



The effect of a 12-week community based exercise programme on Prevention of Falls in people aged 60+ in Liverpool- Liveability Programme

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1. Introduction

The general health and long term illness in Liverpool is amongst the worst in England and Wales (Office for National Statistics (ONS, 2009). There are over 160,000 Liverpool residents between the ages of 49 and 90 and this number is set to increase with about half the population predicted to be in this category by 2024. Further Liverpool residents have a shorter lifespan than the national average; life expectancy is 11.5 years lower for men and 7.8 years lower for women in the most deprived areas of Liverpool than in the least deprived areas of the UK. This is a result of, stroke and heart attack, deaths from smoking, incapacity for mental illness and deprivation and hip fractures amongst over 65s, (Association of Public Health Observatories & Department of Health, APHO, 2010). At present the incidence of hip fracture in the over 65s is significantly worse in Liverpool at 476 cases per year compared to the national average of 458 (Health Profile, Liverpool, 2011).

Further, **the economic burden of osteoporotic fractures and falls on the NHS is significant.** Falls and Injuries are the largest cause of accidental death in older people across Europe (Skelton and Todd, 2004). People aged 65 and older have the highest risk of falling, with 30% and 50% of people older than 65 and 80 respectively falling at least once per year. Costs to the NHS are about £30,000 per person for hip surgery with the total cost peaking at £2.3 billion per year (NICE, 2011). These statistics are alarming and if nothing is done about age related disease more than 10 per cent of people will suffer from a long term illness or disability by 2030 (ONS, 2009). It is crucial that effective approaches to improving health and reducing falls are required.

There is unequivocal evidence that regular physical activity and good levels of fitness can protect against all-cause mortality (Blair et al, 1996). Lack of physical activity leads to a loss in fitness and increased risk of falls (Tinetti and Kumar, 2010). Appropriate amounts of physical activity provide a variety of benefits in prevention of falls such as improvements in strength, balance, and endurance, functional mobility as well as cognitive and psychological effects including better mood and self esteem (CDC, 2008).

Recent evaluations of activity promotion projects in Liverpool (Zest for Life, Liveability) have demonstrated significant potential for increasing physical activity in older people (Minou et al., 2009). However these evaluations have been largely process based and qualitative and have not included specific measures required for further commissioning of services.

2. The Liveability Programme

The Liveability programme is a nurse-led award winning service available to all individuals aged 50 years or over residing in Liverpool. The programme is designed to deliver health messages, increase physical activity and reduce social isolation. This programme focuses on the prevention of health conditions and non-communicable diseases and improving older people's quality of life through increased physical activity. Liveability provides gym based exercise, circuit classes, chair based exercises, line dancing and Tai Chi among other activities. Structured exercise classes are preceded and followed by opportunities for social interaction between participants. Participants are also encouraged to train as volunteers to support the scheme in the role of mentors. Many have taken up this opportunity. Furthermore, Liveability is less resource intensive than the hitherto gold standard Otago model and easier to deliver. Problems with adherence to the intensive regime by both patient and health professional have recently been reported using the Otago approach (Skelton et al., 2005)

Aims

1. The primary aim of this programme was to assess the effect of a 12 week gym based exercise programme on physical activity, fitness and risk of falls in individuals age 60+.
2. The secondary aims were to improve confidence in balance and quality of life.

3. Who took part?

Forty two participants were recruited through leaflets and flyers, self referral, GP referral, word of mouth or referral by other allied health professionals. Participants were mainly female (71%), of white British origin. Twenty five individuals were recruited to the intervention and 17 to the comparison groups. To take part participants had to be, aged 60 years or over, have no existing health issues that could be exacerbated through their participation and reside within in the city of Liverpool. Participants in both the intervention and comparison groups were similar in age, gender, health status and ethnicity.

4. What was measured?

A number of validated assessment and measurement tools were used:

4.1. Anthropometric and demographic data

Demographics and cardiovascular assessment (height and weight, blood pressure)

4.2. Questionnaires

4.2.1. Falls Risk Assessment Tool (FRAT) to assess the risk of falls (NICE, 2004)

4.2.2. Confidence in Maintaining Balance Simpson et al., (2009)

4.2.3. Self report of Physical Activity using the Scale for the Elderly (PASE) – questionnaire Washburn et al., (1993)

4.2.4. Quality of Life questionnaire (SF12) including: Physical and mental Composite Score Melville et al., (2003)

4.3. Objective measurements

Senior Fitness Test: evaluating components including: upper body strength (maximal amount of weighted arm curls), lower body strength (maximal amount of chair-ups), upper body flexibility (back-scratch), lower body flexibility (modified sit-and-reach), and aerobic endurance (maximal distance covered in 2 minutes step) Rickli, and Jones, J (2001).

4.4. Qualitative approach: "Participants Voices"

Focus groups

Participants from both intervention and control groups took part in semi- structured focus groups to get more insight on the effectiveness of the intervention.

5. Analysis

Data were analysed using SPSS (version 17). Mean and SD scores were calculated for age, gender, ethnicity and disability. Participants' height and weight, Body Mass Index (BMI) and prevalence of hypertension were also analysed. A 2 x 2 between-groups analysis of covariance (ANCOVA) was conducted to assess the effectiveness of the intervention in reducing the risk factors associated with falls for male and female participants.

6. Results

6.1. Demographic Data

The total cohort recruited totalled 42 participants. Most were female (71.4%) and a minority considered themselves disabled (26.2%) [see table 1].

Table 1: Demographic data on all participants (n=42)

	Male (n=12)	Female (n=30)
Age, mean (SD)	72.4 (\pm 7.94)	71.8 (\pm 8.05)
Sex	28.6%	71.4%
Age range (min-max)	24 (62-86)	24 (61-85)
Number (%) Consider themselves disabled	4 (33.3%)	7 (23.3%)
Number (%) Caucasian	10 (83.3%)	29 (96.7%)

The most common pre-existing medical complaint was hypertension. Females tended to be overweight [see table 2].

Table 2: Mean Scores, Std Deviation, P value and Percentage change for PASE, ConfBal, FRAT, QoL, SFT for the intervention and the comparison group before and after the intervention

	Group	Time	Mean Scores	Std Deviation	Sig.	Percentage Change
PASE (min·day⁻¹)	Active	1	170.6	81.2	.05	+34
		2	242.1	129.1		
	Control	1	101.	48.4		+3
		2	103.4	57.6		
Conf-Bal	Active	1	26.3	4.5	.002	+7
		2	28.2	3.1		
	Control	2	17.2	4.1		-7.5
			15.7	4.7		
FRAT	Active	1	6.7	1.3	.05	+20
		2	5.5	2.4		
	Control	2	6.7	1.3		+1.3
			6.8	1.2		
QoL PCS	Active	1	22.4	2.3	.118	+4
		2	23.4	1.1		
	Control	2	17.5	2.1		+11
			19.6	2.9		
QoL MCS	Active	1	12.4	2.4	.674	+8.8
		2	13.5	1.9		
	Control	2	9.2	1.6		+8.6
			10.1	1.3		
QoL Total	Active	1	34.8	4.5	.385	+6
		2	37.	2.7		
	Control	2	26.8	2.6		+10
			29.8	3.5		
SFT	Active	1	34.6	17.4	.001	+59
		2	62.6	20.4		
	Control	2	18.9	16		+42
			28.8	21.4		

- **Physical Activity Scores for Elderly (PASE)** mean scores (min/day) showed that physical activity levels significantly increased by 35 per cent post intervention ($p < .05$) (table 1)
- **Falls Risk Assessment (FRAT)** scores reduced in the intervention group by 20 per cent. The scores neared significance between the two groups before and after the intervention ($p < .05$). The risk of falls in comparison group increased by 1.3 per cent after the intervention (table 1)
- **Confidence in Balance** improved in the intervention group. The difference in confidence in balance was highly significant ($p < .002$) between the intervention and comparison group. Whilst the intervention group increased their confidence in Balance by 7 per cent after the 12 week exercise programme, the comparison group showed decreased by -7.5 percent (table 1)
- **Senior Fitness Test (SFT)** mean scores improved by 59 per cent in (*functional ability and performance-based measures for strength, Chair Stands, Arm Curls and for flexibility, Sit-and-Reach*) the intervention group and by 42 per cent in the comparison group after the intervention. Although the comparison group demonstrated higher mean scores after the intervention, the between group interaction was significant ($p < .001$) (table 1)
- **Quality of Life** encompassing physical and mental composites increased in both groups. The intervention and comparison group improved their quality of life by 6 per cent and 10 per cent respectively. There was no significant difference between the two groups. However the mean scores for the comparison group were lower before the intervention compared to the intervention group (table 1)

7. Qualitative data

7.1. Focus groups

All participants from the intervention and comparison groups took part in the focus group interviews. The number of people in each focus group ranged from six to eight people. Five focus groups were conducted, three with the intervention group and two with the comparison group. Focus groups were run in quiet rooms familiar to participants (Lifestyle Centre for the intervention group; Residential Homes for the comparison group). The focus groups discussions were guided by the RE-AIM framework (Glasgow et al, 1999) and Precede-Proceed Model (Green et al, 1999) and were recorded using a dictaphone. Informed consent, participant anonymity and confidentiality were ensured at all times.

7.2. Analysis

The audiotapes were transcribed verbatim immediately after the focus groups. Nvivo v2 was used to analyse the data thematically.

7.2.1. Intervention group

Participating in the Liveability programme stimulated some significant health related changes over and above those recorded from the comparison group. Focus group data suggested that taking part in the 12-week exercise programme for the intervention group improved the participants' physical, mental/emotional and social health. The main emerging themes were as follows:

a) Physical health:

- Muscle gain
- Improved mobility
- Confidence in maintaining balance
- Feeling stronger and fitter

"...and he [the instructor] encouraged us to use weights then the bigger weights as well which I suppose was an indication that we were getting better you know we were getting better.."

"It's [the exercise programme] improved my breathing"

"My flexibility has improved and has my balance"

"I can do things that I probably had difficulty doing six months ago, I'm now much, much better..."

b) Emotional health

- Overcoming emotional problems
- Feel stronger mentally
- Improved confidence in general and in doing exercise

"...coming here [to the liveability programme] has helped me forget about my problems..."

"...it [the programme] makes you feel so strong in your mind as well..."

"I feel very positive and more confident now..."

c) Social health

- Meeting new people
- Finding out about new opportunities

"The project has given me more perspective on my day..."

"Socially it gives me something else to talk about with me and my friends..."

"Well I like this gym because of our age because I would definitely not go to an open gym where all these young men and young women are all..."

"...coming in a group like this where you're all I mean we're young here, sort of thing, and everybody's in the same sort of boat, everyone wants to try and improve their lifestyle, improve their physical ability and so on and you're all doing it at the same time and I think that is a big plus..."

"I do have a social life, so I just come for the health benefits..."

"I spend time with my family and my sister, we go shopping together, I come to this project to get healthy..."

7.2.2. Control group

Participants from the control group who did not attend the 12-week exercise sessions didn't show improvements in their physical, emotional or social health. They considered themselves active enough to the best of their ability and their social activities were around visiting family and friend once or twice a week as well as partaking in occasional social events in the sheltered accommodation. The quotes below exemplify the health status of these individuals.

a) Physical Health

"Well I have to use a stick now ..."

"...and I can't you know I sort of do a little bit of housework, I get tired when I'm out walking ..."

b) Emotional Health

"I feel down at the moment, I'm hoping that, you know I'm on steroids at the moment..."

"Well that's [mood] up and down yeah, it all depends how I get up of a morning, whether I have to do nothing or I get stuck in and do something..."

"...You know, I do have mood swings..."

c) Social Health

"I see my daughter and grandchildren every Sunday and I pick them up from school sometimes..."

"It's very quite here and sometimes you don't feel like going out..."

"I mean you have no focus, you get washed and changed and want to go back to bed..."

"I go to Bingo some Thursdays..."

8. Discussion

This study examined the effectiveness of developing and implementing an award winning, community-based exercise program for older adults in South Liverpool. The aim of the project was to assess the effect of a 12 week gym based exercise programme on physical activity, fitness and risk of falls in individuals age 60+. The secondary aims were to improve confidence in balance and quality of life.

The research findings indicated a significant change in participants' physical activity levels. Physical Activity Scale for the Elderly (PASE) suggested that participants from the intervention group increased their life style and light intensity activity levels after the intervention. The health benefits of partaking in regular exercise sessions yield from other measurements.

The exercise programme was effective in reducing the risks of falls, improving fitness, balance maintenance and quality of life. Participants showed improvement in upper body strength (maximal amount of weighted arm curls), lower body strength (maximal amount of chair-ups), upper body flexibility (back-scratch), lower body flexibility (modified sit-and-reach), and aerobic endurance (maximal distance covered in 2 minutes step) assessed by senior fitness test. The one hour twice a week exercise sessions provided low intensity challenges to maintain balance for participants. The programme was of sufficient dose of 2 hours per week and duration of 12 weeks to have an effect. Although (Nelson et al., 2007) proposed that greater dose of exercise over longer period of time might be needed for the effect, but 2 hours per week has been identified to be the minimum

recommended dose. For the effects of the exercise to be sustained exercise should be regular and continuous as benefits reverse when exercise is ceased (Gillespie et al., 2009). Liveability offered exercise classes which included balance specific, individually-tailored and targeted training for dynamic balance, strength, bone, endurance, flexibility, pace and functional skills, and functional floor exercises.

The baseline measurement showed that not all participants were at significant risk of falls, however all participants reduced their risks of falls as a result of attending the exercise sessions. Hence preventive interventions should be aimed at the general older population not just those who are at high risk (Sherrington et al., 2011).

Qualitative findings post intervention suggested that the Liveability programme enabled individuals to take up physical activity opportunities separate from the Liveability service. This indicated that the group based 12-week exercise was effective in motivating participants to be active at home and other places and therefore maintain the effect of the programme.

The Liveability programme offered resistance training which included muscular endurance, muscular strength, techno gym; easy line training power plate (vibration training) and aerobics. Participants used dumbbells and resistant bands as part of their training. Also some modified Tai Chi was included in the cool down of each training session. These type of exercises improved participants' motor skills, coordination, balance and agility. Although this type of training may not seem to be essential for prevention of falls, there are many benefits from this type of exercise including: improved posture, mobility, and flexibility which help stabilise the levers of the body during movement and maintaining balance (American College of Sports Medicine position stand, 2009). Furthermore, reduced muscle strength can significantly increase the risk of falls. Therefore effective and appropriate strength or resistance training will have longer-term falls prevention benefits (Moreland et al., 2004).

If participants were not being able to attend the structured activity sessions on the specific days of the week, extra sessions were held to make sure everybody benefited from the intended exercise volume i.e. 2 hours per week for 12 months.

The Liveability programme is supported by findings from recent studies that demonstrated effectiveness of fall prevention programmes that promote balance and strength. Therefore regular and appropriate physical activity is essential to maintain daily function in older people (Tremblay and Barber, 2011).

Participants reported improvements in their physical, emotional and social health after attending the exercise programme. Liveability offered user friendly facilities and great deal of support and encouragement. Participants were given the opportunity to mix with their counterparts and meet new people and have stimulating conversations while attending the sessions. Focus groups data from the control group didn't yield positive changes in participants' health status as they didn't report any improvement in their physical, emotional or social health.

In conclusion, the Liveability programme included 2 hours per week of challenging activities that included a mixture of strength, flexibility and balance exercises in a structured instructor led group session. This mixture of exercises not only increased habitual physical activity but also reduced the risk of falls, improved confidence in balance and increased functional mobility and fitness. As such

the findings from this study concur with those of Sherrington et al. (2011) but also quantify the impact of the programme in increasing physical activity during day to day living. This suggests that community type non-clinical programmes can have a significant preventive effect on risk of falls in older people (CDC, 2008; Tinetti and Kumar, 2010). Further randomised controlled trials are required to confirm these findings.

9. References

American College of Sports Medicine position stand. Exercise and physical activity for older adults. *Med Sci Sports Exerc* 2009; 30(6): 992–1008.

Association of Public Health Observatories & Department of Health (2010) Northwest Health Profile 2010

Centers for Disease Control and Prevention. Preventing Falls: How to Develop Community-based Fall Prevention Programs for Older Adults. National Center for Injury Prevention and Control, Atlanta, Georgia. 2008

Gillespie LD, Robertson MC, Gillespie WJ, Lamb SE, Gates S, Cumming RG et al. Interventions for preventing falls in older people living in the community. *Cochrane Database Syst Rev* 2009; CD007146.

Melville MR, Lari MA, Brown N, Young T, Gray D. Quality of life assessment using the short form 12 questionnaire is as reliable and sensitive as the short form 36 in distinguishing symptom severity in myocardial infarction survivors. *Heart*. 2003 Dec;89(12):1445-6.

Moreland JD, Richardson JA, Goldsmith CH, Clase CM. Muscle weakness and falls in older adults: a systematic review and meta-analysis. *J Am Geriatr Soc* 2004; 52(7): 1121–9. doi:10.1111/j.1532-5415.2004.52310.x

Nelson ME, Rejeski WJ, Blair SN, Duncan PW, Judge JO, King AC et al. Physical activity and public health in older adults: recommendation from the American College of Sports Medicine and the American Heart Association. *Med Sci Sports Exerc* 2007; 39(8): 1435–45. doi:10.1249/mss.0b013e3180616aa2

(NICE, 2004) <http://www.bhps.org.uk/falls/documents/FRATtool.pdf>

Rickli, R.E & Jones, J (2001) Senior Fitness Test Manual. Champaign. Human Kinetics

Simpson JM, Worsfold C, Fisher KD, Valentine JD. The CONFbal scale: a measure of balance confidence--a key outcome of rehabilitation. *Physiotherapy*. 2009 Jun;95(2):103-9. Epub 2009 Mar 24.

Sherrington C, Tiedemann A, Fairhall N, Close JC, Lord SR. Exercise to prevent falls in older adults: an updated meta-analysis and best practice recommendations. *N S W Public Health Bull*. 2011 Jun;22(3-4):78-83. *Age Ageing*. 2005 Nov;34(6):636-9.

Skelton D, Dinan S, Campbell M, Rutherford O. Tailored group exercise (Falls Management Exercise -- FaME) reduces falls in community-dwelling older frequent fallers (an RCT).

Tinetti ME, Kumar C. The patient who falls: "It's always a trade-off." *JAMA*, 2010;303(3):258-66.

Tremblay K.R., Barber C.E. (2011), Preventing Falls in the elderly, *Colorado State University*

Washburn RA, Smith KW, Jette AM, Janney CA., The Physical Activity Scale for the Elderly (PASE): Development and Evaluation. *J Clin Epidemiol*. 1993; 46:153-162.