etc. were scheduled into the program in each session for about 30–40 minutes.

All participants in the CCSs were evaluated by physicians before the study. To analyze the physical performance, the following tests were employed by the same physical therapist with 10 years of community experience at baseline and after one year. The Short Physical Performance Battery (SPPB) was used for lower extremity function. The maximum attainable score was 12; the higher the score, the better the performance.[19] Functional reach was employed for the balance function of the older adults by raising their arms in shoulder flexion 90° in the standing position, and then reaching forward as far as possible.[20] One leg standing (OLS) test was used to assess standing steadiness and balance by asking them to perform "one-legged knee flexion and standing on the other leg for as long as possible" on the dominant leg with open eyes.[21] The timed up and go (TUG) test was used to assess the dynamic balance and mobility by asking the participant to rise from a chair, walk 3 m at a comfortable pace, turn around and walk back to the chair, and sit down again.[21] The10-m walk test was conducted to assess the ambulation ability of older adults. We used 14 m and 2 m for acceleration and deceleration, respectively. The evaluator recorded the timing at the middle of 10 m as the participant walked at their usual walking speed.[22] The participants' flexibility was assessed using the sit-to-reach test. Participants in a sitting position, with their knees straight and bilateral hands clasped, reached forward as far as possible to target the feet. The distance was measured in centimeters on a scale according to how far the participants could reach with their fingertips.[23] All the items were tested two times and the average was recorded.

To record the adherence in the study, we adopted the common measures of adherence based on the percentage of attended sessions for the participants relative to the total number of the sessions held by the CCS in one year.[13–16] One community volunteer in the CCS had every participant register their name at the prepared document log before each session. Participants had to finish the half-day course; their attendance was then recorded. A researcher visited the CCS every month to collect the document log and attendance data. Regarding the status of adherence for all participants after one year, we adopted the previous studies with mean long-term (≥ 1 year) adherence rates of 70% for a group-based exercise program as our adherence cut-off.[13–16] Those with an adherence rate of 70% or more were categorized into the high adherence group (HG); otherwise, they were included in the low adherence group (LG). All participants received and signed the consent form approved by the Research Ethics Committee of Hualien Tzu Chi Hospital, Buddhist Tzu Chi Medical Foundation.

2.1. Statistical analysis

We used descriptive analyses to perform the baseline characteristics of the entire sample. Prior to our data further analysis using Kolmogorov-Smirnov test was conducted for data normality. Pearson correlation was used to calculate the correlation of the adherence and change of each physical performance test at baseline and after one year. The change of all physical performance at pre- and post-tests was calculated by the pair t test for parametric data. Between the HG and LG, the basic characteristics, physical performance at baseline, and the change of all physical performance tests at pre and post one year were calculated by independent *t* (normality data) or Mann-Whitney *U* (non-normality data) tests, and chi-square or Fisher's exact tests for categorical data. All statistical analyses were performed using PASW Statistics 18 (SPSS Inc., Chicago, IL). Statistical significance was assumed for $p \leq 0.05$.

3. Results

Fifty-nine participants matched the inclusion criteria, of which 56 completed both pre- and post-data. Three were dropped as they could not be contacted at post-test because they had moved out, shifted to nursing homes, or died. Figure 1 shows the disposition of the participants during the study period. None of the older adults reported adverse events related to the program during the study period. The baseline data of the three dropped participants were not significantly different from the remaining participants. The reasons for low adherence were hospitalization, travel, moving out, etc. The baseline characteristics and the median attendance rates of 71% (average 68.9%) for all participants in one year are presented in Table 1. All physical performance at pre- and post-test and its gain among all participants are demonstrated in Table 2, which presents significant improvements in most physical measures except OLS and flexibility. The adherence was significantly related to the gains in physical performance tests among the participants, as shown in Table 3. As per the 70% attendance cut-off, 28 participants were categorized into the LG (median, 50%) and 28 into the HG (median, 83%). The comparison of all physical tests at baseline between the two groups is demonstrated in Table 4. The HG gained significant improvements

in the physical mobility, balance, and gait speed compared to the LG, as shown in Table 5.

4. Discussion

This study first demonstrated that following one year, the community older adults could show a significant improvement in the physical mobility after participating in CCS activities led by the trained local community volunteers, and the mean adherence was 68.9%. Second, there is a relationship between the physical mobility gains and attendance, and the LG and HG have different physical performance changes after participating in one-year CCS activities.

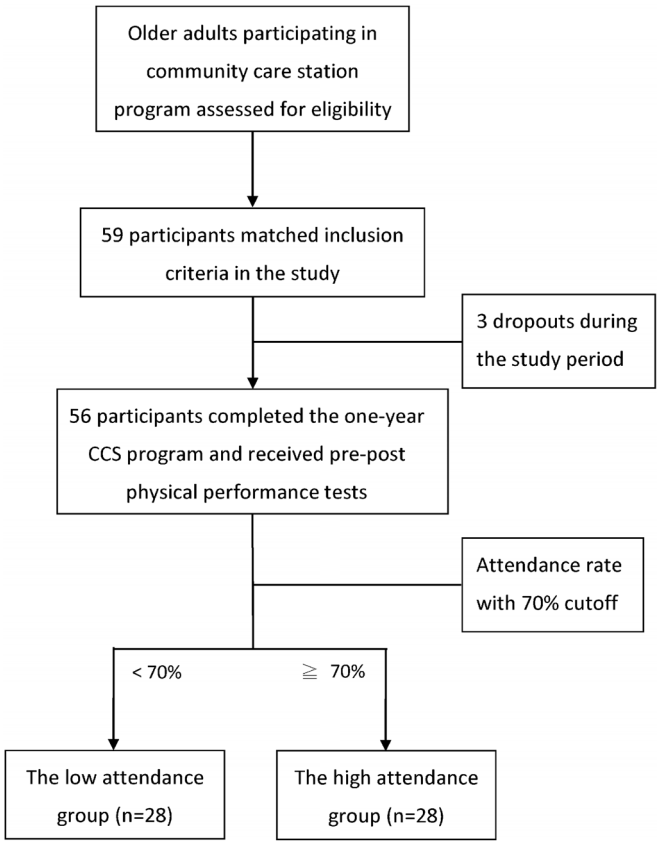

Figure 1. Flowchart for the disposition of the participating community-dwelling older adults.

Despite the lack of a control group, we reasonably assume the reliability of the observed effects. Auyeung et al.[24] reported an age-associated decline of gait speed by 0.022 m/s/year among commu-

Table 2
The physical performance measures of all participants at pre- and post-test and mean differences of pre- and post-test (n = 56).

Variables at baseline†	Pretest	Posttest	Mean dif	*p* value
SPPB (0–12, score)	9.34 ± 2.28	9.86 ± 2.44	0.52 ± 1.32	0.01*
FR (cm)	16.24 ± 5.89	17.31 ± 5.18	1.07 ± 3.22	0.02*
TUG (s)	13.03 ± 5.07	12.57 ± 5.11	-0.45 ± 1.24	< 0.01*
10 meters (s)	12.52 ± 4.33	11.80 ± 5.23	-0.72 ± 2.54	0.04*
OLS (s)	7.17 ± 8.35	8.03 ± 9.21	0.86 ± 4.45	0.15
Sit-to-reach (cm)	-1.77 ± 11.66	-0.65 ± 11.83	1.11 ± 5.62	0.14

† Variables presented as mean ± standard deviation. * $p < 0.05$.
Abbreviation: FR, functional reach; n, number of participants; OLS, one leg standing; SPPB, short physical performance battery; TUG, timed up and go test.

Table 3
The correlation between adherence and changes of pre-posttest in all physical performance measures.

N = 56	SPPB	FR	TUG	10 meters (s)	OLS	Sit-to-reach flexibility
Correlation coefficient†	0.35	0.28	-0.71	-0.62	0.30	0.16
p value	0.01*	0.04*	< 0.01*	< 0.01*	0.02*	0.25

† Data presented as Pearson correlation coefficient. * $p < 0.05$.
Abbreviation: FR, functional reach; N, number of participants; OLS, one leg standing; SPPB, short physical performance battery; TUG, timed up and go test.

Table 4
The physical performance measures of high and low attendance participants at baseline (n = 56).

Variables at baseline†	HG (n = 28)	LG (n = 28)	*p* value
SPPB (0–12, score)	9.54 ± 1.86	9.14 ± 2.66	0.52
FR (cm)	16.00 ± 6.32	16.48 ± 5.54	0.76
TUG (s)	13.00 ± 5.26	13.05 ± 4.96	0.97
10 m-time (s)	12.25 ± 3.87	12.79 ± 4.80	0.65
OLS (s)	7.26 ± 8.72	7.07 ± 8.12	0.93
Sit-to-reach (cm)	-2.04 ± 12.85	-1.50 ± 10.57	0.87

† Variables presented as mean ± standard deviation.
Abbreviation: FR, functional reach; HG, high adherence group; LG, low adherence group; n, number of participants; OLS, one leg standing; SPPB, short physical performance battery; TUG, timed up and go test.

Table 1
The socio-demographic characteristics and adherence between the high and low adherence groups.

Characteristics of study participants	All (n = 56)	HG (n = 28)	LG (n = 28)	*p* value
Age (years), mean ± SD	76.52 ± 6.54	75.75 ± 5.83	77.29 ± 7.21	0.39
Body mass index (kg/m^2), mean ± SD	25.17 ± 3.58	24.48 ± 3.02	25.85 ± 4.00	0.15
Female population, n (%)	44 (78.6)	21 (75)	23 (82.1)	0.51
Education, n (%)				0.38
No education	17 (30.4)	11 (39.3)	7 (25.0)	
Elementary	33 (58.9)	13 (46.4)	19 (67.9)	
High school (or above)	6 (10.7)	4 (14.3)	2 (7.2)	
Comorbid conditions, n (%)				
HTN	31 (55.4)	13 (46.4)	18 (64.3)	0.18
DM	11 (19.6)	5 (17.9)	6 (21.4)	0.74
HD	6 (10.7)	2 (7.1)	4 (14.3)	0.39
Arthritis	24 (42.9)	9 (32.1)	15 (53.6)	0.11
Stroke	4 (7.1)	3 (10.7)	1 (3.6)	0.30
Adherence (%), med (IQR 1, 3)	71 (50, 83)	83 (79, 92)	50 (42, 62)	< 0.01*

The *p* values were computed by independent t (normality data), Mann-Whitney U (non-normality data), or chi-square (categorical data) tests. * $p < 0.05$.
Abbreviations: DM, diabetes mellitus; HD, heart disease; HG, high adherence group; HTN, hypertension; IQR, inter-quartile range; LG, low adherence group; med, median; n, number of participants; SD, standard deviation.

Table 5
Physical performance measures at pre- and post-test changes between low and high adherence groups.

Pre-post change of variables[†]	HG (n = 28)	LG (n = 28)	*p* value
SPPB	0.82 ± 1.31	0.21 ± 1.29	0.09
FR (cm)	2.11 ± 3.37	0.04 ± 2.75	0.01*
TUG (s)	-1.39 ± 0.70	0.49 ± 0.90	< 0.01*
10m walk (s)	-1.86 ± 1.93	0.42 ± 2.61	< 0.01*
OLS (s)	2.13 ± 4.42	-0.41 ± 4.19	0.03*
Sit-to-reach (cm)	1.71 ± 6.67	0.51 ± 4.38	0.43

[†] Variables presented as mean ± standard deviation. * $p < 0.05$.
Abbreviation: FR, functional reach; HG, high adherence group; LG, low adherence group; n, number of participants; OLS, one leg standing; SPPB, short physical performance battery; TUG, timed up and go test.

nity-dwelling older Chinese, contrasting to the gain by 0.072 m/s after one year in this study. Also, our participants demonstrated mean difference improvements in SPPB (0.52 point) and gait speed (0.072 m/s) at 1-year reassessment, both of which exceed the small meaningful change of SPPB (0.5 point) and gait speed (0.05 m/s) reported by Perera et al.[19]

In addition, we believe the following determinants contribute to the improvements in physical performance of these participants following one year. First, the program design consisted of health promotion exercises, recreational activities, handcrafts, etc., which motivated the participants to take part in community physical activity rather than staying home watching TV. Second, the dosage of physical activity, each for nearly 90 minutes and accumulating to over 150 minutes weekly, matches the recommendation by ACSM for the elderly;[12] continuing this routine for one year might have caused physical performance progress.[9–12] Chase et al. demonstrated that a longer duration of intervention sessions was also associated with larger intervention effects.[10] Third, the median adherence of 71% (average 68.9%) in the study is close to the mean value of community-based group exercises for a long-term period in two systematic reviews by van der Bij et al. and Farrance et al., which might have improved physical performance.[14,16] We also found that the adherence was related to the gains in most physical performance measures among the participants. Finally, the trained local community volunteers played an important role in leading and disseminating the programs. Buman et al. indicated that using peer volunteers as delivery agents may enhance the long-term maintenance of physical activity gains for older adults.[25]

With societies facing increased population aging, how to maintain a lifelong physical activity for the community older adults is a recognized area of concern. Developing an ideal strategy and ensuring cost effectiveness in physical activity programs have been a significant concern in most advanced countries. Therefore, various types of physical activities or exercise programs as a community-based service model, tailored according to different cultural backgrounds and lifestyles from different countries, were initiated and implemented by the public health officials and policymakers.[2–7]

The CCS program is currently being translated into community-based settings by the Taiwanese government to implement community eldercare and aging strategies in place.[5,6] Different from other national programs in previous studies, such as Enhance®Fitness[2,11] and the Geriatric Multidisciplinary strategy for the Good Care of the Elderly (GeMS-project),[14] the CCS program model, led by the trained volunteers, focuses on an exercise component for 1–1.5 hours and provides a multidimensional service for community older adults in half a day. The content of the program includes elderly basic care, blood pressure and body temperature measurement, consultation, public or health information delivering or speech, group-based exercises, recreational or handcraft activities, etc. This type of service program, like a kindergarten for children living nearby to get into school, provides the local community older adults with a half day-care service and the trained volunteers are seemingly their "teachers."

Compared to the previous studies having more reliance on the trained professional staff, this study investigated the effects of physical performance and adherence among the community older adults regularly participating in the CCS program led by only the trained local community volunteers. From a practical long-lasting perspective and the limited health professional resources, it could be meaningful to implement and disseminate the community group-based physical activities by local community volunteers. Layne et al. showed that promoting community-based strength training programs for older adults became feasible and practicable through leadership training involving peers as well as health and fitness professionals.[26] Peer volunteers represent a potentially lower cost alternative to trained professional staff, in view of increasing the likelihood of dissemination into community settings.[25–27]

The CCS program was convenient, accessible, and involved no transportation; even when most older adults walked or rode a bike to participate, the mean adherence for one year was near 70% in this study. Compared to previous studies, the long-term adherence of our participants is close to that investigated by Farrance et al. and Killingback et al.,[16,17] a little higher than those of some previous studies,[13–15] and lower than that of Liang et al.[7] We thought that most of the participants were either neighbors or lived near the "community stations"; they already knew each other and got together to participate in the "class activity."[5–7] This condition could support, to some extent, social connectedness, which could bring neighborhood relationships closer and promote attendance.[13,16,17] Different from Liang et al.'s study, continuous health professional involvement in the CCS program could be the major difference.[7]

This study showed a significant relationship between the adherence and gains in most physical mobility activities after one year among the participants. However, we did not find any significant improvement in the LG, rather little regress was witnessed in some physical performance measures. In contrast, the HG showed significant progress in most physical performance measures. This result supports the previous studies indicating that community older adults, only if there is a 70% attendance rate or above while partaking in community group-based physical activity for a longer period, could achieve the apparent progress in physical mobility.[14,16] However, different from previous studies conducted by the health professionals or exercise instructor, the CCS program in the study was offered only by the local community volunteers.

4.1. Limitations

First, although our participants showed significant improvement in most performance tests following one year in the study, it should be interpreted with caution due to having no control group. Further, these participants, recruited from only Hualien County are not representative of all community older adults currently participating in the CCS program in Taiwan. Perhaps, our results can be further validated by a larger scale study. Second, many factors might have affected the participation rate, including personal factors, nutritional status, medications, depression, mental well-being, fatigue, loneliness, living or marital status, etc.,[13–19] and whether these factors affected older adults in the LG need further investigation. Third, we did not record the physical activity level during, and describe participation in other exercises among the participants prior to the CCS activity, which could bias the physical outcomes between the HG and

LG. Lastly, the progression of health promotion exercises was not individually adjusted by the trained volunteers, which might have affected the possible further progress of physical performance among these participants. These could be explained by our participants presenting lower gains, albeit significant, in physical improvements than those by Liang et al.[7]

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Disclosure statement

The authors declare no conflict of interest.

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