

Research Report

Evaluating the Effect of a Group Physical Fitness Program on Activity and Participation in Community Dwelling Older Adults

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Abstract

Background: The effect of exercise interventions on physical function in older adults is well known. However, the effect of improvements in physical function on activity and participation has not been studied in detail. **Aim:** This study attempted to evaluate if group physical fitness program led to improvements on activity and participation; and correlation between changes in physical functions and activity and participation. **Design:** Single group pre-post intervention design, delivered as part of an on-going community outreach program of the department. **Methods:** A group physical fitness program was delivered once a week as part of an on-going community outreach program. Changes in Functional Fitness Test scores and selected components of activity and participation from the ICF geriatric core sets were used as outcome measures to evaluate the effect of intervention. **Statistical Analysis:** Normally distributed data were summarised as mean and standard deviation; and non-normal data were described as median and inter-quartile range. Correlation was assessed using Spearman's correlation. Significance was accepted at $p < 0.05$. **Results:** A total of 15 participants were screened of which 8 (Mean age \pm SD: 68.6 ± 4.7) attended at least 4 sessions and completed pre and post assessment. There was no significant effect of the training program on activity and participation. Improvement in Functional Fitness did not correlate with changes in activity and participation. **Conclusion:** The group physical fitness program did not significantly improve

activity and participation despite improvements in physical function.

Keywords: ICF, Geriatric Core Sets, ICF Qualifies, Functional Fitness Tests, Geriatrics.

Introduction

Ageing, is broadly defined as “the time-dependent functional decline that affects most Living organisms”.¹ It results in a gradual loss of function in all organs. The process of ageing leads to deterioration in muscle strength, flexibility and cardiorespiratory fitness which in turn results in decreased physical activity and functional abilities.²

In older adults, the propensity to live in the community or institution depends majorly on their independence in activities of daily living and activity level.^{3,4} Previous studies on older adults have shown that aerobic exercise improves the physical fitness and health status, thereby postponing the functional decline.^{5,6} Aerobic exercise can be taken up either as routine physical activity or as exercise.

World Health Organization (WHO) proposed a framework known as International Classification of Functioning, Disability and Health (ICF) in 2001 which measures health and disability in a holistic manner. WHO states “ICF is a framework for measuring health and disability at both individual and population levels”. The framework

is designed to measure health at the level of body structure and function, activity and participation (AP). It also considers the effect of personal and environmental factors on health and disability. Though ICF provides a valid and reliable basis for identification of relevant health-related problems, it contains over 1450 categories forbidding its use in regular practice.⁷ Therefore, derivatives of the ICF have been developed in the form of ICF core sets. According to WHO "ICF core sets facilitate the description of functioning in clinical practice by providing lists of categories that are relevant for specific health conditions and health care contexts to allow a user friendly description of functioning and disability, and to support the applicability of ICF in practice".⁸ Brief and comprehensive ICF core sets have been developed for various health conditions and population including older adults. Sophie L. W. Spoorenberg in 2015 developed and validated an ICF core set for use in geriatric population.⁹ This concluding list of geriatric core set consists of 29 ICF categories provides an opportunity for evaluating health and disability in older adults in a comprehensive manner.

Exercise and physical activity, delivered at individual or group level, have shown to improve fitness and functional abilities in older adults. But the impact of such exercise programs on AP has not been adequately evaluated. Hence, this study was planned with the following objectives:

- Assess the effect of group physical fitness program on AP in community dwelling older adults.
- Assess the correlation between change in functional fitness with changes in AP.

Methodology:

Design: Single group pre-post intervention design, delivered as part of an on-going community outreach program of the department. Verbal consent was taken from the participants after were explaining about the structured pre and post assessment and about the possibility of assessment scores being reported to academic audience.

Setting: A peripheral meeting centre of a non-profit organisation for older adults living in community. It provides a platform for older adults to move out of their homes and meet their peers for over two hours, five days a week.

Participants: Participants aged 60 years and above, who were members of the non-profit organisation were included for the outreach activity.

Inclusion Criteria: All the members of the organisation attending a specific peripheral centre were considered to be eligible for the program.

Exclusion Criteria: Participants who did not have the ability to walk independently with or without walking aid. Participants who could not complete at least four exercise sessions within two month period were excluded from the analysis.

Outcome Measures

Functional fitness tests

Functional Fitness Test (FFT), also known as senior fitness test was developed in 2001.^{10,11} It has easy test items assessing the functional fitness of older adults, implying their ability to perform basic activities of daily living. Six tests are included in this manual. They are chair stand, arm curl, two minute step test, chair sit and reach, up and go, back scratch test.

The following tests were performed in this program:

- 30 seconds Chair stand test assesses the lower limb strength. It measures the number of full stands that can be completed in 30 seconds with arms folded across chest.
- Arm curl assesses upper limb strength by measuring the number of biceps curls that can be completed in 30 seconds. A 2 Kg weight was used instead of the recommended weight due to availability and was kept constant throughout the program.
- Two minute step test assesses aerobic endurance

by means of number of full steps completed in 2 minutes, raising each knee to a point midway between the patella and iliac crest.

- Chair sit and reach measures flexibility of lower limb where in the distance between extended finger and big toe is measured in a person sitting on a chair, with legs extended and hands reaching towards toes.
- Back Scratch Test measures flexibility of upper body where the distance between two extended middle fingers is measured with one hand reaching over and behind the shoulder and the other reaching up the middle of the back.
- Up and Go test, which measures agility and balance was not included due extraneous reasons.

ICF geriatric core set

ICF Geriatric Core set⁹ constitutes of 29 ICF Categories of which 10 categories (52 subcategories) are from AP domain. The core set reflects the most relevant health-related problems of community-living older adults without dementia. For the purpose of this study, eight out of 10 categories (except toileting and family relations) and relevant subcategories (17 out of 52) from the AP domain were used to assess activity limitations and participation restriction of the participants. The ICF categories along with their subcategories included in this study are summarised in Table 1. ICF qualifiers were used to assess the participants’ performance in his or her environment of the selected AP categories. The ICF qualifier is five point ordinal scale (scores ranging from 0 – 4) indicating varying levels of difficulty. In this study, based on the number of selected subcategories, the score would range from a minimum of zero (indicating no difficulty in completing the activities) to 68 (indicating total disrupting the persons day to day life). The scale was explained to the participants and they were scored according to their perception of limitation in their activities. The scale is summarised in Table 2.

Table 1: Categories of the ICF Geriatric Core Set in Activity and Participation Domain

ICF Code	ICF Category	Activities included under the category
d410	Changing basic body position	d4100Lying down d4101Squatting d4102Kneeling d4103Sitting d4105Bending
d450	Walking	d4500 walking short distance d4501 walking long distance d4502 walking on different surfaces d4503 walking around obstacles
d470	Using transportation	d4701Using private motorized transportation d4702Using public motorized transportation
d510	Washing oneself	
d520	Caring for body parts	d5202 caring of hair d5204 caring of toenail
d540	Dressing	
d550	Eating	
d560	Drinking	

Table 2: ICF Qualifiers and their descriptions

ICF Qualifier	Code	Description
No difficulty	0	Person has no difficulty in completing the activity.
Mild difficulty	1	Problem that is present less than 25% of the time, with an intensity a person can tolerate and which happens rarely over the last 30 days.
Moderate difficulty	2	Problem that is present less than 50% of the time, with an intensity, which is interfering in the persons day to day life and which happens occasionally over the last 30 days.
Severe difficulty	3	Problem that is present more than 50% of the time, with an intensity, which is partially disrupting the persons day to day life and which happens frequently over the last 30 days.
Complete difficulty	4	Problem that is present more than 95% of the time, with an intensity, which is totally disrupting the persons day to day life and which happens every day over the last 30 days.

Assessment Time Point: Assessment was performed twice; one at the beginning of the program and the other after four sessions of intervention.

Program: A pragmatic intervention strategy was used for this outreach program. Its purpose was to get the participants to increase their activity

levels by focusing on balance, agility and cardio-respiratory fitness^{12,13}. It took into consideration the participant’s interest and fatigue levels. The program was delivered once a week and each session lasted between 45 – 60 minutes. For the purpose of this study, all the participants functional fitness was evaluated prior to beginning of the program and the activities were designed based on their existing fitness levels. The activities were primarily delivered in the form of games and were progressed gradually by increasing the duration, number of repetitions and complexity. The participant’s post intervention assessment was done when they completed four sessions of training. A sample of activities that were used as part of the intervention are listed below:

- Balance the balloon between abdomen
- Balance the balloon between knees
- Walk and stop
- Coordinated movement on command (in and out)
- Cognitive and motor dual task
- Tandem walking and figure of 8 walking
- Strengthening of upper limb (wall push up)
- Lower limb (squats, lunges, spot walking)

Analysis

The data was checked for normality using Shapiro-Wilk test. Normally distributed data were summarised as mean and standard deviation; and non-normal data were described as median and inter-quartile range. Within group pre post comparison was performed using paired t test and Wilcoxon Signed rank test for normal and non-normal data respectively.

Correlation was assessed using Spearman’s correlation. Level of significance was set at 0.05 for all the analysis.

Results

A total of 15 participants were screened of which 8 attended (3 males, 5 females) at least four

sessions and completed pre and post assessment. The mean age of the participants was (Mean age ±SD: 68.6±4.7). The flow of participants through the program is described in figure 1.

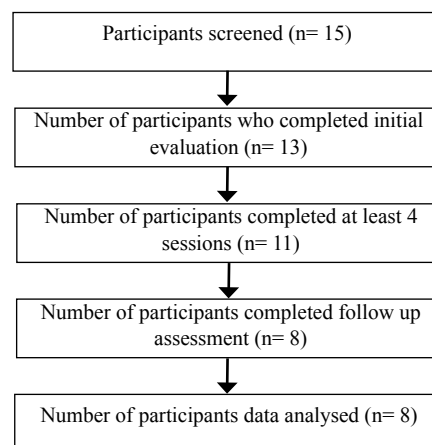


Figure 1: Participants consort flow diagram

Changes in FFT and AP: Three components of FFT (chair stand, Arm Curl and Step Test) were normally distributed. Descriptive statistics and pre post comparison of the normally distributed data are summarised in Table 3. Two components of FFT (sit and reach test and back scratch test) were non-normally distributed. Hence, data was presented as median and inter-quartile range. Within group pre-post comparison was done Wilcoxon Signed rank test. The descriptive statistics and pre post comparison of the non-normally distributed data are summarised in Table 4.

Table 3: Difference in Normally Distributed Components of Functional Fitness test

Variables	Pre-Intervention (Mean±SD)	Post Intervention (Mean±SD)	p Value* 95% CI
Chair Stand test**	10.5±1.5	12±2.2	0.003 (-2.2, -0.7)
Combined Arm Strength**	29.3±5.8	37.3±7.0	0.002 (-11.8, -4.1)
2 Minute Step Test**	129.25±39.2	154.88±45.9	0.003 (-38.9, -12.3)

CI: Confidence Interval; SD: Standard Deviation

* Determined using paired t test

**Number of repetitions

Table 4: Difference in non-normally Distributed Components of Functional Fitness test

Variables	Pre Median (IQR)	Post Median (IQR)	Z Value	p value*
Sit and Reach Test	-22.0 (-23.75, 0.00)	-9.0 (-21.00, 0.75)	- 2.384	0.017
Back Scratch Test	2.25 (0.375, 3.750)	1.0 (-2.25, 5.00)	- 0.210	0.833
Total of Activity and Participation	6.50 (0.25, 20.25)	7.50 (0.75, 16.50)	- 0.412	0.680

*Determined using Wilcoxon Sign Ranked Test

Correlation between Change in FFT and Change in AP: Correlation between difference in components of FFT with difference in AP were analysed using Spearman Correlation. The correlations are summarised in Table 5.

Discussion

Physical fitness is an important attribute that determines functional abilities in older adults.¹⁴ Though it has been established that a physical fitness program improves fitness attributes and decreases the risk of falls¹⁵, its impact on AP is largely unknown. Not many studies have assessed the effect of a group fitness program on activity and participation in older adults using the ICF framework. This study attempted to bridge this knowledge gap by assessing the impact of a group physical fitness program delivered through a community outreach program.

The main hypothesis of this study was that a group physical fitness program will lead to changes in AP. The results of the study indicated that such changes in AP did not happen in this population. A few factors could have contributed to these findings. To begin with, the participants did not have any significant difficulty in their AP (represented by median scores of 6.5 – 7.5 out of a maximum of 68).

Most of them were independent in ambulation and were able to commute between their homes and the community centre on their own. Secondly, not all categories were scored during the post intervention assessment. For example, a few participants were using public transport at the beginning of the program and expressed difficulties in performing the activity. During the course of intervention program, there was a change in weather pattern due to onset of monsoon and due to this change, participants started using private transport. Consequently the subcategory of using public transport was not applicable to those participants and the impact of the fitness program on level of difficulty in using public transport could not be assessed.

The onset of monsoon after the beginning of the program led to drop in temperature, due to which the participants perceived increase in pain and stiffness, and consequent difficulty in AP. Change in weather patterns and temperature is known to influence pain perception. A study conducted in Netherlands enrolled 222 participants with osteoarthritis of hip joint. The reported symptoms were compared with a variety of weather variables and it was found that pain and stiffness slightly worsened with rising barometric pressure and humidity.¹⁶ Another study in Europe among 800 adults with osteoarthritis of hip, knee or hand found no significant change in symptoms with weather but higher humidity was linked with increasing pain and stiffness, mainly in cold weather.¹⁷

Another possible reason for not detecting a significant change in overall AP could be that the AP scores for all the categories were combined and analysed together rather than for individual components of the AP. The adding of scores of all the components of ICF core sets may have masked

Table 5: Correlation between Difference in Functional Fitness and Activity and Participation

		Difference in 30 sec sit to stand Test	Difference in Arm Strength	Difference in Reach Test	Difference in Back Scratch Test	Difference in Step Test
Difference in Activity and Participation	Spearman’s rho	0.206	- 0.198	- 0.314	- 0.420	0.331
	P Value*	0.624	0.639	0.448	0.300	0.423

*Determined using Spearman Correlation

the changes seen in certain components of the AP. In addition, ICF qualifier is an ordinal scale and may not be sensitive to small change. A study published in 2005 reported that reliability of the ICF codes when measured with the ICF qualifiers is relatively low.¹⁸

The other findings from the study indicated that the intervention delivered at a frequency of once a week was able to bring about meaningful and statistically significant changes in three of the five components of FFT. Maximum change was observed in two minute step test that indicated improved cardiopulmonary fitness. The components of flexibility (assessed using sit and reach test and back scratch test) did not change significantly following intervention. The results can be explained by the intervention strategy that was adopted for this program. The focus of the intervention program was on balance, agility and cardio-respiratory fitness. Lack of adequate focus on flexibility could have led to decreased improvements in flexibility. Balance and agility, though an important component of the training program was not assessed due to feasibility issues.

Strengths: This study attempted to use the ICF framework to assess if changes in physical fitness lead to meaningful changes in function. This approach has important implications for clinical practice, wherein there is greater emphasis on correcting the impairment rather than improving function with an underlying assumption that improvement in impairment will translate to improvement in function. Findings from this study demonstrated that change in impairment may not always translate to change in function. The study also demonstrated that it is possible to incorporate ICF framework in evaluating the impact of interventions in regular clinical practice.

Limitations

Some limitations of this study should also be noticed. Firstly, the FFT which is used for assessment was not according to the protocol. The weight used for arm strength should be of 2.5 kg for women and 5 kg for men. But due to feasibility

issues, a standard 2 kg weight was used for both genders. To ensure uniformity, the weight was kept constant through the study. Secondly, up and go test couldn't be performed due to factors beyond the control of the investigators. For the purpose of analysis, the component scores of AP were added up. This might have masked the effect of individual components. Environmental and personal factors, which are part of ICF frame work, were not included in the assessment.

Conclusion

The group physical fitness program did not significantly affect AP. However, the program delivered at a frequency of once a week improved specific components of functional fitness.

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