

**EFFECTS OF A COMMUNITY BASED
STRENGTH TRAINING PROGRAM ON
FUNCTIONAL STATUS AND QUALITY OF LIFE
IN OLDER ADULTS**

FINAL REPORT

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Executive Summary

There are a number of health benefits associated with physical activity and strength training, however, most research involves the evaluation of programs in a strict “laboratory” setting. The Living Longer Living Stronger™ (LLLS™) program is a community based strength training program for people 50 years of age and over. Council on the Ageing Victoria (COTA) endorses facilities as LLLS™ partners and there are currently over 110 partner facilities across Victoria. The aim of the endorsement scheme is to ensure the provision of accessible cost effective, quality strength training programs.

Project Aims

The main aim of this project was to investigate, in a *real life context*, whether there is a significant improvement in self-rated health, cardiovascular fitness, muscle strength, balance, gait, activity level, mental health and quality of life in older adults participating in this community based program. The project also aimed to obtain information from focus groups about program effectiveness and ways to improve, modify and expand the existing program.

Methodology

Participants were recruited through selected LLLS™-endorsed fitness centres in metropolitan Victoria. Participants had to be aged 50 or over, representing both men and women, living in the community or retirement village, able to speak English, and able to provide informed consent. Participants had to be new clients to the LLLS™ program, that is, had not started or had completed no more than 5 weeks of the LLLS™ program.

Participants were assessed at baseline, 4 and 8 months on a range of physical measures and self reported health and well being questionnaires. Level of program adherence was also recorded on calendars. In addition, participants were invited to attend focus groups to discuss their perceptions of the LLLS™ program – the benefits from undertaking the program, any problems encountered and suggestions to improve the program. To capture the views of participants who withdrew from the LLLS™ program exit surveys were forwarded

to them. The survey investigated reasons for ceasing the program and their perceptions of the program.

Results

Results from the assessments confirmed many of the positive findings reported in the focus groups and exit surveys.

Assessments:

Sixty six participants were recruited and assessed at baseline. Thirty five participants completed a 4 month assessment, and 24 remained to complete an 8 month assessment. Data was analysed for both sample groups - the 35 participants and the 24 participants.

A number of significant improvements were identified for participants overall (both the 35 and 24 sample), including the step test, stride length, distance covered in 6 minutes, sit to stand, and in the physical performance test (7 & 9 item) and reported health transition (SF-36).

Where no significant improvement or trends were evident, generally performance levels were maintained, very few measures reported a drop in performance.

The 35 participants who had completed a 4 month assessment also demonstrated significant improvement in self reported vitality (SF-36), quality of life (AQoL) and left shoulder abductor strength at 4 months.

The 24 participants who remained to complete an 8 month assessment also demonstrated significant improvement in role physical and mental health and gait velocity, although vitality, AQoL and left shoulder abductor strength were no longer significant.

In the 35 sample (all with a 4 month assessment) there were significant differences favouring high compliers in relation to vitality and social functioning, the step test, sit to stand and the right shoulder abductor and right elbow extensor strength.

In the 24 sample (all who completed an 8 month assessment) there were fewer significant differences over the time sequence (baseline, 4 & 8 months) between high and low compliers, they included the step test, the sit to stand and the right elbow extensor strength. In relation to the sit to stand and the step test, both high and low compliers showed significant change over time however high compliers significantly improved in the first 4 months compared to low compliers who significantly improved in the subsequent 4 months. In relation to the right elbow extensor strength, high compliers showed significant improvement in the first four months compared to low compliers but there was no significant difference in the subsequent 4 months. Therefore, over time, level of participation is less relevant to overall improvement.

Focus groups:

Nine participants still involved with the LLLS™ program attended a focus group. Participants' experiences of the LLLS™ program were positive and a range of benefits, both physical and psychosocial, were reported. On going, long term involvement with the program was associated with a number of factors. They included the health and well-being benefits that participants perceived in their own abilities and health and those of long term participants of LLLS™ program, the support and encouragement provided, the challenge and the social components of the program. However, participants reported that there was a clear need to promote the LLLS™ program as many older people were not aware of the program.

Exit surveys:

Fourteen participants who had withdrawn from the LLLS™ program completed an exit survey. Feedback confirmed the positive aspects of the program - including personal benefits and physical changes (improved strength, balance, stamina etc), and positive comments about the centres and staff. The majority of participants withdrew due to time, health or family commitments and not because they were dissatisfied with the LLLS™ program. Most intended to return to the program in the future. Some negative aspects were also reported in the survey and were associated with the level of support and attention provided by staff in some centres and the dissipation of the LLLS™ group.

Summary

Participation in the LLLS™ program demonstrated a number of significant improvements in quantitative measures of balance, gait, strength, function and self reported health and well-being measures for a group of older people. The assessment findings confirmed many of the benefits reported by participants still involved in the LLLS™ program (in focus groups) and participants who withdrew from the LLLS™ program (in exit surveys). The majority of the withdrawn participants indicated that they would like to return to the program at some time in the future. Therefore, facilities need to ensure that processes are in place to help participants keep in touch with the program (through newsletters or event invitations) and to assist them to more easily return to the program and exercise routine. Wider promotion of the program is also needed, but this may need additional subsidised funding to ensure that the program remains affordable to a range of older people. Further investigation of this highly regarded program is warranted to build on the current findings.

1. Introduction

1.1 Background

The positive effects of exercise on human health and well-being have been widely researched. Various types of physical activity programs have been shown to achieve a range of physical health benefits for older people (King et al, 1998; Pescatello and Judge, 1995; Gardner et al, 2000) including improved fitness, muscle strength, balance, walking and activity level. Physical activity programs have been shown to also result in improved psychological outcomes, including reduced anxiety and depression, improved mood, and improved sense of well-being (Singh et al, 1997; Bravo et al, 1996; Normand et al, 1994; Puggaard et al, 2000). A meta analysis conducted by Netz et al (2005) looking at physical activity and psychological well-being in advanced aged found physical activity had the strongest effects on self-efficacy, and that improvements in cardiovascular status, strength and functional capacity were linked to well-being improvement overall.

However national data indicates that 43% of people over 60 do not participate in sufficient physical activity to maintain/improve health status and this rate of participation has declined in recent years. In fact, adult participation in sufficient physical activity for a health benefit declined from 62% in 1997 to 57% in 2000 (AIHW, 2002).

A number of factors influence dependence in old age including low levels of physical activity and reduced muscle strength. Low level of physical activity has been found to be highly associated with increased risk of decline in functional status (Stuck et al, 1999; Landi et al, 2007). A study by Dunlop et al (2005) looking at functional decline in older adults with arthritis found that lack of regular vigorous physical activity almost doubled the odds of functional decline. Research also shows that age-related diseases, e.g. coronary heart disease and diabetes, are closely related to level of activity and that mortality is reduced by an increased physical activity level (Powell & Blair, 1994). A review of key observational and experimental diabetes studies by LaMonte et al (2005) reported that the evidence indicates that the major behavioural causal factor for

the increasing prevalence of diabetes was low levels of activity and that an active and fit life style reduces the mortality risk in diabetic individuals.

An article by Paterson et al (2007) looking at older people and physical activity literature suggested that exercise prescription should include various types of exercise that are related to maintenance of functional capacity and independence. The authors concluded that exercise prescription should include cardiorespiratory activities, strength/power training and balance-mobility practice, and flexibility (stretching).

A systematic review on the effectiveness of progressive resistance strength training (PRT) in older people concludes that the effects of PRT on muscle strength and some aspects of functional limitations such as gait speed are significant but the effects of PRT on physical disability remains unclear (Latham, et al, 2004). A study that introduced a group mediated cognitive behavioural intervention coupled with strength training found that empowerment based exercise programs may be particularly motivating for older adults by creating a more meaningful physical activity experience for them (Katula et al, 2005). A randomised controlled trial by Damush et al (1999) investigating the effects of strength training on strength and health related quality of life (QOL) in older adult women found significant increases in muscle strength but no significant changes in either mental or physical health functioning or self-reported QOL.

A majority of studies examining the effectiveness of physical activity, including strength training, in physical performance have focused on intensive training programs conducted in laboratory settings (Sullivan et al, 2005; Kasch et al, 1995), and most exercise programs that offered home-based programs focussed on frail older people or older people with some form of disability (Bravo et al, 1996; Worm et al, 2001).

Although overall the existing research suggests a range of health benefits associated with strength training generally, there is a need to determine whether these benefits are translatable to the community setting through a widely available program such as the Living Longer Living Stronger™ (LLLS™) endorsement scheme. The potential benefits include prevention and/or enhanced

management of a range of chronic health problems prevalent in Australia, including diabetes, musculoskeletal disorders (eg arthritis) cardiovascular disease, and obesity. This project aimed to address important gaps in the literature, in particular evaluating a currently available community program as it is delivered in the community now. As such, results reflect real life factors influencing uptake and outcomes for older people undertaking this community based strength training program. Positive results will yield valuable information for providers of strength training programs, and policy and planning staff, to support wide spread uptake of this lifestyle approach to improving health and well-being.

The overall aim of this study is to elucidate if regular strength training may maintain/improve physical functional ability and quality of life in order to assess its capacity for maintaining independence in older people. Secondary aims are to investigate factors associated with uptake and sustained engagement in this existing program, to inform future promotion and increase participation in strength training by older people.

1.2 The Living Longer Living Stronger™ (LLLS™) endorsement scheme

Living Longer Living Stronger™ (LLLS™) is a partnership approach to providing cost effective, community-based, quality strength training programs for people over 50 years of age. LLLS™ programs are accessible due to local provision, because they are low cost and because the facilities undertake to adopt appropriate (welcoming and inclusive) attitudes and practices in the delivery of their programs. Council on the Ageing Victoria (COTA) and the strength training program providers enter into a partnership where COTA endorses the facility as a LLLS™ partner and works with them to deliver the program. To become a partner the provider must agree to deliver progressive strength training in accordance with a defined set of evidence-based criteria. Upon acceptance of their application, providers pay a 'once off' joining fee and an annual subscription fee. In return, the provider receives endorsement as a COTA partner in the delivery of LLLS™ and a variety of benefits such as referrals, promotion and training.

The key LLLS™ endorsement criteria include:

- conducting strength training in a group setting for people over the age of 50,
- providing initial assessments and developing and regularly reviewing individual programs for each participant,
- providing training with a progressive resistance training format,
- providing fully supervised sessions for the duration of the training session and working exclusively with the LLLS™ group for this period,
- ensuring sessions are conducted by people appropriately qualified to work with older adults,
- providing at least two to three sessions per week at a set time slot,
- providing a social component, a space for participants to sit, chat and have refreshments at the conclusion of the training session,
- restricting the participation fee to approximately \$5 per session. A once off assessment fee of no more than \$40 can be charged. Fees can be payable on a fortnightly or monthly basis but no longer, and
- networking with their local Community Health and Rehabilitation centres, GPs, older persons' organisations and other potential referral sources.

At present there are more than 110 partners across Victoria, providing strength training to an estimated 12,500 people over 50 years of age. Venues include fitness and leisure centres, but also community health and rehabilitation centres and community facilities such as neighbourhood houses. Recently, COTA also commenced offering endorsement to personal trainers who are able to deliver the program at a range of venues including residential and aged care facilities, thus further enhancing the potential accessibility of LLLS™.

Initially, COTA received funding from a range of sources including Vic Health, Sport and Recreation Victoria, Department of Human Services and the Department of Veterans' Affairs to support the administration and implementation of the LLLS™ endorsement scheme. Currently COTA's only source of funding for LLLS™ is the Office of Senior Victorians. LLLS™ programs are also available in Tasmania and Western Australia.

LLLS™ has many potential positive outcomes for individuals, their families, communities and for government. It is estimated that 1 in 3 adults over 60 years suffer from chronic illnesses such as diabetes, arthritis, hypertension, and depression.

1.3 Project rationale, aims and objectives

Although the impact of exercise and fitness training on human health and disease prevention has been fairly consistently reviewed, relatively little is known about the impact of *community based strength training* programs on *functional status* and *quality of life* in older adults. Almost all the research of these programs involve structured exercise and/or fitness programs conducted in non-community settings and very little research has been done on the effects of existing community based programs such as LLLS™.

The main purpose of the project is to determine whether the older adults who commence the LLLS™ program benefit from this program in relation to functional status and quality of life. The project investigates in a real life context whether there is a significant improvement in self-rated health, cardiovascular fitness, muscle strength, balance, gait, activity level, mental health and quality of life in older adults by participating in this program. To investigate these issues NARI and COTA submitted a project proposal to the William Buckland Foundation (ANZ Charitable Services). This application for funding was successful.

Successful outcomes from this project and information obtained from participant focus groups will inform community based strength training providers about program effectiveness and ways to improve, modify and expand existing programs for older people.

Desired outcomes include:

- a better understanding of the effectiveness of community based strength training programs in improving functional status and quality of life in older adults;
- information to assist program managers to ensure potential barriers/enablers of sustained participation in LLLS™ are addressed, and

- promotion and dissemination of the project outcomes by COTA and NARI to support broader involvement in LLLS™ strength training programs in the community.

The following chapter outlines the methodology used in the study. This is followed by the results from the assessments, focus groups and exit surveys. In the discussion, an overall summary of the findings is provided and the implications of the findings and the limitations of the study are discussed. This is followed by the conclusion that briefly highlights some broader implications for program providers and COTA.

2. Methodology

2.1 Recruitment

Participants were recruited through selected LLLS™-endorsed centres in Victoria, including fitness/leisure centres, community health services, rehabilitation centres and neighbourhood houses. Metropolitan centres within an hours drive from Parkville, where NARI is situated, were approached to assist with recruitment, as assessments were to be conducted at NARI. Centre staff were asked to approach new clients to the LLLS™ program and provide them with a flyer outlining the evaluation project. Centre staff provided contact details of interested people to the NARI project team who then contacted the potential participant to provide further information and arrange an assessment. A Participant Information and Consent Form was provided to each participant and written consent to participate was obtained prior to assessment. Participants were also asked to confirm (mainly verbal) that approval to participate in the exercise program was obtained from their general practitioner. Some local centres were not taking in new clients, as they were operating at their full capacity, and were unable to assist in recruitment.

COTA also promoted the evaluation study in their regular newsletter. Interested older people contacted the NARI project team who provided details of local LLLS™ centres they could contact and general information about the evaluation project.

Recruits for this study were people who had decided to commence the program of their own accord and who were paying for the program. No benefits or inducements were offered to potential participants in the evaluation study. As part of the evaluation, participants who completed all three assessments (baseline, 4 and 8 months) received a one page summary of physical performance changes from baseline to 8 months.

Ethics approval to conduct the evaluation study was obtained from the Melbourne Health Research Directorate Human Research Ethics Committee.

2.2 Inclusion and exclusion criteria

Participants had to be aged 50 or over, representing both men and women, living in the community or retirement village, able to speak English, and able to provide informed consent. Participants had to be new clients to the LLLS™ program, that is, had not started or had only commenced the program within the last two weeks. Due to low recruitment rates, and the time between initial interest and initial contact with the participant, this requirement was extended to include those who had completed no more than 5 weeks of the LLLS™ program.

The exclusion criteria included people with a major concurrent physical illness or medical contraindications to exercise (e.g. significant orthopaedic problems or cardiopulmonary disease that would prevent regular exercise) and those with moderate to severe cognitive impairment.

2.3 Sample size calculations

An estimate of required sample size was calculated based on existing data from a separate NARI research project that included people of similar age and functional capacity to those we envisaged would participate in this project. Using the muscle strength measure (from the Nicholas manual muscle tester) for the quadriceps muscle group (one of the main lower limb muscles), using a power of 0.8, alpha of 0.05, and assuming a 20% improvement as a meaningful effect size, it was estimated that 60 participants would be required. Exercise programs for older people commonly have a dropout rate of up to 30% over a 12 month period. Allowing for a 30% dropout rate, it was estimated that an initial sample size of 85 would be required.

2.4. Data collection

2.4.1 Assessments

Participants were assessed at baseline, 4 months and 8 months. Initially assessments were conducted at NARI, but to aid recruitment participants were offered the option of being assessed at their fitness centre. Assessments on average took 60 to 90 minutes and participants were assessed on the following measures:

- physical performance: The Physical Performance Test (PPT). This represents an objective measure that elucidates the subject's motor function, mobility, co-ordination and strength in terms of meaningful everyday activities. The 7 item score includes simulated eating, writing, putting on a jacket, walking, turning, picking up an object and lifting a heavy book onto a shelf. The 9 item score includes two additional stair-climbing tasks. The PPT has good internal consistency (Cronbach alpha=0.87) and high inter-rater reliability ($r=0.99$, Reuben & Siu, 1990) and concurrent validity with other functional performance measures (Reuben et al, 1992).
- self rated health: the Medical Outcomes Survey Short Form 36 (SF-36). This survey measures eight domains – physical functioning, role physical, bodily pain, general health, vitality, social functioning, role emotional, and mental health (Stewart et al, 1988). Transformed scores are presented, that is each raw score is transformed to a 0-100 scale. In addition, Reported Health Transition is also reported. Two week test-retest reliability is excellent (>0.8) for function, vitality and general health perceptions, the lowest coefficient was 0.6 for social function (Brazier et al, 1992).
- cardiovascular fitness: 6 minute walk test. The 6 minute walk test involves the subject walking on a circuit for 6 minutes to cover as much distance as possible (Guyatt et al, 1985). Subjects are permitted to stop if they feel the need during the test, and to resume when they feel capable, although the 6 minute time frame is inclusive of any rest periods. One week test-retest reliability is high (0.95) and distance covered significantly greater for active, compared to inactive, individuals ($p<0.001$) (Harada et al, 1999).
- muscle strength:
 - (1) time taken to stand up and sit down five times from a standard height (45cm) chair (Tinetti et al, 1997). Test-retest reliability (0.95) (McCarthy et al, 2004) and intraclass coefficients (ICC) (0.89, Lord et al, 2002) are high.
 - (2) Nicholas Hand Held Manual Muscle Tester (MMT). This portable device was used to assess the muscle strength of three major lower limb muscles and two upper limb muscles. A digital score (adjusted for body weight) was derived for each test using the MMT. Test-retest reliability is high, with ICC's ranging from 0.95 to 0.99, Wang et al, 2002.

- Balance: Step Test. The Step Test is a measure of dynamic balance, which involves the subject stepping one foot on then off a 7.5cm high step as many times as possible in 15 seconds without using hand support (Hill et al, 1996). Subjects were closely supervised by the assessor and were required to stand close to a wall, table or other solid object that could provide steadying support if overbalancing occurred. Test-retest reliability (>0.88) is high and there is significant correlation with other balance and gait measures (Hill et al, 1996).
- Gait: Six Metre Walk. Walking speed and stride length were measured with the subject walking at comfortable speed on a 6 metre walkway (with 2 metres warm up and warm down either side of the 6 metres to minimise acceleration and deceleration during the test distance (Hill et al, 1997). Test retest reliability is high (Wade et al, 1987) (stroke patients).
- quality of life: the Assessment of Quality of Life Scale (AQoL). This 15 item questionnaire evaluates a number of aspects of quality of life and has good internal consistency (Cronbach alpha=0.81) (Hawthorne et al, 1999).
- depression: Geriatric Depression Scale (GDS). This 15 item questionnaire provides a screen for depressive symptoms (Yesavage et al, 1983) and has been proven to be both a valid and reliable measure (Yesavage et al, 1983; Sheikh & Yesavage, 1986).
- activity level: Physical Activity Scale for the Elderly (PASE). This scale is a valid method of classifying healthy older men and women into categories of physical activity level, and has good test-retest reliability (0.75) (Washburn et al, 1993).

[See Appendix 1 for copies of assessment questionnaires.]

To determine level of compliance (high or low compliance) for the comparative analysis, participants were given calendars to record the days they participated in the LLLS™ program.

As previously reported, participants who completed all three assessments (baseline, 4 and 8 months) received a one page summary of physical performance changes from baseline to 8 months.

2.4.2 Focus group interviews

Initially, four focus groups were to be conducted with participants who had undertaken the strength training program, two after 4 months and two after 8 months. Qualitative information was to be sought about perceived benefits from undertaking the program, any problems encountered and suggestions to improve the program. This information aimed to provide an understanding of potential barriers, enablers and reasons why people may withdraw from the LLLS™ program. However, only two focus groups were conducted in March 2008. A decision not to hold the second round of focus groups was made in conjunction with the COTA on the following grounds:

- a wealth of information had been obtained in the two focus groups conducted in March, and it was unlikely that any additional themes would emerge from other participants still involved in the program,
- it was unlikely that participants who withdrew from the program would attend a focus group as there was no interest shown in the March focus groups for that group, and
- it was deemed to be more important to invest time and resources to follow up the exit surveys, so that the views of those who withdrew from the program were also collected.

2.4.3 Exit Surveys

A number of participants who had withdrawn from the Living Longer Living Stronger™ (LLLS™) program were providing anecdotal feedback relating to their reasons for discontinuing the program. It was deemed important to capture this valuable feedback and therefore an exit survey was developed. The exit survey was designed to investigate reasons for withdrawal and to determine which factors contributed to participants deciding not to continue with the LLLS™ program. In addition the exit survey provided information relating to the participants' perceptions of the LLLS™ program, both positive and negative. Following the submission of an ethics amendment, exit surveys were mailed to all participants who had withdrawn from their respective LLLS™ programs. Some participants completed their survey over the telephone as they were contacted for other matters regarding the project. This interviewer-administered method was at the request of the participant.

2.5 Data analysis

The analysis of the quantitative data was conducted using SPSS software. All comparisons used a test of significance of a p (critical) value of 0.05. To determine change over the time sequence (baseline, 4 and 8 month intervals) repeated measures analysis of variance (RM-ANOVA) was used for normally distributed data of continuous variables. Comparison of outcome was also made according to level of participation in the LLLS™ program (high and low compliance). To compare changes in the first 4 months (between baseline and 4 month) with changes in the subsequent 4 month period (between 4 month and 8 months), for continuous variables, paired Student t-tests were used for the total sample and independent t-tests for high and low compliance comparisons. Categorical, discontinuous variables such as demographic data, was analysed using descriptive statistics or chi-square.

For the qualitative study, the focus groups, interviews were tape-recorded and transcribed. Key themes were independently identified by two staff, and areas of non-agreement were discussed with a third person to determine the thematic outcomes.

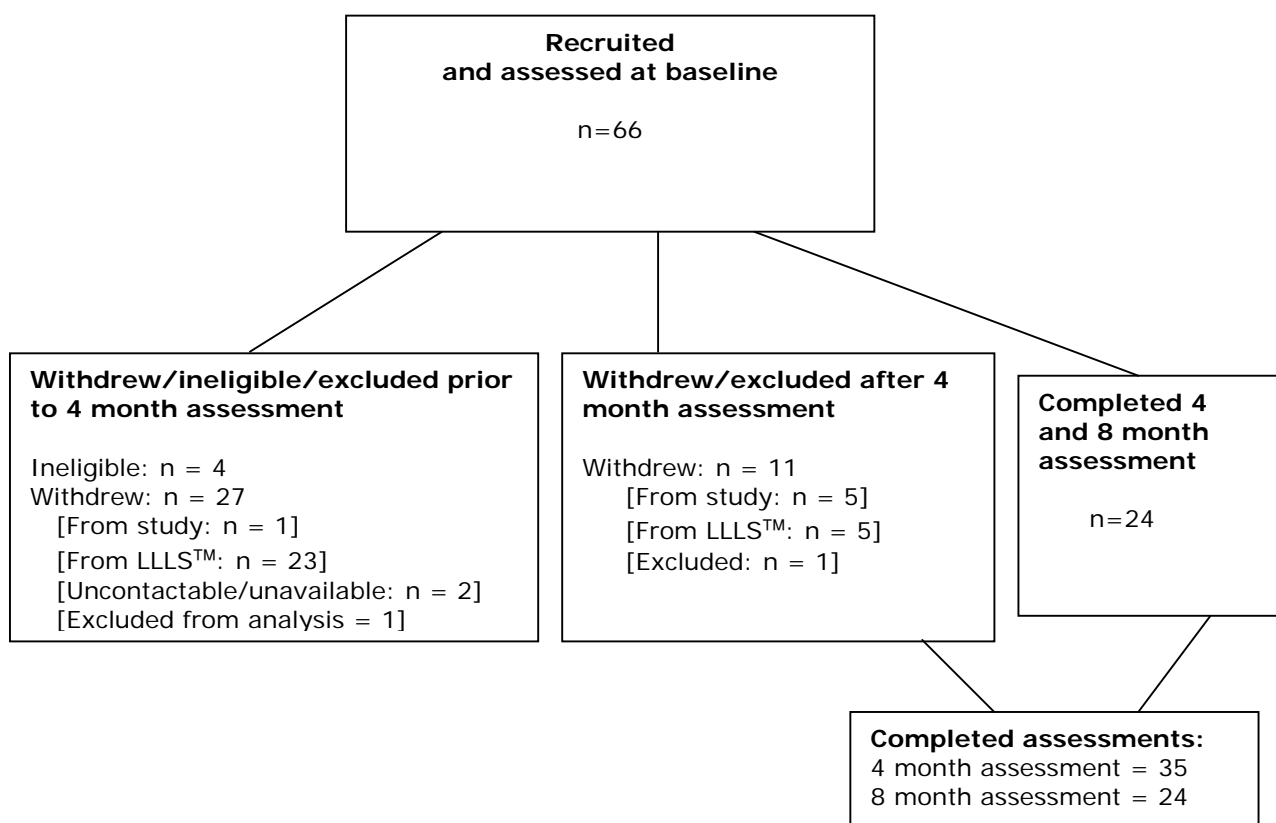
In relation to the exit surveys, categorical data were analysed using descriptive statistics (SPSS) while open-ended questions were analysed for themes by one staff member and reviewed by the project team.

3. Results

3.1 Participants

Sixty six people were recruited and assessed at baseline after written consent to participate was obtained. Of these, four were found to be ineligible as they had participated in strength training for some period of time. Twenty seven (41%) participants withdrew prior to the second (4 month) assessment. Of these, 23 withdrew from LLLS™ program, one from the evaluation study, two were uncontactable/unavailable to complete the study, and one person was excluded from the analysis as she had not attended any LLLS™ sessions (and at 8 months was uncontactable). A further 11 (17%) participants withdrew after completing a 4 month assessment. Five participants withdrew from the LLLS™ program, five withdrew from the evaluation study and one person was excluded from the 8 month analysis as she had left the LLLS™ program one week after the 4 month assessment to undertake a personal training program. Therefore, the analysis includes 11 participants who completed two assessments (baseline and 4 months) and 24 participants who had completed all three assessments (baseline, 4 and 8 months), a total of 35 participants.

Figure 1: Recruitment and completed assessments



3.1.1 Participant demographics and activity profiles

Table 1 includes some broad baseline demographic and activity data for participants who withdrew prior to the 4 month assessment (n=27), those who withdrew after the 4 month assessment (n=11) and those who completed all three assessments (baseline, 4 & 8 months; n=24). There were no statistical differences between the three groups in terms of age, gender, and number of health issues and medications taken. In addition, there were no statistical differences between the three groups in relation to the reported hours of moderate physical activity undertaken per week, with or without the LLLS™ program. There was however a non-significant trend for a higher level of reported hours of moderate physical activity undertaken per week - not including the LLLS™ program - by those who completed both the 4 and 8 month assessment compared to those who withdrew prior to the 4 month assessment (p=0.074).

Table 1: Comparison baseline demographics and activity profile

| | Withdrawn participants (after baseline assessment) (n=27) | Participants completing 4 month assessment only (n=11) | Participants completing 4 & 8 month assessments (n=24) |
|---|---|--|--|
| Age – Mean (SD) | 65 (7.3) (n=25– 2 missing data) | 68 (8.4) | 66 (7.3) |
| Gender - Number (%) | | | |
| - Male | 7 (26 %) | 3 (27 %) | 8 (33%) |
| - Female | 20 (74%) | 8 (73%) | 16 (67%) |
| Number of health issues - Mean (SD) | 2.6 (1.9) | 2.8 (1.8) | 2.4 (2.0) |
| Number of medications (includes herbal supplements) - Mean (SD) | 3.2 (3.1) | 3.8 (1.9) | 4.3 (4.2) |
| Physical activity hours per week (without LLLS™) - Mean (SD) | 5.7 (3.99) | 5.8 (3.89) | 7.9 (4.56) |
| Physical activity hours per week (with LLLS™) - Mean (SD) | 7.7 (4.20) | 7.8 (4.04) | 9.5 (4.41) |

Independent t-tests; chi square for gender

Table 2 provides demographic data for participants with a 4 month and/or 8 month assessment. Column 2 includes all 35 participants with a 4 month assessment and column 3 includes only those who remained to complete the 8 month assessment.

Baseline demographics for all 35 participants

This includes participants who completed a 4 month assessment only (n=11) and those who completed a 4 and 8 month assessment (n=24). The average age of the 35 participants was 66 years (SD 7.6), 69% were female, 63% were married and 71% lived at home with family (eg spouse). On average, participants had 2.5 medical conditions and took 4 medications (includes prescription and herbal) (Table 2).

Baseline demographics for participants with an 8 month assessment

The average age of the 24 participants who completed a four and eight month assessment was 66 years (SD 7.3), 67% were female, 67% were married and 71% lived at home with family (eg spouse). On average, participants had 2.4 medical conditions and took 4 medications (includes prescription and herbal) (Table 2).

Table 2: Baseline demographics of participants with a 4 and/or 8 month assessment

| | All participants completing a 4 month assessment (n=35) | Participants who remained to complete an 8 month assessment (n=24) |
|---|---|--|
| Age – Mean (SD) - Range | 66 (7.6) 53-83 | 66 (7.3) 53-83 |
| Gender - Number (%) - Male - Female | 11 (31.4 %) 24 (68.6%) | 8 (33.3 %) 16 (66.7%) |
| Marital status (%) - Married - Widowed - Single - Divorced - Other | 22 (62.9 %) 7 (20.0 %) 1 (2.9 %) 4 (11.4 %) 1 (2.9 %) | 16 (66.7%) 4 (16.7 %) 1 (4.2 %) 2 (8.3 %) 1 (4.2 %) |
| Living arrangements – Number (%) - Alone | 10 (28.6%) | 7 (29.2%) |

| | | |
|--|------------------------|------------------------|
| - With family - Retirement village | 25 (71.4%) 0 (0%) | 17 (70.8%) 0 (0%) |
| Number of health issues - Mean (SD) - Range | 2.5 (1.9) 0-7 | 2.4 (2.0) 0-7 |
| Number of medications (includes herbal supplements) - Mean (SD) - Range | 4.1 (3.6) 0-15 | 4.3 (4.2) 0-15 |
| Height (cm) - Mean (SD) - Range | 168.3 (7.2) 155-184 | 169.4 (6.5) 155-183 |
| Weight (kg) - Mean (SD) - Range | 78.2 (15.0) 52-115 | 79.5 (14.2) 59-115 |

Baseline activity profile for all 35 participants

At baseline assessment, 66% of participants had started the LLLS™ program between 1-3 weeks prior to the assessment, 14% between 4-5 weeks and 20% had not started the LLLS™ program (Table 3).

On average, participants were involved in 7.3 hours of moderate physical activity per week not including the LLLS™ program or 9.0 hours of activity when including the LLLS™ program. In addition to the LLLS™ program, of which 80% of participants were currently undertaking, walking (80%), gardening (63%) and housework-heavy duties (69%) were the most common activities participants were involved in at baseline (Table 3).

Baseline activity profile for 24 participants with an 8 month assessment

At baseline assessment, 67% of participants had started the LLLS™ program between 1-3 weeks prior to the assessment, 4% between 4-5 weeks and 29% had not started the LLLS™ program (Table 3).

On average, participants were involved in 7.9 hours of moderate physical activity per week not including the LLLS™ program or 9.5 hours of activity when including the LLLS™ program. In addition to the LLLS™ program, of which 71% of participants were currently undertaking, walking (79%), gardening (67%) and

housework-heavy duties (67%) were the most common activities participants were involved in at baseline (Table 3).

Table 3: Baseline activity profile of participants who completed a 4 and/or 8 month

| | All participants completing a 4 month assessment (n=35) | Participants who remained to complete an 8 month assessment (n=24) |
|---|---|--|
| How long was attending LLLS™ prior to baseline assessment – Number (%): | | |
| - Had not started | 7 (20.0%) | 7 (29.2%) |
| - Between 1-3 weeks | 23 (65.7%) | 16 (66.7%) |
| - Between 4-5 weeks | 5 (14.3%) | 1 (4.2%) |
| Moderate physical activity hours (without LLLS™ program) - | | |
| - Mean (SD) | 7.3 hours (4.41) | 7.9 hours (4.56) |
| - Range | 2-21 hours | 2.3-21 hours |
| Moderate physical activity hours (with LLLS™ program) - | | |
| - Mean (SD) | 9.0 hours (4.32) | 9.5 hours (4.41) |
| - Range | 3.8–23 hours | 4–23 hours |
| Organised physical activities undertaken – Number (%): | | |
| - Strength training | 28 (80.0%) | 17 (70.8%) |
| - Tai Chi | 2 (5.7%) | 2 (8.3%) |
| - Group exercise | 1 (2.9%) | 1 (4.2%) |
| - Walking group | 1 (2.9%) | 1 (4.2%) |
| - Yoga | 3 (8.6%) | 3 (12.5%) |
| - Water exercise | 3 (8.6%) | 2 (8.3%) |
| - Other | 1 (2.9%) | 1 (4.2%) |
| Average number of organised activities undertaken by participant – | | |
| - Mean (SD) | 1.1 (0.7) | 1.1 (0.8) |
| - Range | 0-3 | 0-3 |
| Recreational (non-organised) physical activity undertaken: | | |
| - Walking | 28 (80.0%) | 19 (79.2%) |
| - Bowls | 2 (5.7%) | 2 (8.3%) |
| - Golf | 5 (14.3%) | 4 (16.7%) |
| - Swimming | 1 (2.9%) | 1 (4.2%) |
| - Gardening | 22 (62.9%) | 16 (66.7%) |

| | | |
|---|------------|------------|
| - Heavy Housework | 24 (68.6%) | 16 (66.7%) |
| - Dance group | 1 (2.9%) | 1 (4.2%) |
| - Tennis | 2 (5.7%) | 1 (4.2%) |
| - Cycling | 2 (5.7%) | 1 (4.2%) |
| - Other | 7 (20.2%) | 5 (20.8%) |
| Average number of recreational (non-organised) activities undertaken by participant – | | |
| - Mean (SD) | 2.7 (1.4) | 2.6 (1.4) |
| - Range | 0-5 | 0-5 |
| Average number of overall activities undertaken by participant – | | |
| - Mean (SD) | 3.8 (1.4) | 3.9 (1.4) |
| - Range | 1-6 | 1-6 |

3.2 Assessment findings

3.2.1 Compliance

Although all participants were required to complete activity calendars, at the 4 month assessment only 27 participants (out of 35) fully completed or partially completed calendars and at 8 months only 19 calendars (out of 24) were completed. Where applicable, the average number of LLLS™ sessions attended per month was calculated based on the activity calendars. Where no activity calendars were completed the average number of LLLS™ sessions attended per month was calculated based on the number of sessions attended per week less the reported number of sessions or weeks missed. Participants were encouraged to undertake at least two LLLS™ sessions per week, over a 4 month period this equates to 8.5 sessions per month, and this was deemed to be full compliance.

At 4 months, the average number of LLLS™ sessions attended per month was 7.0 (median 7.0, range 2.2 – 11.7). At 8 months the average number of sessions completed per month (from baseline to 8 months) were 7.0 (median 7, range 3.0 – 11.8).

Based on the frequency distribution of the average number of LLLS™ sessions completed per month, undertaking 6 sessions or more (71%) per month was deemed to be high compliance.

3.2.2 Assessment timeframes

Participants completed their 4 month assessment on average at 4.6 months (range: 3.7-6.2 months) after the initial assessment. Eight month assessments were completed on average 8.9 months (range: 7.6-10.4) after the initial assessment, excluding two outliers. Assessment delays were due to participants' busy schedules; some were on holidays, ill or had other commitments and were unable to attend earlier.

3.2.3 Changes at 4 months for the 35 participants

Looking at the overall sample, that is all those who completed a 4 month assessment, a number of significant changes were evident when comparing performance at baseline and 4 months (based on RM-ANOVA) (Table 4). There were significant improvements in the step test–worse leg, sit to stand (5 times), stride length (6 metre walk) and distance (6 minute walk). In terms of balance, participants were able to complete more steps on/off a 7.5cm block in 15 seconds with their worse leg (14% improvement, $p=0.000$). In relation to the 6 metre walk, although there was no significant improvement in gait speed, there was a significant improvement in stride length (11% improvement, $p=0.000$). In terms of leg muscle strength, participants were able to sit and stand five times in a faster time (18% improvement, $p=0.000$). However, leg muscle strength, as measured by the Nicholas Muscle Tester (a hand held dynamometer), did not confirm this improvement. In fact, the only significant improvement identified using the hand held dynamometer was the left shoulder abductor strength (13% improvement, $p=0.008$). There was also a non-significant trend evident for the right shoulder abductor (9% improvement, $p=0.061$). In relation to cardiovascular fitness, participants were able to walk a significantly greater distance in 6 minutes (6% improvement, $p=0.010$). There was also a 2% drop in weight ($p=0.021$).

There were also a number of significant changes found in function, self reported health and well-being measures. There was a significant improvement in physical function based on the physical performance test (7 and 9 item score) (4% for both, $p=0.001$ and 0.002 respectively). The PPT includes observation of basic and complex activities of daily living – simulated eating, writing, putting on a jacket, walking, turning, picking up an object, lifting a heavy book onto a shelf,

and in the 9 item test, stair climbing. As most participants scored highly at baseline (mean score was 90% & 91% of the total score respectively) there was little room for a large percentage change. Reported health transition (SF-36), that asks the person to compare their health in general now to one year ago on a 5 point scale, also showed significant improvement. There was a 25% improvement (p=0.000) that changed the mean score from “about the same as last year” to a score closer to “somewhat better now than one year ago”. There were also significant improvements in self-reported vitality (SF-36) (7% improvement, p=0.04), quality of life (AQoL) (10% improvement, p=0.016) and a non-significant trend in self-reported mental health (SF-36) (12% improvement; p=0.065).

Table 4: Participants (with a 4 month assessment) assessment scores (n=35)

| | Baseline Assessment Mean (SD) | 4 month Assessment Mean (SD) | % Change |
|---|-------------------------------|------------------------------|----------|
| SF-36 - Mean (SD) | | | |
| - Physical functioning | 80.9 (19.3) | 85.0 (16.8) | 5% |
| - Role - Physical | 84.6 (30.8) | 89.7 (23.9) | 6% |
| - Bodily pain | 73.9 (18.9) | 77.7 (21.1) | 5% |
| - General health | 83.3 (12.3) | 81.3 (11.2) | 2%↓ |
| - Vitality | 66.8 (18.5) | 71.6 (15.0)* | 7% |
| - Social functioning | 93.4 (15.1) | 94.9 (12.7) | 2% |
| - Role – Emotional | 88.2 (28.3) | 91.2 (23.7) | 3% |
| - Mental health <i>(higher = better score)</i> | 74.2 (18.0) | 83.2 (13.1) | 12% |
| - Reported health transition <i>(lower = better score)</i> | 2.8 (0.78) | 2.1 (0.79)* | 25% |
| AQoL - Mean (SD) (n=35) <i>(lower = better score)</i> | 7.32 (4.26) | 6.56 (3.90)* | 10% |
| GDS - Mean (SD) (n=35) <i>(lower = better score)</i> | 0.79 (1.4) | 0.62 (1.3) | 22% |
| PASE - Mean (SD) | 135.7 (58.8) | 140.9 (52.5) | 4% |
| Physical Performance Test - Mean (SD) | | | |
| - 7 items (n=34) | 25.4 (1.8) | 26.5 (2.1)* | 4% |
| - 9 items (n=25) | 32.5 (2.1) | 33.9 (2.7)* | 4% |
| Distance (m) (6 minute walk) - Mean (SD) | 454.6 (91.8) | 481.4 (80.2)* | 6% |

| | | | |
|---|--------------------------------|---------------------------------|------------|
| 6 metre walk – Mean (SD) - Velocity (m/min) - Stride length | 80.87 (12.22) 1.30 (0.16) | 83.17 (11.78) 1.44 (0.20)* | 3% 11% |
| Step test -worse leg (number of steps in 15 sec) – Mean (SD) | 16.9 (4.0) | 19.3 (3.6)* | 14% |
| Sit to stand – 5 times (sec) - Means (SD) (lower = better score) | 10.68 (2.81) | 8.73 (1.93)* | 18% |
| Manual Muscle Tester | | | |
| Knee extensor strength - Right knee (n=34) - Left knee (n=33) | 0.272 (0.069) 0.268 (0.068) | 0.276 (0.082) 0.274 (0.088) | 1% 2% |
| Hip abductor strength - Right hip - Left hip | 0.237 (0.055) 0.222 (0.065) | 0.230 (0.057) 0.219 (0.060) | 3%↓ 1%↓ |
| Ankle dorsiflexion strength - Right ankle - Left ankle (n=33) | 0.260 (0.057) 0.256 (0.050) | 0.245 (0.045) 0.248 (0.060) | 6%↓ 3%↓ |
| Shoulder abductor strength - Right shoulder (n=33) - Left shoulder (n=33) | 0.206 (0.050) 0.199 (0.048) | 0.224 (0.063) 0.224 (0.064)* | 9% 13% |
| Elbow extensor strength - Right elbow (n=34) - Left elbow | 0.181 (0.050) 0.182 (0.048) | 0.179 (0.039) 0.191 (0.046) | 1%↓ 5% |
| Weight (kg) Mean (SD) | 78.20 (15.03) | 76.69 (15.31)* | 2% |

* significant at/below 0.05. [vitality = 0.04; reported health transition = 0.000; AQoL = 0.016; PPT 7 & 9 item = 0.001 and 0.002; distance = 0.010; sit to stand, step test, stride length = 0.000]; left shoulder abductor strength = 0.008, weight = 0.021] [Non-significant = right shoulder abductor strength = 0.061; SF-36 Mental health = 0.065]
Note: knee, hip, ankle, shoulder and elbow strength measured by the MMT are adjusted for body weight.

3.2.3.1 High and low compliers

There were some significant differences between high and low compliers (based on RM-ANOVA) (Table 4), that is those who completed less than 6 LLLS™ sessions a month (n=14) compared to those who completed 6 or more sessions a month (n=21). In regards to both the step test–worse leg (p=0.018) and the sit to stand (5 times) (p=0.000) although both groups improved, the high compliers (22% and 25% respectively) showed a significantly greater

improvement than low compliers (5% and 6% respectively). The right shoulder abductor strength ($p=0.044$) and the right elbow extensor strength ($p=0.000$) (as measured by the hand held dynamometer) also showed differences between high and low compliers. Low compliers dropped in shoulder strength by 1% and elbow strength by 15%, whereas high compliers' improved by 16%, and 9% respectively.

In regards to the SF-36, two domains showed a significant difference between high and low compliers. Where the low compliers' self reported vitality ($p=0.027$) dropped by 2% the high compliers improved by 14%. In relation to social functioning (the extent that physical health or emotional problems impact on social activities) ($p=0.043$) the low compliers' score dropped by 3% whereas the high compliers improved by 5%. A non-significant trend was also evident in relation to role physical (the impact that physical health interferes with work or other daily activities) ($p=0.078$), the low compliers' score dropped by 8% whereas high compliers improved by 17% (there was greater variability within groups).

In a reverse trend, there was a significant improvement in the PASE score for low compliers (24% improvement) compared to high compliers (a 6% drop) ($p=0.012$). However, the PASE asks people to report on activity one week prior, and this may not be representative of the participant's regular routine, particularly for those who were ill or on holidays prior to the assessment.

Table 5: Outcome measures with significant (or near significant) differences between high (n=21) and low compliers (n=14) (see Appendix 2 for all outcome measures)

| | Compliance | Baseline Assessment Mean (SD) | 4 month Assessment Mean (SD) | % change | p value |
|--|------------|-------------------------------|------------------------------|----------|---------|
| SF-36 - Mean (SD) <i>(higher = better score)</i> - Role – Physical | Low | 89.3 (23.4) | 82.1 (31.7) | 8%↓ | 0.079 |
| | High | 81.3 (35.2) | 95.0 (15.4) | 17%↑ | |
| - Vitality | Low | 70.7 (20.2) | 69.6 (17.3) | 2%↓ | 0.027 |
| | High | 64.0 (17.1) | 73.0 (13.5) | 14%↑ | |
| - Social functioning | Low | 98.2 (6.7) | 95.5 (13.5) | 3%↓ | 0.043 |
| | High | 90.0 (18.4) | 94.4 (12.5) | 5%↑ | |

| | | | | | |
|---|-------------|--------------------------------|--------------------------------|-------------|-------|
| PASE - Mean (SD) | Low High | 114.8 (47.7) 149.7 (62.3) | 141.8 (55.2) 140.3 (52.1) | 24%↑ 6%↓ | 0.012 |
| Step test -worse leg (number of steps in 15 sec) – Mean (SD) | Low High | 18.6 (3.3) 15.8 (4.2) | 19.5 (3.8) 19.2 (3.5) | 5%↑ 22%↑ | 0.018 |
| Sit to stand – 5 times (sec) - Means (SD) <i>(lower = better score)</i> | Low High | 9.18 (1.72) 11.69 (2.97) | 8.61 (1.85) 8.81 (2.02) | 6%↑ 25%↑ | 0.000 |
| Shoulder abductor strength - Right shoulder (n=33) | Low High | 0.214 (0.051) 0.201 (0.050) | 0.211 (0.046) 0.234 (0.072) | 1%↓ 16%↑ | 0.044 |
| Elbow extensor strength - Right elbow (n=34) | Low High | 0.197 (0.049) 0.171 (0.035) | 0.167 (0.032) 0.186 (0.042) | 15%↓ 9%↑ | 0.000 |

Note: MMT scores have been adjusted for body weight.

3.2.4 Changes at 8 months for the 24 participants

For the overall sample of participants who remained to complete the 8 month assessment there were a number of significant improvements (based on RM-ANOVA) in performance over the time sequence (baseline, 4 and 8 months) (Table 6). Similar to the previous findings, there were significant improvements in the distance covered in the 6 minute walk (13%, $p=0.001$), the step test -worse leg (24%, $p=0.000$), sit to stand (5 times) (24%, $p=0.000$), and stride length (6 metre walk, 25%, $p=0.000$). In addition, gait velocity (6 metre walk) had also significantly improved (21%, $p=0.001$). In relation to strength, as measured by the hand held dynamometer, there were no significant improvements found, although there was a non-significant trend in the left knee extensor strength (11% improvement, $p=0.072$). Unlike the previous findings, there was no significant improvement in the left shoulder abductor strength (4% improvement only) and there was a significant drop (13%, $p=0.012$) in the right hip abductor strength.

Similar to the previous findings there was a significant improvement in the physical performance test (7 and 9 item) measures (5% and 6% respectively, $p=0.000$) and in reported health transition (SF-36) (28%, $p=0.001$). Improvement in reported health transition occurred in the first 4 months (at the 4 month assessment) and was maintained at the 8 month assessment. Unlike the previous findings, changes in quality of life (7% improvement) and vitality (SF36) (8% improvement) scores were no longer significant, however a significant improvement was evident for both mental health and role physical (SF-36 domains) (5%, $p=0.015$ and 16%, $p=0.020$, respectively).

Paired Student t-tests were conducted to look more closely at the differences in performance in the first 4 months (from baseline to 4 months) compared to the subsequent 4 months (from the 4 month assessment to the 8 month assessment). The only significant differences between these two time periods were reported health transition (SF-36, $p=0.005$) and the right ankle dorsiflexion strength ($p=0.002$). As previously reported, the improvement in the reported health transition score occurred in the first four months, which was maintained with no additional percentage improvement in the subsequent 4 months. In relation to the right ankle dorsiflexion strength, after a 6% drop in the first 4 months an 8% improvement occurred in the subsequent 4 months. For many of the other measures there were non-significant ongoing improvements between 4 and 8 months.

Table 6: Participants (with an 8 month assessment) assessment scores (n=24)

| | Baseline | 4 month follow up | 8 month follow up | p value | % change Baseline & 4 months | % change 4 months & 8 months | % change Baseline & 8 months |
|--|---------------|-------------------|-------------------|---------|------------------------------|------------------------------|------------------------------|
| SF-36 - Mean (SD) | | | | | | | |
| - Physical functioning | 82.9 (17.6) | 86.3 (15.1) | 87.9 (14.4) | 0.170 | 4% | 2% | 6% |
| - Role - Physical | 82.3 (34.2) | 85.4 (27.5) | 95.8 (20.4) | 0.020 | 4% | 12% | 16% |
| - Bodily pain | 77.2 (16.6) | 78.0 (20.1) | 77.0 (13.8) | 0.946 | 1% | 1%↓ | 0% |
| - General health | 82.9 (12.8) | 80.3 (12.7) | 85.3 (12.7) | 0.192 | 3%↓ | 6% | 3% |
| - Vitality | 66.9 (17.9) | 72.1 (15.3) | 72.1 (17.2) | 0.130 | 8% | 0% | 8% |
| - Social functioning | 94.8 (10.4) | 95.3 (11.5) | 94.3 (13.3) | 0.637 | 1% | 1%↓ | 1%↓ |
| - Role – Emotional | 95.8 (14.9) | 90.3 (25.0) | 93.1 (24.0) | 0.193 | 6%↓ | 3% | 3%↓ |
| - Mental health | 82.7 (14.6) | 83.7 (12.1) | 87.0 (12.2) | 0.015 | 1% | 4% | 5% |
| <i>(higher=better score)</i> | | | | | | | |
| - Reported health transition <i>(lower=better score)</i> | 2.9 (0.7) | 2.1 (0.7) | 2.1 (0.6) | 0.001 | 28% | 0% | 28% |
| AQOL - Mean (SD) | 6.42 (3.34) | 6.00 (3.20) | 5.96 (3.51) | 0.465 | 7% | 1% | 7% |
| <i>(lower=better score)</i> | | | | | | | |
| GDS - Mean (SD) | 0.63 (0.92) | 0.33 (0.64) | 0.46 (0.83) | 0.149 | 48% | 39%↓ | 27% |
| <i>(lower=better score)</i> | | | | | | | |
| PASE - Mean (SD) | 140.4 (58.3) | 140.9 (47.3) | 139.7 (44.2) | 0.992 | 0% | 1%↓ | 0% |
| Physical Performance Test - Mean (SD) | | | | | | | |
| - 7 items | 25.6 (1.8) | 26.4 (2.1) | 27.0 (1.4) | 0.000 | 3% | 2% | 5% |
| - 9 items (n=17) | 32.7 (2.2) | 33.8 (2.83) | 34.6 (1.8) | 0.000 | 3% | 2% | 6% |
| Distance (m) (6 minute walk) - Mean (SD) | 443.4 (93.0) | 482.6 (84.9) | 501.0 (78.0) | 0.001 | 9% | 4% | 13% |
| 6 metre walk – Mean (SD) | | | | | | | |
| - Velocity | 79.15 (12.53) | 84.68 (12.92) | 95.98 (14.95) | 0.000 | 7% | 13% | 21% |

| | | | | | | | |
|---|--------------------------------|--------------------------------|--------------------------------|----------------|------------|--------------|--------------|
| - Stride length | 1.29 (0.17) | 1.49 (0.21) | 1.61 (0.26) | 0.000 | 16% | 8% | 25% |
| Step test -worse leg (number of steps) – Mean (SD) | 16.9 (3.6) | 19.1 (4.1) | 20.8 (4.1) | 0.000 | 13% | 9% | 23% |
| Sit to stand (sec) - Means (SD) (<i>lower=better score</i>) | 10.87 (3.2) | 9.05 (2.01) | 8.31 (2.83) | 0.000 | 17% | 8% | 24% |
| Manual Muscle Tester | | | | | | | |
| Knee extensor strength - Right knee - Left knee | 0.264 (0.070) 0.262 (0.067) | 0.276 (0.080) 0.267 (0.081) | 0.276 (0.069) 0.292 (0.077) | 0.619 0.072 | 5% 2% | 0% 9% | 5% 11% |
| Hip abductor strength - Right hip - Left hip | 0.237 (0.057) 0.226 (0.070) | 0.235 (0.061) 0.228 (0.063) | 0.206 (0.057) 0.203 (0.057) | 0.012 0.103 | 1%↓ 1% | 12%↓ 11%↓ | 13%↓ 10%↓ |
| Ankle dorsiflexion strength - Right ankle (n=21) - Left ankle (n=22) | 0.265 (0.050) 0.259 (0.049) | 0.249 (0.047) 0.257 (0.064) | 0.270 (0.045) 0.266 (0.053) | 0.283 0.720 | 6%↓ 1%↓ | 8% 4% | 2% 3% |
| Shoulder abductor strength - Right shoulder (n=23) - Left shoulder (n=21) | 0.207 (0.049) 0.205 (0.037) | 0.222 (0.064) 0.224 (0.068) | 0.218 (0.061) 0.213 (0.047) | 0.358 0.354 | 7% 9% | 2%↓ 5%↓ | 5% 4% |
| Elbow extensor strength - Right elbow - Left elbow | 0.177 (0.043) 0.177 (0.044) | 0.179 (0.043) 0.186 (0.048) | 0.183 (0.039) 0.187 (0.044) | 0.678 0.471 | 1% 5% | 2% 1% | 3% 6% |
| Weight (kg) | 79.50 (14.28) | 77.74 (15.40) | 77.44 (14.11) | 0.114 | 2% | 0% | 3% |

3.2.4.1 High and low compliers

Comparing low and high compliers, that is those who completed less than 6 LLLS™ sessions a month (n=9) to those who completed 6 or more sessions a month (n=15) across the time sequence (baseline, 4 and 6 months) there were three significant differences (based on RM-ANOVA) (Table 7).

In regards to the step test – worse leg, high compliers had a 26% overall improvement at 8 months compared to 20% for low compliers ($p=0.051$). However, for high compliers, the majority of improvement (19%) occurred at 4 months, whereas for low compliers, the majority of their improvement (16%) occurred at the 8 month assessment (between 4 and 8 months).

Similar trends emerged in relation to the sit to stand. Both groups improved over time, the high compliers by 22% and the low compliers by 26% ($p=0.010$). However for the high compliers the main change occurred at the 4 month assessment and this improvement was maintained at 8 months. The majority of the low compliers' improvement occurred at the 8 month assessment (23%), with only a 4% improvement at 4 months.

The other significant difference related to the right elbow extensor strength, high compliers improved overall by 10% at 8 months while low compliers fell by 5% ($p=0.030$). Once again, improvement occurred earlier (at 4 months) for high compliers, and this was maintained at 8 months, whereas low compliers, after an 11% drop at 4 months, improved by 6% between 4 and 8 months.

Therefore low compliers need to work longer (over time) to significantly improve outcomes.

There were no significant group differences in any of the function, self reported health and well-being questionnaires between low and high compliers across the time sequence.

Table 7: Outcome measure with significant (or near significant) differences between high (n=15) and low compliers (n=9) (see Appendix 3 for all outcome measures)

| | Compliance | Baseline Assessment Mean (SD) | 4 month Assessment Mean (SD) | 8 month Assessment Mean (SD) | p value | % change Baseline & 4 months | % change 4 months & 8 months | % change Baseline & 8 months |
|---|-------------|--------------------------------|--------------------------------|--------------------------------|---------|------------------------------|------------------------------|------------------------------|
| Step test -worse leg (number of steps in 15 sec) – Mean (SD) | Low High | 18.4 (3.8) 16.0 (3.2) | 19.0 (5.0) 19.1 (3.7) | 22.0 (4.4) 20.1 (3.9) | 0.051 | 3% 19% | 16% 5% | 20% 26% |
| Sit to stand – 5 times (sec) - Means (SD) (<i>lower = better score</i>) | Low High | 9.06 (2.10) 11.96 (3.40) | 8.71 (1.88) 9.26 (2.11) | 6.70 (1.11) 9.27 (3.13) | 0.010 | 4% 23% | 23% 0% | 26% 22% |
| Elbow extensor strength - Right elbow (n=34) | Low High | 0.191 (0.052) 0.168 (0.036) | 0.170 (0.035) 0.184 (0.048) | 0.181 (0.030) 0.184 (0.044) | 0.030 | 11%↓ 10% | 6% 0% | 5%↓ 10% |

Independent Student t-tests also were conducted to look more closely at the differences in performance in the first 4 months (from baseline to 4 months) compared to the subsequent 4 months (from the 4 month assessment to the 8 month assessment) between high and low compliers. There were four significant differences and two non-significant trends, once again confirming that improvements were achieved earlier by high compliers. As previously reported, for the step test–worse leg, in the first 4 months high compliers improved by 19% (compared to 3% for low compliers, $p=0.030$), whereas low compliers improved in the subsequent 4 months by 16% (compared to 5% for high compliers, $p=0.037$). Similarly, in relation to the sit to stand, in the first 4 months high compliers improved by 23% (compared to 4% for low compliers, $p=0.007$), whereas low compliers improved in the subsequent 4 months by 23% (compared to 0% for high compliers, $p=0.006$). So these differences were significant at the two time points (first four and second four months). However in relation to right elbow extensor strength, high compliers significantly improved by 10% at 4 months ($p=0.013$), whereas low compliers dropped by 11%, but there was no significant difference between high and low compliers in the subsequent 4 months in relation to right elbow extensor strength.

In addition, there was a significant change in the left knee extensor strength for high compliers in the first 4 months (11% improvement, compared to a 10% drop in low compliers, $p=0.051$). However, in the subsequent 4 months (8 months) low compliers improved by 20% compared to 3% for high compliers, but this difference was not statistically significant ($p=0.078$). In the first 4 months the high compliers' right shoulder abductor strength improved by 15%, whereas low compliers dropped by 5% ($p=0.055$), and there was a non-significant trend in the right hip abductor strength, it improved by 6%, compared to an 11% drop for low compliers ($p=0.073$). However, there were no significant differences or trends between the two groups in the subsequent 4 months (8 months) for either of these two measures.

There were two additional differences or trends between high and low compliers in the subsequent 4 months (the 8 month assessment) where low compliers

improved while high compliers fell - vitality (8 % improvement for low compliers and a 4% drop for high compliers, $p=0.079$) and the right knee extensor strength (11 % improvement for low compliers and 7% drop for high compliers, $p=0.053$). However, this analysis fails to take into account the initial improvement (although not significant) in the first 4 months (as does the repeated measures ANOVA) where high compliers improved by 11% and low compliers dropped by 4%. However, this still confirms that although improvements (whether significant or not) tend to be achieved earlier by high compliers, that improvement over time can be achieved with lower levels of compliance.

3.2.5 Assessment Summary

A number of significant improvements were identified for participants overall ($n=35$ and $n=24$), including the step test, stride length, distance covered in 6 minutes, sit to stand, and in the physical performance test (7 & 9 item) and reported health transition (SF-36).

The 35 participants who had completed a 4 month assessment demonstrated significant improvement in self reported vitality (SF-36), quality of life (AQoL) and left shoulder abductor strength at 4 months. There were also significant differences favouring high compliers in relation to vitality and social functioning (SF-36), the step test, sit to stand and the right shoulder abductor and right elbow extensor strength.

The 24 participants who remained to complete an 8 month assessment demonstrated significant improvement in role physical and mental health (SP-36 domains) and gait velocity, although vitality, AQoL and left shoulder abductor strength were no longer significant. There were fewer significant differences over the time sequence (baseline, 4 & 8 months) between high and low compliers, they included the step test, the sit to stand and the right elbow extensor strength. In relation to the sit to stand and the step test, both high and low compliers showed significant change over time however high compliers significantly improved in the first 4 months compared to low compliers who significantly improved in the subsequent 4 months. In relation to the right elbow extensor strength, high compliers showed significant improvement in the

first four months compared to low compliers but there was no significant difference in the subsequent 4 months. In addition, although there were no significant differences over the time sequence (baseline, 4 & 8 months) for high and low compliers in relation to the right shoulder abductor and left knee extensor strengths, there were significant/near significant improvements (0.051-0.055) evident for high compliers in the first 4 months. Therefore significant improvement was and can be achieved over time on many measures for both high and low compliers.

In addition, where no significant improvement or trends were evident, generally performance levels were maintained, very few measures reported a drop in performance. This issue will be explored further in the discussion as well as the limitations of the assessment study.

3.3 Focus group findings

Two focus groups were conducted in March 2008, one at a fitness centre in Burwood on the 4th March and the other at NARI on the 6th March. An invitation to attend one of two focus groups was forwarded to all participants, including those who withdrew from the LLLS™ program. Participants who withdrew from the project were advised that invitations to attend a focus group would be forwarded to them (as well as an exit survey, see Section 3.4) as the project team was keen to ascertain their views of the LLLS™ program. All withdrawing participants indicated that they were happy to receive a letter of invitation (and to complete the exit survey). Attached to the invitation letter was an expression of interest form asking participants to nominate which of the two focus groups they would prefer to attend, and to date and sign the form. Upon receiving the expression of interest, one of the project officers contacted the participant to confirm their involvement in the focus group.

Fourteen people (out of 66) had responded to the invitation, two indicated they were unable to attend either focus group and twelve participants accepted the invitation to attend one of the two focus groups. Nine people attended the focus groups, four at Burwood and five at NARI. No participant who withdrew from the program attended the focus groups. One participant had temporarily withdrawn from the LLLS™ program due to a knee injury, however at the time of the focus group she had returned to the LLLS™ program (but not the evaluation project) and had been attending for several weeks.

3.3.1 Themes

A number of questions were asked to facilitate discussion. They included:

- 1) why participants joined the LLLS™ program,
- 2) whether they had any concerns about doing a strength training program,
- 3) how they were finding the program and whether the program was tailored to their needs,
- 4) how often and how the individual programs were reviewed,
- 5) the perceived benefits of doing the program,
- 6) the factors that contributed to their ongoing participation and reasons for missed sessions, and

7) whether they could see themselves participating in the LLLS™ program long term (see Appendix 4 for the focus group protocol). A number of key themes emerged.

Reasons for joining

There were a number of reasons reported for joining the LLLS™ strength training program. However, the two main reasons people reported that they joined the program were to stay healthy and independent (eg. get fitter/stronger) and/or to address specific health/physical problems (eg. high cholesterol and blood pressure, neck problems, lack of strength).

“Well I’m 77 and the reason I joined is that I don’t want to be a burden on my family so I want to stay as healthy as I can, I try to eat healthily and so I figured that doing exercise is another way of keeping healthy.” (Male, LB)

“I went for health reasons. I had high cholesterol and high blood pressure and my younger sister had a heart attack so we were all on our toes you know about getting on this thing and since I have joined my blood pressure has gone down and so has my cholesterol so I am very pleased.” (Female, BC)

“I had always wanted to go and obviously last year was the right time that I could fit it in with all my other commitments. I wanted to live longer, I wanted to live stronger and I wanted to shrink a bit. I have diabetes and I had a bad knee” (Female, ML)

In some instances an event or circumstance, either directly related to the participant or a family member, highlighted a problem or the need to take some immediate or preventive action.

“My first inkling that something wasn’t quite right was when I tried to lift the grandchildren out of the bath and 6 months later we were travelling in Canada and I could haul my suitcase with my right side but not with my left, and found that I just couldn’t drag my suitcase with my left side.”(Female, MS)

“I was having intermittent problems with my neck and I went to a new physio out where my office is ...and he said ‘you have got no muscles left here mate’ and so that sort of pushed me over the edge. I thought well I’ve always been a fairly active person and to be told you haven’t got any muscles left, apart from anything else, is a smack in the face so I joined up and I am really pleased I have.” (Male, NR)

“...I felt my husband is failing a bit, memory wise and all of those things lately, and I felt one of us really might have to take charge, i.e. me. So I thought maybe if I got a bit more energetic and fitter I’d be able to do that if I had to. So I came in here just to join a gym....” (Female, RD)

Other reasons for joining the program included wanting to lose weight, the timing being right in relation to other commitments, the cost and method of payment (pay as you go) for the program, starting to work with fitness for older people and wanting to practice what they preach, a spouse joined, and one participant was doing gym work (not LLLS™) at another facility which she found “cold” and “unsupportive” and changed gyms and began the LLLS™ program.

Initial concerns

Most participants reported having no concerns about doing a strength training program or gym work. Two participants reported having some concerns about “being out of place” (eg question of what to wear) or having preconceived ideas (stereotypes) of the type of people who use gyms (“*I thought it would all be people in the gym with swishing ponytails and lycra*” (female, MS); “*might be all the young guys in there with all the equipment*” (female, BC). One person reported concerns about normal gyms (not LLLS™), and was “put off” by her husband’s gym experience, where you had to pay whether you attended or not and there was no encouragement from staff. Only one person questioned whether they were physically up to strength training, “*Never having done exercise of any kind I wondered whether I was taking a bit of a chance*”, but reported that “*So far it has worked out alright*” (female, RD). Another participant referred to their joint problems (mainly in the knees) but stated they had “*... found the benefit of physio, building the muscles to support the joints, so I wasn’t worried about it, I was actually looking forward to it*” (male, NR).

How they are finding the LLLS™ program

A range of positive experiences and responses were reported, including “terrific” and “great”, and many reported enjoying the program. In fact some participants were surprised that they were enjoying the program. Participants reported finding the program challenging and that it provided a sense of achievement.

“Terrific. No it’s not too challenging. You make yourself go outside that square. I’ve had body images and all that and to think that I have gone to a gym – I couldn’t believe it.” (Female, ML)

*“I think the challenge works too, I’ll always look forward to building it up.”
(Male, NR)*

“And I never thought that I’d be doing weights as such, because I’ve always being quite proud of the fact that I couldn’t do a push up to save myself. But it does get you in a bit, this weight business, you’re trying to beat what you could do last week.” (Female, JW)

“...I’ve been able to do something that I thought was hard like doing, the numbers one to five, and then once you get to six your in the next colour, so I’ve been up to 6, and the feller before me has done 23 or something, which is awful, but then I feel better because somebody next to me says she’s on 3 or something! So then I think, “Well I’m not doing bad, I’m getting better,”, so its that thing against yourself, “Oh I can do that now, I think I’ll put it up, I’ll put the bike level from 4 up to 6. So it’s just, you can see for yourself that you’re improving.” (Female, RD)

Only one person reported “overdoing it” and “wearing” themselves out, given their busy schedule. However, he reported that the LLLS™ program “... has been a good experience and I could recommend it to everybody” (male, DB). This participant also reported an adverse event.

“ I went down on Sunday and I said to them last time I was here I walked out with a stiff neck and it’s annoying, and I can’t sleep, so I’m laying on the pillow and I can’t sleep and I have a stiff neck at the same time. And she (staff) said well on a particular exercise I was probably getting my shoulders up, she showed me what to do. I did it last Sunday and the neck was OK.” (Male, DB)

Participants reported that LLLS™ staff were approachable, encouraging and supportive, this was very important to all participants, and was also the reason cited by three participants for leaving other gyms (not LLLS™).

“ She is very committed and very, very, good, because we had a couple while she was away and really if it had been left to them we wouldn’t have bothered coming. So I think the person who is doing it, it depends a lot on them.” (Female, RD)

“The first time, the first place I went to – No. I just feel that we went in and well I went in and told them what I was doing and there was no back up, I felt that where I was there was no back up and there was no support and the instructors came into the gym, they sat at the computer and they played around, but there was nobody supervising.” (Female, MS)

“At [the facility] where I go they’re really encouraging. There’s two girls that run this part of the program at the gym, they know everybody’s name,...and they’re just very supportive and everything.” (Female, JW)

“It was a foreign country the first time I went in and I was really grateful to have the trainer come around and show you the things and she knew I could only do one minute and when [she] came and saw I could do more she said well done and gave encouragement, it’s good.” (Female, BC)

Generally participants reported that staff observed participants doing the exercises and would correct them if the exercises were not performed as required or safely, particularly the LLLS™ instructors. Only one person reported *“that hasn’t happened to me but they (staff) are very approachable” (male, DB).*

“[The instructor] keeps coming around each one of us, “no you’re not doing that quite correctly, your arm should be bent here, and so on and so forth. And essentially she says do it at your own pace if you are struggling, do not push or over exert yourself.” (Female, RD)

“In terms of interaction with the staff, there has been a slight change over of the staff up there, one guy that is up there regularly at two of the sessions a week, he comes out and mingles with you and chews the fat with you, and goes round like you say if you are not doing your exercise correctly he’ll straighten you out and that so it sounds like we are doing OK up there.” (Male, NR)

“... but I just found that with the second gym we have gone to, the physiotherapist is there, he is supervising, we have all got to do warm ups, we’ve all got to do the program and he keeps an eye on everybody; if he sees that you are not using the equipment the way that he wants you to, and you are virtually being assessed all of the time because somebody is there controlling you.” (Female, MS)

“But there is always someone in the gym, there are two people walking around and they will take you through anything you want, you just ask questions.” (Female, ML)

Participants also reported that support and encouragement was received not only from staff but also other participants. Even the one participant who reported initial concerns about “young guys with all the equipment” found them helpful, *“... sometimes if I can’t lift something that needs to be changed they come across and offer to help, they are very obliging” (female, BC).*

“And then the other people that have already done that program or that part of the program will even help you. So they sort of, they want you to support each other too.” (Female, ML)

The LLLS™ program also provided a “friendly” gym atmosphere and a social network both in and outside of the gym. Being “recognised”/“acknowledged” and “recognising others”, “having another person you can say good day to” were important factors, as were the additional external social activities (eg Christmas lunch, etc).

“So what it seems to me is some of them go and do a class group and others just in and out, but we are still part of the family, sort of, so to speak.....I was saying I think the social side of it is just as important because some of the people I talk to

they really look forward to catching up with each other, and that part of it. Whereas, that is not so much for me, for the ones who do not have a lot in their life, I think it is a great thing. Introducing them to a new network.” (Female, JW)

“At [the facility] after the classes, there’s always two or three tables of ladies sitting, chatting, having their coffee, waiting for the next class, sometimes they do Tai Chi and its an hour to the next class so we’ll have a coffee while we’re waiting for whatever’s next. There’s always groups sitting there chatting.” (Female, PG)

Although all participants acknowledged the importance of the social aspect of the program, talking while exercising was found to be both a motivator and a distraction for one person and a definite distraction for another.

“I quite like being there with others, especially on the cross trainer. The first time I went on it I could only do one minute but you know people would be talking either side and you would find you had done 5 and now I am doing 10 and I’m quite pleased. It is encouraging to work with somebody on the treadmill or anything, you sort of get chatting about things and the time goes by, and I love Living Longer Living Stronger™ because that is encouraging.” (Female, BC)

“Actually, if someone starts talking to me, it is a distraction sometimes because you won’t go on to your next machine and then when your body starts to cool down it is harder to get back into it.” (Female, BC)

“I like to go round alone. It is hard enough concentrating on counting to 10 without talking.” (Female, ML)

Participants also reported that the cost of the program was very important to them, and that the program was value for money.

“I had no idea what it was going to cost and I was very pleasantly surprised by how cheap it was. In my case I was very happy.” (Male, LB)

“It (the cost) is a cup of coffee a day, less than a cup of coffee a day - \$2.50.” (Female, ML)

“When I first went down and found out what the gym costs [not LLLS™] were, I just thought I can’t afford this and I am not spending half my retirement income in a gym.” (Female, MS)

One participant reported no cost for attending the LLLS™ program. A physiotherapist conducted the program and the cost was directly charged to the participant’s Medibank Private card (with extras). She highly praised this method of payment and recommended it to others.

“We pay our Medibank Private with extras, and we are actually going into the gym without having to pay anything. You just go in and swipe your card.” (Female, MS)

The method of payment was also important. For the majority of participants the preferred method of payment was monthly or three monthly payments because it established a “commitment to attend” and a regimen.

“As [female, RD] said once you’ve paid you make sure you go. It is a commitment. You can say to yourself that I will exercise at home, but if you say I will exercise at home there is always an excuse why, I’ll do this, then I will do my exercises, I’ll do that. But if you’ve paid to go out to a thing like this, you go and you do your exercises.” (Female, PG)

“I was surprised at how I enjoy it and like [male, NR] I like a routine, knowing those days are there. (Female, BC)

Only one person reported preferring to pay for 20 sessions so that you pay only if you go and you did not have to negotiate any make up sessions if, for example, you went away on holidays.

“ And then I saw this one advertised in the paper and when I asked about it, the average seems to be that you pay about \$5.00 when you actually go. And that particular idea is what motivated me more because I have a busy life style and I didn’t want to be paying for something I wasn’t using. And I like the idea that if I go, I pay and so on.” (Female, JW)

Access, particularly in terms of flexible class times, was one aspect of the program that participants felt could be improved. Many participants reported preferring morning classes as it frees up the rest of the day, however they were not always available or easily accessed. Two participants could not get to the group classes because they were not available at a suitable time.

“But because of the fact there are different times when you can go there is only one morning session. The morning session is always busy. It is the ones that start from 2 till 3.30 and of course then you get tangled up in school traffic and all that sort of thing, that puts some people off. ...I play bowls and you listen to them and they say “I couldn’t do that in the afternoon, I couldn’t give up bowls”...You either go first thing in the morning or you don’t go at all.” (Female, MS)

“Initially we started off about 9.30 to 11.30 and twice a week we had an exercise program but since the gym has changed round a bit we’re not having that and you can go early which suits me if I have other things to do.” (Female, BC)

“For me regimentation works. The 8 to 9 suits me fine and I feel that I am getting a benefit from it; it’s pretty simple stuff.” (Male, NR)

In relation to the gym environment, participants generally reported that their gym had people of all sizes, ages, gender, wearing all sorts of clothing. This may be one reason why participants easily adapted to the gym environment.

“...There are a few younger ones but there is no lycra scenes or things like that but all ages, all sizes, ladies and men.” ... “Some people wear long pants, some people..., it’s what you feel comfortable in.” (Female, ML)

“Yes, and you don’t feel out of place. Some are in shorts, some are in track pants.” (Female, MS)

One person, who started in a small gym that moved into newly renovated and larger premises, reported feeling intimidated initially but familiarity with the routine helped them overcome these feelings.

“The first time we went over to the bigger gym in the new building, we all felt a bit intimidated but then because we were familiar with our program, once you got working on your program you forgot about it being a much bigger set up you know and now we are all comfortable.” (Female, BC)

Some referred to old facilities and equipment and new equipment that did not work, but this did not detract from the program (*“you just get past that”- female, ML*). Music played at the gyms was generally reported as a negative issue (eg “loud”, “head banging”) but a number of people reported that this has led to the use of ipods/MP3.

“I am amazed at the number of older people who have now learned to use ipods. They take their own music because they dislike the music that is there.” (Female, BC)

Program tailored to needs

Most participants reported initially attending group classes and then having an individual program developed. Only one person (female, RD) reported a group approach to all classes, “where everyone does the same program but at their own pace”, however they were “shown how to do the exercises individually”. All participants agreed the program was tailored to meet individual needs.

“...they have a range of exercises on an exercise sheet and they picked out the ones that would suit and I’m on my third review now I think – maybe more, because they normally review it each month and change the exercises and accordingly take into account where the aches and pains are. I’ve just started the new one and from the old lot there was one exercise that I just took out because it was affecting my knee, and this time around I have my wrist and elbow to worry about as well. The trainer there went through each of the exercises with me and I would say “that is hurting my

elbow” and so he would say “well do it this way or do something different”, so yes they do make adjustments there.” (Male, NR)

“Well they ask you if there’s any particular area that you want built up, I’m doing balancing on this ball thing, and its to help with balance, and if your balance is good apparently it helps your reflexes, doing weights on those beam things that wobble you around, discs... So that was a couple of things I needed... oh, and you know, I said, “I’m no good at pushing, I can pull alright but I have trouble with pushing,” so there’s things like that that they’ll set the program to specific areas, if you ask, particular areas you want help with.” (Female, PG)

“So it seems that they just work each person that comes to it at their own level, which is good.” (Female, JW)

Review of programs

All but one participant reported a review process that involved an individual interview. Reviews were conducted at various timeframes (monthly, every 2 months, every 6-8 weeks, after you complete a program). Programs were progressive and modified in various ways – by increasing the number of repetitions, increasing the weights used and by including new exercises and new and different equipment. The progressive element of the program was not only part of the review process but at the core of each session.

“Well what we’re doing is that you get a set of exercises and you start at 8, you build them up until you are doing 12 in the set. Once you get to 12 in the set you then increase the weight and go back to 8 again, build it up to 12, go back, increase the weight and that’s how [the instructor] does that. And he keeps an eye on you.” (Female, MS)

“They’ll set a weight to start at, but when you feel you can do whatever exercise at that weight comfortably you can increase the weights, so this is why, how you’re building up, because the challenge is, challenging yourself to a heavier weight, and if you can do a particular weight 12 times comfortably, go up a bit and you might only be able to do that weight 10 times, or 8 times, but its, until you can do that more comfortably then you do that again. It’s not a stabilised program, you’re increasing it yourself.” (Female, PG)

The one participant (female, RD) who participated in a group program reported no specific review process but indicated that exercises were regularly changed and that no two weeks were the same. Further adding that although the group had *“...started off probably slowly. Now this year I have noticed that we are being worked hard. She’s (the instructor) building it up.”*

Benefits

A range of benefits was reported as a result of the program, including physical and psychosocial. Physical benefits included improvements in previous health conditions (lower blood pressure and cholesterol, helps arthritis), feeling stronger, fitter, less tired and weight loss. The psychosocial benefits included the social aspects, general well-being and an enjoyment of the program that was in some instances an added and unexpected benefit. Another benefit of the program was the encouragement and support the program provided. Quotes have been included for each participant.

“I certainly feel better. Sometimes if I have been particularly conscientious with my program I still sit and read the paper in the afternoon and have a “nanna nap” but I don’t feel guilty about it you know, I do think my well-being is improved.....Physical and mental I think, because I have thought well I can actually do it, it is something I never dreamed that I could do, and I am enjoying it, I am surprised at how I am enjoying it. When the music is playing and I am on the treadmill or the cross-trainer, it reminds me of when I was young, you know when you were dancing and you can lift yourself up....” (Female, BC)

“The reason I went there was to build up the muscles around my neck and I haven’t had problems with my neck since, so that’s a definite one. General well-being, I feel I have got more muscle bulk, just sitting here I can feel the extra muscle bulk that I have. I don’t know that I overtly have more strength because I am always conscious of my joints but I probably do.” (Male, NR)

“I don’t get as tired after golf as I used to.” (Male, LB)

“I have improved my knee. I am definitely stronger. I walk up to the gym and walk home so that is my warm-up session. So I quite enjoy that, that is just a bit of time out. You can just get lost in the suburbs. I don’t particularly go for the – look it is nice just to say hello; I don’t need to go up there and talk for half an hour to anyone in particular. But you just sort of acknowledge each other as you go around.” (Female, ML)

“And on the physical aspect, and the gym is the only thing I have done differently and my blood pressure has dropped down enormously. It is quite radical the way it has dropped and this is the only different thing I have done.” (Female, RD)

“...I’ve always been pretty active, to me this is just another aspect. Probably I am feeling stronger than I was because of the weights, but it’s just another phase added into my active life.” (Female, PG)

“Actually you just said something there that because you’re feeling stronger that reminds me that my computer went on the blink the other day and I wanted it fixed fast, so my husband was out, so I’d already got my computer half unscrewed. So I just pulled out the plugs, lifted the computer up, and you know how heavy that case

is, carried it out to the car, would you believe, down some steps and then when I came home again, carried it all the way up the steps. I thought gee, I would never have done that ten months ago. I must really be building things up.” (Female, RD)

“I notice that when the children come running down the passage, “nanny, nanny, nanny”, that at least now I can grab them and lift them up, whereas before it was me going down there and taking ten minutes to get up off the floor, no it is much better.” (Female, MS)

Two participants stated that they were waiting to see if there were any specific physical changes - one had missed classes due to an injury, the other had stopped going for a few months. Although both participants were anxious to see their results from the study to quantify changes, they had reported a number of psychosocial benefits and other benefits associated with the program (eg social, cost, the support and encouragement). This also included the structure and type of exercises provided that were seen to be more beneficial for older people.

“I think the benefit...often older people go to the doctor and the doctor says you should exercise, get a dog or walk. I see lots of old people walking around our area and the walk I don’t think does them any good. You’ve got to get a heart rate, where you get that at the gym. They know, they give you an exercise that will build the heart rate up a bit, and that’s beneficial. But I see some of the old people, they’re moving, they’re walking, but if they stop still they will fall over. (Male, DB)

“I think going to a gym is much more beneficial as you get older because you’re restricted. You’ve got somebody telling you how far you can go, but because you got somebody telling you, you obviously do it and once you pay your money you think gee if I don’t go I’m wasting my money, so you’ve got to go. (Male, DB)

Factors contributing to ongoing and long term participation

Most participants saw themselves doing the LLLS™ program long term (years, not months), one reported doing it on and off because they travel a lot. Only one participant stated that they may not continue with the program given their busy schedule and will wait to see whether, based on the study outcomes, there has been any physical improvement before deciding. [This participant withdrew from the project, prior to its completion.]

Only one person reported missing one class because they were not in “the mood”. Another person, as reported above, did not attend for two months due to other preferred activities and a busy schedule. Generally, classes were missed due to bona fide reasons such as illness, funerals, work and other

commitments, usually “a day here/there”, as well as injuries and holidays. Also, as previously reported, two participants could not attend the group classes because the hours/days did not suit them, but attended regularly, doing their individual LLLS™ program.

Many of the factors that were attributed to both ongoing participation and long term involvement in the program have been mentioned. They included seeing the benefits of the program (improved health, reduction in medication, increased activity and energy, strength), the enjoyment, the challenge and sense of achievement, the encouragement, wanting to stay independent (avoid frailty and nursing home placement), the cost (inexpensive), and doing exercise with others (motivating and the social benefits). Establishing a routine (“regimen”) was important, and was seen to be greatly assisted by having paid monthly/every three months (“commitment” to attend).

“I was surprised at how I enjoy it and like [NR] I like a routine, knowing those days are there. And I have had results health wise – I have halved one of my tablets, the milligrams, and my blood pressure has gone down. So I am very pleased. That motivates me to keep going.” (Female, BC)

“When you are doing things by yourself, like I used to walk before I joined the program. But it would be a bit windy or you know, and you knew you were by yourself. Because you have got a program to follow and there are other people doing it, even though you don’t know them – you just know them by sight – it is still better than doing things on your own.” (Male, LB)

“... so you really do have to slot that time away.” (Female, ML)

“I think the challenge works too, it is a good point you make there, I’ll always look forward to building it up.” (Male, NR)

Seeing the benefits and achievements of long term attendees and others was also reported as a motivator.

“When you go to the gym and you see people – there is a girl that goes up there and you will see that she is disabled but she gets into the exercise and they are all doing very well so you can only benefit from it.” (Male, LB)

“Yes, because there are ladies, I know more of the ladies up there than the men, you are talking to people who have been there 7 and 8 years. We’ve got someone, [SR], she has gone on to do strength training and goes into all these championships. ... She is impressive.” (Female, ML)

“The person we have, she said initially she went to the gym for herself for health reasons and weight reasons and enjoyed it so much that she has become a trainer. So she goes round encouraging everybody. There were 80 year olds there who get on. When we couldn’t do the cross-trainer, they would say “look at old Jim over there, he can do 20 minutes” and you think why can’t I do a bit more so you hold on a bit longer and do a bit more.” (Female, BC)

Family support and reactions were also motivators, as was the excitement of learning something that was initially foreign.

“I find with my family, they are all so pleased with me that if I drop off I will disappoint myself and them.” (Female, BC)

“It’s quite funny, I’ve got a daughter-in-law who carried quite a lot of weight and she has been going down to the Ascot Vale [gym] and she has a personal trainer down there and she has taken off an enormous amount of weight and I was over there for dinner one night and [my son] and I were talking about the gym and my son said ‘isn’t this a change of times, there is my wife and my father talking about the gym’.” (Male, LB)

“Isn’t it amazing you can talk about all these machines and all these other people who go to gym know what you are talking about, it is wonderful.” (Female, ML)

“That’s right, my brother-in-law said to me ‘what number are you on for walking’ and I thought if you had asked me that a couple of months ago I wouldn’t have known what he was talking about.” (Female, BC)

Other motivators included the sense of being responsible for your health, knowing once you get going you feel better and that the program was preferable to walking, which was dependent on the weather, had safety concerns, or was of little benefit if just “ambling”.

However ongoing attendance long term was dependent on still having quality trainers and suitable hours. One person also indicated that ongoing participation depended on the continuation of the group approach, because they found that there were more benefits being in a group.

Some suggestions offered by the group for why other older people may have dropped out of the program or have not joined the program, included work, “something always comes up” (such as health issues), the distance (harder to get to), not having the type of exercise they wanted (aerobic), unsuitable session times, the cost and a lack of interest or motivation.

“I suppose it comes down to motivation really and whether you want to do it or whether you don’t and whether you feel you are getting any benefit, because I feel I am.” (Male, LB)

Another possibility suggested was that older people are not aware of COTA, what it is or what it does, or the LLLS™ program.

Promotion

Of the nine focus group participants, three had heard about the LLLS™ program from someone they knew, two from someone doing the LLLS™ program and one from a spouse who works for COTA. Two others heard about the program through a senior’s association book/magazine article and two from a local paper advertising the LLLS™ evaluation study. The other two participants went to their local gym and were told about the LLLS™ program.

A key theme from the focus groups highlighted the need for COTA to promote the LLLS™ program more widely. Participants from both groups stated that people are not aware of LLLS™ and that more publicity was needed to promote the program, what it is, what it does and what audience it relates to.

A number of suggestions were made to promote the LLLS™ program. These included promotion through diabetes and other support groups/clinics, general practices and the University of the Third Age. It was suggested that COTA address sporting groups, senior citizens and bowling clubs about the LLLS™ program. It was also suggested that although some bowling clubs were sponsored by local gyms, they were seen to *“push their own products and fees (female, MS)”* and that the COTA label was not visible at some gyms. In addition, although the National Seniors 50 Something magazine includes information from COTA it usually related to their political/advocacy activities, and although the Victorian Seniors Newspaper included articles and promotion from COTA this was not on a regular basis.

“I think it could be advertised better. Anyone I talk to has never heard of it, in my group of my friends, don’t know what I’m talking about. So maybe a bit more publicity about what it is and what it does, and what audience it relates to.” (Female, RD)

“But maybe COTA representatives should go out and speak to these sporting body groups, senior citizens clubs and bowling clubs and all that sort of thing. Because there

are a lot of people who have no idea who [COTA] are or what [COTA] do, and whatever they read in the paper it is the political view of what the representative of COTA or 50 Something is doing in the political field, not what [COTA] are doing somewhere else.” (Female, MS)

Other suggestions for promotion included promotion during senior week, getting the council involved in a try out a gym for the week or an offer of a couple of free sessions as an “incentive to try it out”, word of mouth and providing a courtesy bus to get people there. Getting people in, without pressuring them to join, was the starting point and was seen as a means of getting others (eg spouses) motivated as well.

“..Because my husband actually drove me over to the thing and [the instructor] said to my husband ‘you can come in, I’m not going to hurt you, you can come in’, and so actually he then made an appointment to see him and has joined too. As soon as he realised that I wasn’t going to be accosted or put through hoops, he too has joined the program.” (Female, MS)

Suggestions were also provided as to how the LLLS™ program could be improved. The suggestions primarily involved the inclusion of other health and well-being information (eg diets; physiotherapy; other activities; spiritual and lifestyle information) that took a holistic approach to health and well-being. This included having someone come and talk about different topics or having COTA organise meetings to discuss different topics. A suggestion was also made that COTA could organise a walking group, under the COTA banner, as an additional activity. Both groups referred to and highly praised a walking group organised by a local chemist. One participant queried whether a lack of walking groups in her area was due to insurance liability and stated that *“nobody is prepared to accept the responsibility” (female, MS)*.

3.3.2 Focus group summary

All focus group participants were currently involved with the LLLS™ program, no participants who withdrew from the program attended. Based on the focus group findings, participant experiences of the LLLS™ program were positive and a range of benefits, both physical and psychosocial, were reported. Some participants were surprised that they were doing gym work or weights and that they were enjoying it. Long term motivators were associated with the health and well-being benefits that participants perceived (in their own abilities and

health and those of long term participants of LLLS™ program), the support and encouragement, the challenge and the social components of the program.

3.4 Exit survey findings

Fourteen of the twenty-nine (48%) participants who had withdrawn from the LLLS™ program completed exit surveys. The exit surveys provided valuable feedback relating to the participants positive and negative perceptions of the LLLS™ program. Furthermore information relating to the different gym environments and how various centres run their respective LLLS™ programs was also obtained. The main aim of the exit survey was to investigate reasons why participants had withdrawn from the LLLS™ programs (refer to Appendix 5 for a copy of the survey).

3.4.1 Main reasons why participants withdrew

Participants were asked to list their major reasons for withdrawing. Reasons included time restraints or other time commitments (67%), family commitments (33%), and/or health reasons (25%).

No participants withdrew because they were dissatisfied with the program and the majority (83%) indicated that they would like to return to the program at some point in the future. This data suggests that it is not the LLLS™ program itself but rather other events and personal commitments that prevented people from continuing their gym programs.

3.4.2 Length of attendance and number of sessions attended per week

In order to gauge at what point participants were withdrawing from the LLLS™ programs, length of attendance was evaluated (Table 8).

Table 8: Length of Attendance

| Length of Attendance | Number of Participants |
|--------------------------|------------------------|
| One Month | 8% |
| Two Months | 42% |
| Three Months | 25% |
| Four Months | 8% |
| Greater than Four Months | 17% |

Of the participants who had withdrawn, 8% had attended one session per week, 58% had attended two sessions of LLLS™ per week and 33% had attended 3 sessions per week. These data may suggest that the longer a person is involved in the LLLS™ program and the more they attend the gym the less likely they are to withdraw.

3.4.3 Personal benefits and physical changes

Personal benefits and physical changes obtained from participating in LLLS™ programs were also investigated through the exit surveys. The most common reported benefits and physical changes were improved muscle strength (58%), improved balance (42%), increased stamina (42%) and increased energy levels (42%). Twenty-five percent of surveyed participants also reported an improvement in their functional capacity, with the LLLS™ program helping them with daily activities such as getting out of chairs and with lifting and carrying heavy objects. In addition nearly all surveyed participants (92%) reported the LLLS™ program to be challenging, in a positive way.

3.4.4 How sessions were run and the gym environment

How the LLLS™ sessions were run and how the participants found their specific gym environments and LLLS™ instructors was also investigated. Fifty-eight percent of withdrawn participants attended LLLS™ programs that were run as a combination of group and individual sessions, 33% attended LLLS™ programs that were run individually and one participant attended a group LLLS™ program. Of the surveyed participants, 75% felt they had adequate support and attention provided to them during their LLLS™ sessions with the remainder feeling they did not receive sufficient support and attention.

In relation to the gym environment, 67% found their gym environment to be “friendly”, 58% found it to be “welcoming” and 33% found it to be “sociable”. None of the participants reported their gym environment to be “uncomfortable” however one participant did find the environment to be “intimidating”.

3.4.5 Positive aspects of the LLLS™ program

Various themes emerged regarding the positive aspects of the LLLS™ program. Some themes were specific to the individual including personal benefits while others were related to the LLLS™ program including feedback about centres and the broader structural environment of the gyms.

Personal benefits

Personal benefits reported included improvements in mood and increased social interaction. One participant noted that,

“I felt so much better in myself” and “I found I was getting more energy”.

In addition another participant said the LLLS™ program had been “*a lot of fun*” and that they would “*recommend the LLLS™ scheme to all*”. Interaction with other people was also a reported benefit with the comment that the LLLS™ sessions made for a “*good social environment*” within the group.

Comments from the surveys also indicated a change in attitudes and beliefs towards the gym and physical activity. One participant noted that the LLLS™ program had allowed them “*to recognise the necessity of exercising*”. Another participant stated,

“When time permits I will return to LLLS™ as I believe it is important to do weight bearing exercise as we get older”.

Feedback about Centres

Participants also provided positive feedback about their respective LLLS™ centres. This included comments about staff members at the centres. One participant noted that the “*changing routines (were) very well managed by staff at [the] centre*”. In addition another participant reported the most positive aspect of their centre to be the “*considerate and caring attitude of staff*”.

The inclusion of a group introduction session for new LLLS™ participants at one centre was also reported as a positive aspect,

“The group introduction at [the centre] was good. That meant we could help each other”.

Another participant noted that the centre they attended helped them become aware of other activities that could be undertaken in the community,

“ The various community notices that appeared on the pin board to promote various programs and events such as Tai-chi appealed to me”.

Broader Structural Environment

Positive aspects relating to the gym environment and how the different programs were run were also reported. One participant noted that the *“times we were told to attend was also good”* while another suggested that *“variety in the program is very important otherwise it would become boring”*. Following on from this, one participant stated that they enjoyed the gym because of the *“friendly, controlled gym exercises”* that were prescribed to them. In addition another participant stated that they enjoyed the gym and LLLS™ program because the *“casual environment”* appealed to them.

3.4.6 Negative aspects of the LLLS™ program

Participants also provided valuable information relating to how the LLLS™ programs could be improved. Themes that emerged were either related to individual preferences or the LLLS™ program itself.

LLLS™ program

Four participants reported negative experiences that had occurred during the time they were involved with the LLLS™ program. These events were mostly related to the LLLS™ instructors where participants felt they did not receive adequate support and attention. One participant noted,

“I considered the instructors could deal more effectively to deliver more efficient individual instructions were they better personally organised”.

Another participant reported that they were not shown the proper position of equipment (e.g. shoulder height) also indicating a lack of individualised support

and attention. Similarly a participant reported that they were left on their own and felt intimidated by the gym environment,

“With my age (64 years) I made a few mistakes, the younger ones don’t take age into account, I was getting confused and paid for it”.

This same participant also noted that after their group introduction, *“our group just disappeared, being left to self coordinate just didn’t work”*. They also stated that the females in the group stayed together but the men attended at different times due to a lack of coordination from the top.

One participant reported on the differences they experienced between attending the LLLS™ program and another group activity (aqua aerobics) at their gym centre. They noted that the gym environment varied; at times they spoke to no other person for the whole time they were doing gym work (individual session). In contrast they found their other activity (aqua aerobics) to have greater social benefits than the LLLS™ gym program,

“With the aqua aerobics which I continue to do twice weekly it seems to be easier to connect with other participants as it is a group session with a free coffee offered after”.

Individual

Other comments reported from participants were not related to the LLLS™ program but rather their own preferences and other commitments that influenced their perception of the program. One participant noticed a decline in people attending their class and thought that is was due to other time commitments arising for people. Another participant who stopped attending because the LLLS™ session times always clashed with their medical appointments stated,

“I should have been more proactive and checked with the Administration about attending on other days when hospital appointments clashed for me”.

Similarly another participant who stopped attending due to other preferences and commitments stated,

“My problem being my activity to golf and B.H.G Club 3 days a week fairly normal plus trade work mostly on a voluntary basis. At 82 together with LLLS™ became too much to the extent I mostly felt too tired”.

3.4.7 Exit survey summary

Exit surveys were conducted with those participants who had withdrawn from the LLLS™ program. Based on the exit survey findings, the majority of participants withdrew due to time, health or family commitments and not because they were dissatisfied with the LLLS™ program. Many positive comments about the LLLS™ program were reported including personal benefits, physical changes and feedback about the centres and staff. In addition a small number of withdrawn participants commented on some the negative experiences that had occurred during their time with the LLLS™ program, mainly associated with the level of support and attention provided by staff and the dissipation of the group. Such feedback could be useful in terms of further improving the conduct of the LLLS™ program in some centres. These findings are consistent with the focus group findings, which were conducted with participants still undertaking the LLLS™ program.

4. Discussion

The aim of this unique study was to evaluate an existing community based progressive resistance strength training, as it is implemented in the community in a real life context. The study aimed to determine if significant improvement could be achieved for older adults participating in the LLLS™ program in relation to self-rated health, cardiovascular fitness, muscle strength, balance, gait, activity level, mental health and quality of life.

Although the study failed to recruit the 60 participants initially estimated to be required to complete the study, limiting the study's power to identify significant differences, a number of significant improvements were identified for participants involved in the study. Thirty five participants completed a 4 month assessment but only 24 completed the 8 month assessment.

There were improvements in a number of physical measures based on both the 35 participant sample (4 months) and the 24 participant sample (8 months). Consistent across both samples, improvements were evident in *cardiovascular fitness* (distance, the 6 minute walk), *balance* (step test), *stride length* (based on the 6 metre walk), and *lower leg strength* (sit to stand-5 times). Improvements were also evident in the *physical performance test* (7 & 9 item) that includes a range of day to day activities of function, and (self-reported) reported health transition (SF-36) that compares health in general now to a year ago.

There were also differences between the two samples. For the 35 participants who had completed a 4 month assessment, there was significant improvement in *self reported vitality* (SF-36), *quality of life* (AQoL) and *left shoulder abductor strength*. Based on this sample, there were also significant differences favouring high compliers in relation to vitality and social functioning (SF-36), the step test, sit to stand and the right shoulder abductor and right elbow extensor strength.

For the 24 participants who remained to complete an 8 month assessment, although vitality, AQoL and left shoulder abductor strength were no longer significant, role physical and mental health (SP-36 domains) and gait velocity

significantly improved. There were also fewer significant differences over the time sequence (baseline, 4 & 8 months) between high and low compliers – the step test, the sit to stand and the right elbow extensor strength remained as significantly better outcomes for those with higher compliance with the LLLS™ program.

In relation to sit to stand and the step test, both high and low compliers showed significant change over time, however high compliers significantly improved in the first 4 months whereas low compliers significantly improved in the subsequent 4 months. In relation to the right elbow extensor strength there was a significant time sequence difference based on the repeated measures ANOVA. However, based on paired t-tests, although high compliers significantly improved in the first four months compared to low compliers, there was no significant difference or trend in the subsequent four months. Therefore, over time, level of participation (high or low compliance) seemed less relevant to overall improvement, or to put in simple terms, a participant does not have to be a “gym junkie” to achieve significant improvement.

In addition, when looking at the effectiveness of exercise, the importance of physical health and fitness maintenance or lack of deterioration is also important to acknowledge. Where no significant improvement or trends were evident, generally performance levels were maintained across the time sequence, with very few measures demonstrating reduced performance. In fact, there were only six non-significant measures in the 35 participant sample that recorded a drop and the drop ranged from 1% to 6%. They included general health (SF-36), the right and left hip abductor strength, the right and left ankle dorsiflexion strength, and the right elbow extensor strength. In relation to the 24 participant sample, there were only four measures recording a drop in performance – social functioning and role emotional (SF-36) (1% and 3% drop) and both the right and left hip abductor strength (13%, $p=0.012$, and 10%). Most of these changes would be expected to be within the accepted range of measurement error.

A number of factors may have impacted on the lack of significant changes in most strength measures assessed using the hand held dynamometer. First,

there were a number of changes in assessment staff, who had different levels of individual strength and may not have been able to provide the equal levels of force as the other assessors. Secondly, the study was assessing a “real life” program that varied not only according to individual program differences but facility differences so that the program contents were not controlled. It is unknown what percentage of the participant program was dedicated to weights (free weights or machine weights as compared to stretching, swiss ball, treadmills, exercise bikes etc) or the number of repetitions completed or the weights being used. Also all measures of strength using the hand held dynamometer at baseline were 0.100 or above (a score below 0.100 indicates a deficit), so no muscle deficits were evident at baseline.

In addition to the small sample size, another limitation of the study is the fact that some participants (58%) were assessed substantially later than the 4 and 8 months due date. This was due to people being on holidays, ill or having other commitments and therefore they were unable to attend earlier. In addition, some participants had completed 4 – 5 weeks of the LLLS™ program before the baseline assessment. These two issues would impact on the timing one would expect to see significant improvement. Other study limitations were the changes to research assessment staff, which would have particularly impacted on the hand held dynamometer measures, mentioned above, and not all participants completed or fully completed compliance calendars. However, regardless of these limitations, many significant changes were found in a number of important outcome measures over time.

The positive outcomes from the assessment findings confirm the many benefits reported by the focus group participants and the participants who withdrew and completed an exit survey. Improved vitality, strength, fitness and balance were reported as well as improvements in health, well-being and functional capacity. Participants found the program challenging and enjoyable, and they valued the structure of the program – the structured exercise, the friendly supportive and qualified staff, the social opportunities and support from other participants. The challenge, the program structure and the perceived health benefits were the factors that motivated participants to remain with the program. For those who withdrew, given that the reasons for withdrawing from the LLLS™ program were

related to health, time and family commitments, these benefits may encourage them to return to the program when time, health and other commitments permit. Having qualified and attentive staff was important to participants and an area that could be improved in some facilities. Other improvements suggested by focus group participants to enhance the program included the inclusion of other health related and life style topics in the LLLS™ program and wider promotion of the program.

Participants in this study were generally healthy, active older people and may not be representative of the broader older population, or the broader population of participants in LLLS™. Most participants (91%) were recruited from fitness/leisure centres, which represent about two-thirds of LLLS™ providers. LLLS™ is also delivered to a large number of participants through community health and rehabilitation centres and other community facilities, where participants may be less healthy and/or active. Although seven such centres were approached to participate, only three people were recruited and completed a follow up assessment from these facilities – one from a rehabilitation service and two from the one community health service.

An article by Sims et al (2007) involving a cross sectional survey of older people aged 65 and over, in Victoria, found that the majority of participants (85.7%) were not engaged in strength training. Although strength training may not be acceptable to all older people, there most likely is a substantial proportion of older people who may be interested if they were aware of the LLLS™ program, its many benefits, and that this training is available across Victoria at a reasonable cost. While the success of LLLS™ has contributed to changes in perceptions about the 'appropriateness' of strength training for older people by the fitness and health sectors and also the broader community, the reach of this message has thus far been limited. An effective advertising campaign, for which funds are not currently available, would be required to support promotional activities presently undertaken by COTA and LLLS™ partners, to address this lack of awareness. Also, there are still structural, social and economic barriers to access for many potential participants.

Further investigation of this highly regarded program is warranted to build on the findings of this current study.

5. Conclusion

Participation in the LLLS™ program demonstrated a number of significant improvements in quantitative measures of balance, gait, strength, function and self reported health and well-being measures for a group of older people. The assessment findings confirmed many of the benefits reported by participants still participating in the LLLS™ program in focus groups and participants who withdrew from the program in exit surveys. Being an existing community based program, program withdrawals whether permanent or temporary, due to health issues, family and other time commitments, are common. The majority of the withdrawn participants indicated that they would like to return to the program at some time in the future. Facilities need to ensure that processes are in place to help participants keep in touch with the program (for example through telephone follow-up, newsletters or event invitations) and to assist them to more easily return to the program and exercise routine.

Wider promotion of LLLS™ is also needed, but this would necessitate additional subsidised funding. Strategies to recruit new and different kinds of providers, and where feasible to increase the capacity of existing ones, are also needed to ensure that the program remains affordable and accessible for all older people who desire to participate.

In summary, findings from this study indicate that there is a range of benefits, both physical and psychosocial, that can be achieved by older people participating in the Living Longer Living Stronger™ program. Further investigation of this program is warranted to build on the current findings.

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Appendices

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Appendix 1.1: Assessment of quality of life

INSTRUCTIONS

Please circle the statement below that best describes you during the last week.

1. Concerning my use of prescribed medicines:

- I do not or rarely use any medicines at all
- I use one or two medicinal drugs regularly
- I need to use three or four medicinal drugs regularly
- I use five or more medicinal drugs regularly

2. To what extent do I rely on medicines or a medical aid? (NOT glasses or a hearing aid) (for example: walking frame, wheelchair, prosthesis etc.)

- I do not use any medicines and/or medical aids
- I occasionally use medicines and/or medical aids
- I regularly use medicines and/or medical aids
- I have to constantly take medicines or use a medical aid

3. Do I need regular medical treatment from a doctor or other health professional?

- I do not need regular medical treatment
- Although I have some regular medical treatment, I am not dependent on this
- I am dependent on having regular medical treatment
- My life is dependent upon regular medical treatment

4. Do I need any help looking after myself?

- I need no help at all
- Occasionally I need some help with personal care tasks
- I need help with the more difficult personal care tasks
- I need daily help with most or all personal care tasks

5. When doing household tasks: (for example, preparing food, gardening, using the video recorder, radio, telephone or washing the car)

- I need no help at all
- Occasionally I need some help with household tasks
- I need help with the more difficult household tasks
- I need daily help with most or all household tasks

6. Thinking about how easily I can get around my home and community:

- I get around my home and community by myself without any difficulty
- I find it difficult to get around my home and community by myself
- I cannot get around the community by myself, but I can get around my home with some difficulty
- I cannot get around either the community or my home by myself

7. Because of my health , my relationships (eg: with my friends, partner or parents) generally:

- Are very close and warm
- Are sometimes close and warm
- Are seldom close and warm
- I have no close and warm relationships

8. Thinking about my relationship with other people:

- I have plenty of friends, and am never lonely
- Although I have friends, I am occasionally lonely
- I have some friends, but am often lonely for company
- I am socially isolated and feel lonely

9. Thinking about my health and my relationship with my family:

- My role in the family is unaffected by my health
- There are some parts of my family role I cannot carry out
- There are many parts of my family role I cannot carry out
- I cannot carry out any part of my family role

10. Thinking about my vision, including when using my glasses or contact lenses if needed:

- I see normally
- I have some difficulty focusing on things, or I do not see them sharply. *For example: small print, a newspaper, or seeing objects in the distance.*
- I have a lot of difficulty seeing things. My vision is blurred. *For example: I can see just enough to get by with*
- I only see general shapes, or am blind. *For example: I need a guide to move around*

11. Thinking about my hearing, including using my hearing aid if needed:

- I hear normally
- I have some difficulty hearing or I do not hear clearly. *For example, I ask people to speak up, or turn up the TV or radio volume*
- I have difficulty hearing things clearly. *For example, often I do not understand what is said. I usually do not take part in conversations because I cannot hear what is said.*
- I hear very little indeed. *For example: I cannot fully understand loud voices speaking directly to me.*

12. When I communicate with others: (for example: by talking, listening, writing or signing)

- I have no trouble speaking to them or understanding what they are saying
- I have some difficulty being understood by people who do not know me. I have no trouble understanding what others are saying to me
- I am only understood by people who know me well. I have great trouble understanding what others are saying to me
- I cannot adequately communicate with others

13. If I think about how I sleep:

- I am able to sleep without difficulty most of the time
- My sleep is interrupted some of the time, but I am usually able to go back to sleep without difficulty
- My sleep is interrupted most nights, but I am usually able to go back to sleep without difficulty
- I sleep in short bursts only. I am awake most of the night

14. Thinking about how I generally feel:

- I do not feel anxious, worried or depressed
- I am slightly anxious, worried or depressed
- I feel moderately anxious, worried or depressed
- I am extremely anxious, worried or depressed

15. How much pain or discomfort do I experience?

- None at all
- I have moderate pain
- I suffer from severe pain
- I suffer unbearable pain

Appendix 1.2: Geriatric Depression Scale

Choose the best answer for how you have felt over the past week:

1. Are you basically satisfied with your life? Yes No
2. Have you dropped many of your activities and interests? Yes No
3. Do you feel that your life is empty? Yes No
4. Do you often get bored? Yes No
5. Are you in good spirits most of the time? Yes No
6. Are you afraid that something bad is going to happen to you? Yes No
7. Do you feel happy most of the time? Yes No
8. Do you often feel helpless? Yes No
9. Do you prefer to stay at home, rather than going out and doing new things? Yes No
10. Do you feel you have more problems with memory than most? Yes No
11. Do you think it is wonderful to be alive now? Yes No
12. Do you feel pretty worthless the way you are now? Yes No
13. Do you feel full of energy? Yes No
14. Do you feel that your situation is hopeless? Yes No
15. Do you think that most people are better off than you are? Yes No

Appendix 1.3: The Short Form–36 Health Survey

Instructions: This survey asks for your views about your health. This information will help keep track of how you feel and how well you are able to do your usual activities.

Answer every question by marking the answer as indicated. If you are unsure about how to answer a question, please give the best answer you can.

1. In general, would you say your health is:

- | | |
|-----------|--------------|
| | (circle one) |
| Excellent | 1 |
| Very good | 2 |
| Good | 3 |
| Fair | 4 |
| Poor | 5 |

2. *Compared to one year ago*, how would you rate your health in general *now*?

- | | |
|---------------------------------------|--------------|
| | (circle one) |
| Much better now than one year ago | 1 |
| Somewhat better now than one year ago | 2 |
| About the same now as one year ago | 3 |
| Somewhat worse now than one year ago | 4 |
| Much worse now than one year ago | 5 |

3. The following items are about activities you might do during a typical day. Does *your health* now limit you in these activities? If so, how much?

| | (circle one number on each line) | | |
|--|----------------------------------|--------------------------|------------------------------|
| Activities | Yes, Limited a lot | Yes, Limited a little | No, Not limited at all |
| a. Vigorous activities, such as running, lifting heavy objects, participating in strenuous sports | 1 | 2 | 3 |
| b. Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf | 1 | 2 | 3 |
| c. Lifting or carrying groceries | 1 | 2 | 3 |
| d. Climbing several flights of stairs | 1 | 2 | 3 |
| e. Climbing one flight of stairs | 1 | 2 | 3 |
| f. Bending, kneeling or stooping | 1 | 2 | 3 |
| g. Walking more than a mile | 1 | 2 | 3 |
| h. Walking several blocks | 1 | 2 | 3 |
| i. Walking one block | 1 | 2 | 3 |
| j. Bathing or dressing yourself | 1 | 2 | 3 |

4. During the *past 4 weeks*, have you had any of the following problems with your work or other regular daily activities *as a result of your physical health*?

(circle one number on each line)

| | Yes | No |
|---|-----|----|
| a. Cut down on the amount of time you spent on work or other activities | 1 | 2 |
| b. Accomplished less than you would like | 1 | 2 |
| c. Were limited in the kind of work or other activities | 1 | 2 |
| d. Had difficulty performing the work or other activities (for example, it took extra effort) | 1 | 2 |

5. During the *past 4 weeks*, have you had any of the following problems with your work or other regular activities *as a result of any emotional problems* (such as feeling depressed or anxious)?

(circle one number on each line)

| | Yes | No |
|---|-----|----|
| a. Cut down on the amount of time you spent on work or other activities | 1 | 2 |
| b. Accomplished less than you would like | 1 | 2 |
| c. Didn't do work or other activities as carefully as usual | 1 | 2 |

6. During the *past 4 weeks*, to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbours, or groups?

(circle one)

| | |
|-------------|---|
| Not at all | 1 |
| Slightly | 2 |
| Moderately | 3 |
| Quite a bit | 4 |
| Extremely | 5 |

7. How much *bodily* pain have you had during the *past 4 weeks*?

(circle one)

| | |
|-------------|---|
| None | 1 |
| Very mild | 2 |
| Mild | 3 |
| Moderate | 4 |
| Severe | 5 |
| Very severe | 6 |

8. During the *past 4 weeks*, how much did *pain* interfere with your normal work (including both work outside the home and housework)?

- (circle one)
- Not at all 1
 - A little bit 2
 - Moderately 3
 - Quite a bit 4
 - Extremely 5

9. These questions are about how you feel and how things have been with you during the *past 4 weeks*. For each question, please give the one answer that comes closest to the way you have been feeling.

How much of the time during the *past 4 weeks* –

(circle one number on each line)

| | All of the time | Most of the time | A good bit of the time | Some of the time | A little bit of the time | None of the time |
|--|-----------------|------------------|------------------------|------------------|--------------------------|------------------|
| a. Did you feel full of pep? | 1 | 2 | 3 | 4 | 5 | 6 |
| b. Have you been a very nervous person? | 1 | 2 | 3 | 4 | 5 | 6 |
| c. Have you felt so down in the dumps that nothing could cheer you up? | 1 | 2 | 3 | 4 | 5 | 6 |
| d. Have you felt calm and peaceful? | 1 | 2 | 3 | 4 | 5 | 6 |
| e. Did you have a lot of energy? | 1 | 2 | 3 | 4 | 5 | 6 |
| f. Have you felt downhearted and blue? | 1 | 2 | 3 | 4 | 5 | 6 |
| g. Did you feel worn out? | 1 | 2 | 3 | 4 | 5 | 6 |
| h. Have you been a happy person? | 1 | 2 | 3 | 4 | 5 | 6 |
| i. Did you feel tired? | 1 | 2 | 3 | 4 | 5 | 6 |

10. During the *past 4 weeks*, how much of the time, has your *physical health* or *emotional problems* interfered with your social activities (like visiting with friends, relatives etc)?

- (circle one)
- All of the time 1
 - Most of the time 2
 - Some of the time 3
 - A little of the time 4
 - None of the time 5

11. How TRUE or FALSE is *each* of the following statements for you?

(circle one number on each line)

| | Definitely true | Mostly true | Don't know | Mostly false | Definitely false |
|---|-----------------|-------------|------------|--------------|------------------|
| a. I seem to get sick a little easier than other people | 1 | 2 | 3 | 4 | 5 |
| b. I am as healthy as anybody I know | 1 | 2 | 3 | 4 | 5 |
| c. I expect my health to get worse | 1 | 2 | 3 | 4 | 5 |
| d. My health is excellent | 1 | 2 | 3 | 4 | 5 |

Appendix 1.4: Physical Performance Test protocol

Reuben DB, Siu AL. An objective measure of physical function of elderly outpatients-The Physical Performance Test. *J Am Geriatr Soc* 38:1105-1112, 1990.

Administer the Physical Performance test as outlined below. Subjects are given up to two chances to complete each item. Assistive devices are permitted for tasks 6 through 8.

1. Ask the subject, when given the command “go” to write the sentence “whales live in the blue ocean”. Time from the word “go” until the pen is lifted from the page at the end of the sentence. All the words must be included and legible. Period need to be included for task to be considered completed.
2. Five kidney beans are placed in a bowl, 5 inches from the edge of the desk in front of the patient. An empty coffee can is placed on the table at the patient’s non-dominant side. A teaspoon is placed in the patient’s dominant hand. Ask the subject, on the command “go”, to pick up the beans, one at a time, and place each in the coffee can. Time from the command “go” until the last bean is heard hitting the bottom of the can.
3. Place a Physician’s Desk Reference or other heavy book on a table in front of the patient. Ask the patient, when given the command “go”, to place the book on a shelf above shoulder level. Time from the command “go” to the time the book is resting on the shelf.
4. If the subject has a jacket or cardigan sweater, ask him or her to remove it. If not, give the subject a lab coat. Ask the subject, on the command “go” to put the coat on completely such that it is straight on his or her shoulders and the remove the garment completely. Time from the command “go” until the garment has been completely removed.
5. Place a penny approximately 1 foot from the patient’s foot on the dominant side. Ask the patient, on the command “go”, to pick up the penny from the floor and stand up. Time from the command “go” until the subject is standing erect with penny in hand
6. With subject in a corridor or in an open room, ask the subject to turn 360 degrees. Evaluate using scale on PPT scoring sheet.
7. Bring subject to start on 50-foot walk test course (25 feet out and 25 feet back) and ask the subject, on the command “go”, to walk to 25-foot mark and back. Time from the command “go” until the starting line is crossed on the way back.
8. Bring the subject to foot of stairs (nine to 12 steps) and ask subject, on the command “go”, to begin climbing stairs until he or she feels tired and wishes to stop. Before beginning this task, alert the subject to possibility of developing chest pain or shortness of breath and inform the subject to tell you if any of these symptoms occur. Escort the subject up the stair. Time from the command “go” until the subject’s first foot reaches the top of the first flight of stairs. Record the number of flights (maximum is four) climbed (up and down is one flight).

Appendix 1.4.1: Physical Performance Test Scoring Sheet

| Physical performance test | | | |
|---|------------|---|---|
| | Time | Scoring | Score |
| 1. Write a sentence (Eg. whales live in the blue ocean) | _____ sec* | ≤ 10 sec = 4 10.5-15 sec = 3 15.5-20 sec = 2 > 20 sec = 1 unable = 0 | _____ |
| 2. Simulated eating | _____ sec | ≤ 10 sec = 4 10.5-15 sec = 3 15.5-20 sec = 2 > 20 sec = 1 unable = 0 | _____ |
| 3. Lift a book and put it on a shelf | _____ sec | ≤ 2 sec = 4 2.5 –4 sec = 3 4.5-6 sec = 2 > 6sec = 1 unable = 0 | _____ |
| 4. Put on and remove a jacket | _____ sec | ≤ 10 sec = 4 10.5-15 sec = 3 15.5-20 sec = 2 > 20 sec = 1 unable = 0 | _____ |
| 5. Pick up penny from floor | _____ sec | ≤ 2 sec = 4 2.5 –4sec = 3 4.5-6 sec = 2 > 6 sec = 1 unable = 0 | _____ |
| 6. Turn 360 degrees | | discontinuous steps 0 continuous steps 2 unsteady (grabs, staggers) 0 steady 2 | _____ |
| 7. 50-foot walk test | _____ sec | ≤ 15 sec = 4 5.5-20 sec = 3 20.5-25 sec = 2 >25 sec = 1 unable = 0 | _____ |
| 8. Climb one flight of stairs[†] | _____ sec | ≤ 5 sec = 4 5.5-10 sec = 3 10.5-15 sec = 2 >15 sec = 1 unable = 0 | _____ |
| 9. Climb stairs[†] | | Number of flights of stairs up and down (maximum 4) | _____ |
| TOTAL SCORE | | | _____ maximum 36 for nine-item _____ maximum 28 for seven-item |

*, For timed measurements, round to nearest 0.5 seconds; †, Omit for seven-item scoring.

Appendix 1.5: Instructions for the PASE questionnaire

Calculations

The PASE investigators have devised a set of item weights for the PASE questionnaire by using principal components analysis and regression techniques. Total PASE scores are computed by multiplying activity weights by activity frequencies.

PASE Item weights

| PASE Activity | PASE Weight |
|---|--------------------|
| Muscle strength/endurance* | 30 |
| Strenuous sports* | 23 |
| Moderate sports* | 23 |
| Light sports* | 21 |
| Job involving standing or walking* | 21 |
| Walking* | 20 |
| Lawn work or yard care† | 36 |
| Caring for another person† | 35 |
| Home repairs† | 30 |
| Heavy housework† | 25 |
| Light housework† | 25 |
| Outdoor-gardening† | 20 |

*, Determine average number of h/d over a 7-day period. †, scored as 1=engaged in activity during the previous 7 d or 0= did not engage in activity during the previous 7 days.

EXAMPLE-Hypothetical data from the Physical Activity Scale for the Elderly

| PASE Activity | PASE Score | PASE weight | Contribution to Total PASE Score |
|------------------------------------|-------------------|--------------------|---|
| Muscle strength/endurance* | 0.05 h/d | 30 | 1.50 |
| Strenuous sports* | 0.04 h/d | 23 | 0.92 |
| Moderate sports* | 0.10 h/d | 23 | 2.30 |
| Light sports* | 0.06 h/d | 21 | 1.26 |
| Job involving standing or walking* | 0.57 h/d | 21 | 11.97 |
| Walking† | 0.55 h/d | 20 | 11.00 |
| Lawn work or yard care† | 1 | 36 | 36 |
| Caring for another person† | 0 | 35 | 0 |
| Home repairs† | 1 | 30 | 30 |
| Heavy housework† | 0 | 25 | 0 |
| Light housework† | 1 | 25 | 25 |
| Outdoor-gardening† | 1 | 30 | 20 |
| PASE Total | | | 139.95 |

*, Determine average number of h/d over a 7-day period. †, scored as 1=engaged in activity during the previous 7 d or 0= did not engage in activity during the previous 7 days.

Appendix 1.5.1: Physical Activity Scale for the Elderly

All items on the questionnaire refer to activities performed in the previous seven days. “Never” and “No” responses should always be marked to indicate any activities the respondent did not perform during that period.

Leisure Time Activity-Sitting

1. Over the past 7 days, how often did you participate in sitting activities such as reading, watching TV or doing handcrafts?

- [1] Never →Go to Q. 2
- [2] Seldom (1-2 days)
- [3] Sometimes (3-4 days)
- [4] Often (5-7 days)

1a. What were these activities?

1b. On average, how many hours per day did you engage in these sitting activities?

- [1] Less than 1 hour
- [2] 1 but less than 2 hours
- [3] 2-4 hours
- [4] More than 4 hours

2. Over the past 7 days, how often did you take a walk outside your home or yard for any reason? For example, for fun or exercise, walking to work, walking the dog, etc.?

- [1] Never →Go to Q. 3
- [2] Seldom (1-2 days)
- [3] Sometimes (3-4 days)
- [4] Often (5-7 days)

2a. What were these activities?

2b. On average, how many hours per day did you spend walking?

- [1] Less than 1 hour
- [2] 1 but less than 2 hours
- [3] 2-4 hours
- [4] More than 4 hours

Light Sport or Recreation

3. Over the past 7 days, how often did you engage in light sport or recreational activities such as bowling, golf with a cart, shuffleboard, fishing from a boat or pier or other similar activities?

- [1] Never →Go to Q. 4
- [2] Seldom (1-2 days)
- [3] Sometimes (3-4 days)
- [4] Often (5-7 days)

3a. What were these activities?

3b. On average, how many hours per day did you engage in these light sport or recreational activities?

- [1] Less than 1 hour
- [2] 1 but less than 2 hours
- [3] 2-4 hours
- [4] More than 4 hours

Moderate Sport or Recreation

4. Over the past 7 days, how often did you engage in moderate sport and recreational activities such as doubles tennis, ballroom dancing, hunting, ice skating, golf without a cart, softball or other similar activities?

- [1] Never →Go to Q. 5
- [2] Seldom (1-2 days)
- [3] Sometimes (3-4 days)
- [4] Often (5-7 days)

4a. What were these activities?

4b. On average, how many hours per day did you engage in these moderate sport and recreational activities?

- [1] Less than 1 hour
- [2] 1 but less than 2 hours
- [3] 2-4 hours
- [4] More than 4 hours

Strenuous Sport or Recreation

5. Over the past 7 days, how often did you engage in strenuous sport and recreational activities such as jogging, swimming, cycling, singles tennis, aerobic dance, skiing (downhill or cross-country) or other similar activities?

- [1] Never →Go to Q. 6
- [2] Seldom (1-2 days)
- [3] Sometimes (3-4 days)
- [4] Often (5-7 days)

5a. What were these activities?

5b. On average, how many hours per day did you engage in these moderate sport and recreational activities?

- [1] Less than 1 hour
- [2] 1 but less than 2 hours
- [3] 2-4 hours
- [4] More than 4 hours

Muscle Strength and Endurance

6. Over the past 7 days, how often did you do any exercises specifically to increase muscle strength and endurance, such as lifting weights or push-ups, etc.?

- [1] Never →Go to Q. 7
- [2] Seldom (1-2 days)
- [3] Sometimes (3-4 days)
- [4] Often (5-7 days)

6a. What were these activities?

6b. On average, how many hours per day did you engage in these moderate sport and recreational activities?

- [1] Less than 1 hour
- [2] 1 but less than 2 hours
- [3] 2-4 hours
- [4] More than 4 hours

Household Activity

7. During the past 7 days, have you done any light housework, such as dusting or washing dishes?

- [1] No →Go to Q. 8
- [2] Seldom (1-2 days)
- [3] Sometimes (3-4 days)
- [4] Often (5-7 days)

7a. What were these activities?

7b. On average, how many hours per day did you engage in these activities?

- [1] Less than 1 hour
- [2] 1 but less than 2 hours
- [3] 2-4 hours
- [4] More than 4 hours

8. During the past 7 days, have you done any heavy housework or chores, such as vacuuming, scrubbing floors, washing windows, or carrying wood?

- [1] No →Go to Q. 9
- [2] Seldom (1-2 days)
- [3] Sometimes (3-4 days)
- [4] Often (5-7 days)

8a. What were these activities?

8b. On average, how many hours per day did you engage in these activities?

- [1] Less than 1 hour
- [2] 1 but less than 2 hours
- [3] 2-4 hours
- [4] More than 4 hours

9. During the past 7 days, did you engage in any of the following activities?

9.1 Home repairs like painting, wallpapering, electrical work, etc.

- [1] No →Go to Q. 9.2
- [2] Seldom (1-2 days)
- [3] Sometimes (3-4 days)
- [4] Often (5-7 days)

9.1a. What were these activities?

9.1b. On average, how many hours per day did you engage in these activities?

- [1] Less than 1 hour
- [2] 1 but less than 2 hours
- [3] 2-4 hours
- [4] More than 4 hours

9.2 Lawn work or yard care, including snow or leaf removal, wood chopping, etc.

- [1] No →Go to Q. 9.3
- [2] Seldom (1-2 days)
- [3] Sometimes (3-4 days)
- [4] Often (5-7 days)

9.2a. What were these activities?

9.2b. On average, how many hours per day did you engage in these activities?

- [1] Less than 1 hour
- [2] 1 but less than 2 hours
- [3] 2-4 hours
- [4] More than 4 hours

9.3 Outdoor gardening

- [1] No →Go to Q. 9.4
- [2] Seldom (1-2 days)
- [3] Sometimes (3-4 days)
- [4] Often (5-7 days)

9.3a. What were these activities?

9.3b. On average, how many hours per day did you engage in these activities?

- [1] Less than 1 hour
- [2] 1 but less than 2 hours
- [3] 2-4 hours
- [4] More than 4 hours

9.4 Caring for another person, such as children, dependent spouse, or an older adult?

- [1] No →Go to Q. 10
- [2] Seldom (1-2 days)
- [3] Sometimes (3-4 days)
- [4] Often (5-7 days)

9.4a. What were these activities?

9.4b. On average, how many hours per day did you engage in these activities?

- [1] Less than 1 hour
- [2] 1 but less than 2 hours
- [3] 2-4 hours
- [4] More than 4 hours

Work-related Activity

10. During the past 7 days, did you work for pay or as a volunteer?

10a. What were these activities?

10b. How many hours per week did you work for pay and/or as a volunteer?

_____ HOURS

10c. Which of the following categories best describes the amount of physical activity required on your job and/or volunteer work?

[1] Mainly sitting with slight arm movements. (Examples: office workers, watchmaker, seated assembly line worker, bus driver, etc.)

[2] Sitting or standing with some walking. (Examples: cashier, general office worker, light toll and machinery worker).

[3] Walking, with some handling of materials generally weighing less than 50 pounds. (Examples: mailman, waiter/waitress, construction worker, heavy tool and machinery worker).

[4] Walking and heavy manual work often requiring handling of material weighing over 50 pounds. (Examples: lumberjack, stone mason, farm or general labourer).

Appendix 2: Outcome measure differences between high (n=21) and low compliers (n=14) (Total n=35)

| | Compliance | Baseline Assessment Mean (SD) | 4 month Assessment Mean (SD) | % change | p value |
|---|-------------|-------------------------------|------------------------------|--------------|---------|
| SF-36 - Mean (SD) <i>(higher = better score)</i> | | | | | |
| - Physical functioning | Low High | 81.4 (18.4) 80.5 (20.5) | 85.7 (16.3) 84.5 (17.6) | 5%↑ 5%↑ | 0.952 |
| - Role – Physical | Low High | 89.3 (23.4) 81.3 (35.2) | 82.1 (31.7) 95.0 (15.4) | 8%↓ 17%↑ | 0.079 |
| - Bodily Pain | Low High | 71.9 (14.2) 75.4 (21.9) | 77.5 (19.6) 77.8 (22.6) | 8%↑ 3%↑ | 0.519 |
| - General health | Low High | 86.3 (9.4) 80.9 (13.9) | 82.5 (11.9) 80.4 (10.9) | 4%↓ 1%↓ | 0.424 |
| - Vitality | Low High | 70.7 (20.2) 64.0 (17.1) | 69.6 (17.3) 73.0 (13.5) | 2%↓ 14%↑ | 0.027 |
| - Social functioning | Low High | 98.2 (6.7) 90.0 (18.4) | 95.5 (13.5) 94.4 (12.5) | 3%↓ 5%↑ | 0.043 |
| - Role - Emotional | Low High | 95.2 (12.1) 83.3 (35.0) | 95.2 (17.8) 88.3 (27.1) | 0% 6%↑ | 0.640 |
| - Mental health | Low High | 84.0 (15.7) 75.8 (19.1) | 84.3 (14.0) 82.4 (12.7) | 0.4%↑ 9%↑ | 0.141 |
| - Reported health transition <i>(lower score better)</i> | Low High | 2.7 (0.7) 2.8 (0.8) | 2.2 (0.7) 2.0 (0.9) | 19%↑ 29%↑ | 0.353 |
| AQOL – Mean (SD) (n=34) <i>(lower = better score)</i> | Low High | 7.1 (2.8) 7.5 (5.1) | 6.1 (3.3) 6.9 (4.3) | 14%↑ 8%↑ | 0.403 |
| GDS – Mean (SD) (n=34) | Low High | 0.4 (0.8) 1.1 (1.7) | 0.4 (0.6) 0.8 (1.6) | 0% 27%↑ | 0.547 |
| PASE - Mean (SD) | Low High | 114.8 (47.7) 149.7 (62.3) | 141.8 (55.2) 140.3 (52.1) | 24%↑ 6%↓ | 0.012 |
| Physical Performance Test – Mean (SD) | | | | | |
| - 7 items (n=33) | Low High | 26.3 (1.4) 25.0 (1.9) | 27.2 (1.0) 26.1 (2.4) | 3%↑ 4%↑ | 0.718 |
| - 9 items (n=24) | Low High | 33.5 (1.4) 32.1 (2.3) | 35.5 (0.8) 33.4 (3.0) | 6%↑ 4%↑ | 0.466 |

| | | | | | |
|--|-------------|--------------------------------|--------------------------------|--------------|-------|
| Distance (m) (6 minute walk) Mean (SD) | Low High | 467.6 (87.8) 446.0 (95.6) | 494.3 (72.3) 472.8 (85.6) | 6%↑ 6%↑ | 0.992 |
| 6 metre walk – Mean (SD) | | | | | |
| - Velocity | Low High | 84.2 (11.5) 78.7 (12.5) | 84.5 (11.7) 82.3 (12.0) | 0.4%↑ 5%↑ | 0.438 |
| - Stride length | Low High | 1.32 (0.18) 1.28 (0.14) | 1.42 (0.17) 1.46 (0.22) | 8%↑ 14%↑ | 0.281 |
| Step test -worse leg (number of steps in 15 sec) – Mean (SD) | Low High | 18.6 (3.3) 15.8 (4.2) | 19.5 (3.8) 19.2 (3.5) | 5%↑ 22%↑ | 0.018 |
| Sit to stand – 5 times (sec) | Low High | 9.18 (1.72) 11.69 (2.97) | 8.61 (1.85) 8.81 (2.02) | 6%↑ 25%↑ | 0.000 |
| - Means (SD) (lower = better score) | | | | | |
| Manual Muscle Tester | | | | | |
| Knee extensor strength | | | | | |
| - Right knee (n=34) | Low High | 0.292 (0.065) 0.260 (0.070) | 0.270 (0.064) 0.280 (0.093) | 8%↓ 8%↑ | 0.125 |
| - Left knee (n=33) | Low High | 0.287 (0.063) 0.257 (0.070) | 0.270 (0.066) 0.276 (0.100) | 6%↓ 7%↑ | 0.139 |
| Hip abductor strength | | | | | |
| - Right hip (n=35) | Low High | 0.235 (0.062) 0.238 (0.051) | 0.217 (0.050) 0.239 (0.060) | 8%↓ 0.4%↑ | 0.226 |
| - Left hip (n=35) | Low High | 0.233 (0.069) 0.214 (0.062) | 0.219 (0.056) 0.218 (0.064) | 6%↓ 2%↑ | 0.392 |
| Ankle dorsiflexion strength | | | | | |
| - Right ankle (n=35) | Low High | 0.280 (0.061) 0.247 (0.052) | 0.250 (0.045) 0.241 (0.046) | 11%↓ 2%↓ | 0.290 |
| - Left ankle (n=33) | Low High | 0.276 (0.037) 0.243 (0.054) | 0.274 (0.057) 0.232 (0.057) | 1%↓ 5%↓ | 0.638 |
| Shoulder abductor strength | | | | | |
| - Right shoulder (n=33) | Low High | 0.214 (0.051) 0.201 (0.050) | 0.211 (0.046) 0.234 (0.072) | 1%↓ 16%↑ | 0.044 |
| - Left shoulder (n=33) | Low High | 0.207 (0.037) 0.194 (0.054) | 0.221 (0.034) 0.226 (0.078) | 7%↑ 16%↑ | 0.317 |
| Elbow extensor strength | | | | | |
| - Right elbow (n=34) | Low High | 0.197 (0.049) 0.171 (0.035) | 0.167 (0.032) 0.186 (0.042) | 15%↓ 9%↑ | 0.000 |
| - Left elbow (n=35) | Low High | 0.191 (0.047) 0.176 (0.052) | 0.194 (0.041) 0.189 (0.049) | 2%↑ 7%↑ | 0.413 |
| Weight (kg) Mean (SD) | Low High | 69.14 (7.98) 84.24 (15.72) | 67.82 (8.59) 82.61 (16.10) | 2%↑ 2%↑ | 0.814 |

Appendix 3: Outcome measure differences between high (15) and low compliers (n=9) (Total n=24)

| | Compliance | Baseline Assessment Mean (SD) | 4 month Assessment Mean (SD) | 8 month Assessment Mean (SD) | p value | % change Baseline & 4 months | % change 4 months & 8 months | % change Baseline & 8 months |
|---|------------|-------------------------------|------------------------------|------------------------------|---------|------------------------------|------------------------------|------------------------------|
| SF-36 - Mean (SD) <i>(higher = better score)</i> | | | | | | | | |
| - Physical functioning | Low | 76.67 (20.92) | 81.67 (17.32) | 81.67 (17.85) | 0.686 | 7% | 0% | 7% |
| | High | 86.67 (14.72) | 89.00 (13.39) | 91.67 (10.80) | | 3% | 3% | 6% |
| - Role – Physical | Low | 83.33 (27.95) | 77.78 (36.32) | 88.89 (33.33) | 0.668 | 7%↓ | 14% | 7% |
| | High | 81.67 (38.34) | 90.00 (20.70) | 100.00 (0.00) | | 10% | 12% | 22% |
| - Bodily Pain | Low | 66.00 (12.32) | 68.56 (18.33) | 70.78 (10.77) | 0.529 | 4% | 3% | 7% |
| | High | 83.87 (15.43) | 83.67 (19.54) | 80.73 (14.31) | | 0.2% | 4%↓ | 4%↓ |
| - General health | Low | 84.33 (10.21) | 79.89 (11.20) | 80.67 (13.12) | 0.065 | 5%↓ | 1% | 4%↓ |
| | High | 81.64 (14.99) | 80.55 (14.31) | 89.00 (11.63) | | 1%↓ | 10% | 9% |
| - Vitality | Low | 63.89 (20.28) | 63.89 (15.57) | 68.89 (19.33) | 0.107 | 0% | 8% | 8% |
| | High | 68.67 (16.74) | 77.00 (13.34) | 74.00 (16.17) | | 12% | 4%↓ | 8% |
| - Social functioning | Low | 97.22 (8.33) | 94.44 (16.67) | 93.06 (16.67) | 0.472 | 3%↓ | 1%↓ | 4%↓ |
| | High | 93.33 (11.44) | 95.83 (7.72) | 95.00 (11.38) | | 3% | 1%↓ | 2% |
| - Role - Emotional | Low | 96.30 (11.11) | 92.59 (22.22) | 92.59 (22.22) | 0.517 | 4%↓ | 0% | 4%↓ |
| | High | 95.56 (17.21) | 88.89 (27.22) | 93.33 (25.82) | | 7%↓ | 5% | 2% |
| - Mental health | Low | 83.56 (18.05) | 80.00 (15.49) | 85.33 (16.00) | 0.258 | 4%↓ | 7% | 2% |
| | High | 82.13 (12.82) | 85.87 (9.43) | 88.00 (9.68) | | 5% | 3% | 7% |

| | | | | | | | | |
|---|-----------------|---|--|--|-------|----------------|---------------|----------------|
| Reported health transition (<i>lower = better score</i>) | Low High | 2.89 (0.60) 2.87 (0.74) | 2.22 (0.67) 2.07 (0.80) | 2.11 (0.33) 2.13 (0.74) | 0.808 | 23% 28% | 5%↓ 2% | 27% 26% |
| AQOL – Mean (SD) (n=24) (<i>lower = better score</i>) | Low High | 6.56 (3.13) 6.33 (3.56) | 6.33 (3.39) 5.80 (3.19) | 6.33 (3.20) 5.73 (3.77) | 0.904 | 4% 8% | 0% 1% | 4% 9% |
| GDS – Mean (SD) (n=24) | Low High | 0.56 (0.88) 0.67 (0.98) | 0.33 (0.50) 0.33 (0.72) | 0.44 (0.73) 0.47 (0.92) | 0.935 | 41% 51% | 33% 42% | 21% 30% |
| PASE - Mean (SD) | Low High | 125.00 (55.08) 149.67 (60.00) | 143.00 (58.37) 139.67 (41.52) | 135.56 (58.73) 142.20 (34.99) | 0.333 | 14% 7%↓ | 5%↓ 2% | 8% 5%↓ |
| Physical Performance Test – Mean (SD) | | | | | | | | |
| - 7 items (n=24) | Low High | 26.22 (1.39) 25.27 (1.98) | 27.00 (1.12) 26.07 (2.52) | 27.33 (0.71) 26.87 (1.73) | 0.061 | 3% 3% | 1% 3% | 4% 6% |
| - 9 items (n=17) | Low High | 33.67 (2.08) 32.43 (2.21) | 35.33 (1.15) 33.50 (3.01) | 35.33 (0.58) 34.50 (1.99) | 0.066 | 5% 3% | 0% 3% | 5% 6% |
| Distance (m) (6 minute walk) Mean (SD) | Low High | 462.70 (106.17) 431.80 (86.01) | 516.47 (85.94) 462.32 (80.30) | 519.85 (74.08) 489.71 (80.51) | 0.343 | 12% 7% | 1% 6% | 12% 13% |
| 6 metre walk – Mean (SD) | | | | | | | | |
| - Velocity | Low High | 84.47 (13.07) 75.95 (11.46) | 89.35 (12.05) 81.88 (12.99) | 98.86 (15.47) 94.25 (14.89) | 0.821 | 6% 8% | 11% 15% | 17% 24% |
| - Stride length | Low High | 1.37 (0.18) 1.24 (0.14) | 1.51(0.16) 1.47 (0.23) | 1.66 (0.23) 1.58 (0.27) | 0.731 | 10% 19% | 10% 7% | 21% 27% |

| | | | | | | | | |
|---|-------------|--------------------------------|--------------------------------|--------------------------------|-------|-------------|--------------|--------------|
| Step test -worse leg (number of steps in 15 sec) – Mean (SD) | Low High | 18.4 (3.8) 16.0 (3.2) | 19.0 (5.0) 19.1 (3.7) | 22.0 (4.4) 20.1 (3.9) | 0.051 | 3% 19% | 16% 5% | 20% 26% |
| Sit to stand – 5 times (sec) - Means (SD) (lower = better score) | Low High | 9.06 (2.10) 11.96 (3.40) | 8.71 (1.88) 9.26 (2.11) | 6.70 (1.11) 9.27 (3.13) | 0.010 | 4% 23% | 23% 0% | 26% 22% |
| Manual Muscle Tester | | | | | | | | |
| Knee extensor strength | | | | | | | | |
| - Right knee (n=24) | Low High | 0.291 (0.078) 0.248 (0.062) | 0.279 (0.051) 0.275 (0.095) | 0.310 (0.081) 0.255 (0.054) | 0.157 | 4%↓ 11% | 11% 7%↓ | 7% 3% |
| - Left knee (n=24) | Low High | 0.302 (0.067) 0.237 (0.056) | 0.271 (0.069) 0.264 (0.089) | 0.326 (0.067) 0.271 (0.077) | 0.102 | 10%↓ 11% | 20% 3% | 8% 14% |
| Hip abductor strength | | | | | | | | |
| - Right hip (n=24) | Low High | 0.256 (0.058) 0.226 (0.055) | 0.228 (0.055) 0.239 (0.066) | 0.209 (0.051) 0.204 (0.047) | 0.184 | 11%↓ 6% | 8%↓ 15%↓ | 18%↓ 10%↓ |
| - Left hip (n=24) | Low High | 0.252 (0.078) 0.210 (0.062) | 0.234 (0.062) 0.224 (0.065) | 0.208 (0.055) 0.200 (0.060) | 0.405 | 7%↓ 7% | 11%↓ 11%↓ | 17%↓ 5%↓ |
| Ankle dorsiflexion strength | | | | | | | | |
| - Right ankle (n=21) | Low High | 0.275 (0.054) 0.258 (0.048) | 0.243 (0.043) 0.254 (0.052) | 0.276 (0.040) 0.265 (0.050) | 0.591 | 12%↓ 2%↓ | 14% 4% | 0.4% 3% |
| - Left ankle (n=22) | Low High | 0.269 (0.042) 0.253 (0.054) | 0.279 (0.069) 0.242 (0.059) | 0.290 (0.056) 0.250 (0.046) | 0.634 | 4% 4%↓ | 4% 3% | 8% 1%↓ |

| | | | | | | | | | |
|----------------------------|-------------------------|---------------|---------------|---------------|---------------|-------|------|-----|-----|
| Shoulder abductor strength | | | | | | | | | |
| | - Right shoulder (n=23) | Low | 0.221 (0.057) | 0.209 (0.058) | 0.227 (0.054) | 0.123 | 5%↓ | 9% | 3% |
| | | High | 0.199 (0.044) | 0.229 (0.068) | 0.214 (0.065) | | 15% | 7%↓ | 8% |
| | - Left shoulder (n=21) | Low | 0.219 (0.033) | 0.214 (0.039) | 0.203 (0.046) | 0.110 | 2%↓ | 5%↓ | 7%↓ |
| | High | 0.196 (0.037) | 0.230 (0.082) | 0.219 (0.048) | 17% | | 5%↓ | 12% | |
| Elbow extensor strength | | | | | | | | | |
| | - Right elbow (n=24) | Low | 0.191 (0.052) | 0.170 (0.035) | 0.181 (0.030) | 0.030 | 11%↓ | 6% | 5%↓ |
| | | High | 0.168 (0.036) | 0.184 (0.048) | 0.184 (0.044) | | 10% | 0% | 10% |
| | - Left elbow (n=24) | Low | 0.190 (0.044) | 0.192 (0.040) | 0.194 (0.042) | 0.804 | 1% | 1% | 2% |
| | High | 0.169 (0.043) | 0.182 (0.053) | 0.183 (0.046) | 8% | | 1% | 8% | |
| Weight (kg) Mean (SD) | Low | 70.50 (6.62) | 69.39 (8.43) | 69.11 (8.34) | 0.835 | 2% | 0.4% | 2% | |
| | High | 84.91 (15.05) | 82.75 (16.66) | 82.43 (14.71) | | 3% | 0.4% | 3% | |

Appendix 4 Focus group protocol

Focus Group Potential Structure and Questions

Equipment and other requirements:

- Electronic digital tape recorder, name tags (even if they are sticky labels) to be provided as they arrive. PHOTO CONSENT FORMS
- Afternoon tea – apple/orange juice and cold water, biscuits [AT NARI – coffee/tea??] will be out on the table so that as we wait for people to arrive those who are there can help themselves.

1) Introduction

- Welcome to the group and thank them for coming.
- Explain car park reimbursement arrangements (if required).
- Explain the discussion will be taped for ease of transcription and ensure everyone has consented to the taping: “As part of your acceptance you agreed to allow us to tape this discussion, is everyone still happy for us to do so.”
- Inform participants that no identifying information will be presented in the final report, or any other documentation, and that they are free to withdraw at any time.
- Explain that there is a mixture of people in the group – from various facilities, and includes people currently doing the program and some who have withdrawn from the program.
- Outline purpose of the focus group: To obtain information about your experiences with the LLLS™ program through a series of questions:
 - the perceived benefits of the program,
 - any problems or suggestions to improve, modify or extend the program, and
 - to identify the factors that help/obstruct (barriers/enablers) people from joining the program and continuing with the program.
- Ask if any questions before we start.

2) Focus Group Questions:

1) *Why did you join the LLLS™ program?*

- What did you hope to gain? What were your expectations? What factors most contributed to your final decision to join?
- If there was more than one factor, what was the most important one?
- Did you join alone or with someone else?
- How did you find out about the LLLS™ program? (friends, media, GP etc)

2) *Did you have any concerns about doing a progressive strength training program?*

- Regarding health concerns - how were they overcome and how did the facility address these concerns?
- Were there other concerns (eg safety; excessive muscle development; the nature of the gym environment; appropriate clothing etc)

3) *How did you find the LLLS™ program?*

- Challenging, too hard, not challenging enough?

| |
|--|
| <ul style="list-style-type: none"> • Did the program meet your expectations? • How did you find the <u>gym environment</u>? (welcoming, uncomfortable, intimidating, sociable, friendly etc)? (Issue that could impact on experience - was there set times/days, mixed aged groups, group/individual classes or both, the social components of the program.) • Do you feel/did you feel you have/had <u>adequate support/attention</u> during the sessions? (Was there one or many instructors throughout the program? Did they provide advice and adjustment as required or only upon request? If a mixed group, was a instructor available exclusively to those doing the LLLS™ program?) • <u>Cost</u>: Is the training value for money? Is cost a consideration for you? What would be too much? • <u>Social issues</u>: What did the social elements consist of? Do they help/hinder your training goals/training motivation? • <u>Travel/access</u>: How far would you travel to do strength training (as opposed to other more accessible forms of activity eg walking? Were the hours of operation sufficient/restrictive (especially for those programs with set times & days)? |
| <p>4) <i>How tailored was your LLLS™ program to your needs?</i></p> <ul style="list-style-type: none"> • Did you have an <u>initial LLLS™ assessment</u> conducted by facility staff? • How much <u>information</u> was provided to you regarding this assessment? • Prior to the development of your program, were you <u>consulted about your goals</u> (short and long term)? Potential barriers/obstacles? • Was an <u>individual program</u> designed for you? • Were you provided with <u>individual supervision/guidance</u> with your <u>first session</u> on the program? • Was your <u>feedback</u> sought regarding the individual program? |
| <p>5) <i>How often and how was your individual program reviewed? (to ensure your strength training incorporated progressive resistance principles and to evaluate whether it was helping you achieve your goals)</i></p> <ul style="list-style-type: none"> • How was it reviewed (individual consultation with instructor or some other way) • Were you satisfied with the outcomes of the review(s)? |
| <p>6) <i>What are some of the benefits you have noticed since joining LLLS™?</i></p> <ul style="list-style-type: none"> • <u>Physical</u>, such as improvements in strength, balance, stamina/energy levels, and other functional or well being changes. • <u>Other</u> eg social, more confident about doing other types of activity. |
| <p>7) <i>Have you missed any sessions, and if so what were the reasons for missing sessions (injury, illness, holidays, other commitments)?</i></p> <ul style="list-style-type: none"> • Where related to an injury – was it related to the program? If an injury occurred (related or not related to the program) how was this injury handled by facility staff (eg was the exercise program modified until the injury improved etc)? • If you missed consecutive sessions was there any follow up (by instructors? Other participants?) |

| |
|--|
| <ul style="list-style-type: none"> • If there was follow-up did this help you in returning after your absence? |
| <p>8) <i>Do you see yourself continuing to participate in LLLS™ long-term ie years (as opposed to months), health permitting and if not, why not?</i> (given that the training needs to be progressive and ongoing and many people perceive ‘getting fit’ as a short term thing.</p> |
| <p>9). <i>What do you think has contributed to your ongoing participation in the program?</i></p> <ul style="list-style-type: none"> • Did your motivation fluctuate during the program and how did you overcome decline in motivation? |
| <p>10) <i>For those who have withdrawn: Why did you withdraw from the program and do you intend to return to the program?</i></p> <ul style="list-style-type: none"> • Have they had <u>further contact</u> with the facility, or discussed their reasons for withdrawing with the facility? • Had any <u>discussions</u> about the <u>process of rejoining</u> the program? • What (if anything) would <u>encourage/motivate you to return</u> (eg changes to times; better instructors etc)? • If not happy with facility/access – Have you looked at <u>LLLS™ classes</u> at <u>other facilities</u>? |
| <p>10) <i>Are there any other issues that you wish to tell us (positive or negative) about the program, or how the program can be improved?</i></p> <ul style="list-style-type: none"> • Would you recommend the program to other older people and in one sentence, why would you recommend/not recommend the program? |

3) Thank them again - for their valuable thoughts and experiences and for coming to the focus group.

Appendix 5: Exit Survey

Exit Survey:

Please circle the most appropriate response and add comment where required.

1) How long did you attend the LLLS™ program?

1 month 2 months 3 months 4 months

2) How many sessions a week did you attend?

1 2 3 more (specify).....

3) Why did you withdraw from the LLLS™ program?

Health reasons Family commitments Other time commitments

Dissatisfied with program Other (please specify).....

.....

4) Would you like to return to the program at some point in the future?

Yes No

5) How did you find the LLLS™ program?

Not challenging enough Challenging Too challenging

6) Did you notice any of the following physical changes while participating in the LLLS™ program?

Increased muscle strength Improved balance Increased stamina

Increased energy levels (please specify).....

.....

7) Did you consider the program to be value for money?

Yes No (please comment

.....

8) How was the LLLS™ program run at the facility you attended?

Group sessions Individual work Combination of group and individual

9) Did you feel you had adequate support / attention during the sessions?

Yes No

(P.T.O)

How did you find the gym environment?

Welcoming
Sociable

Uncomfortable
Friendly

Intimidating
Other comments.....

.....

10) Can you identify / describe any other positive aspects of the program?

.....
.....
.....
.....
.....
.....
.....

11) Can you identify / describe any other negative aspects of the program?

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.....
.....

Thank you for your feedback.