

School of Nursing & Midwifery

**Physical Activity for Older Home Care Clients Receiving a
Restorative Home Care Service**

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Declaration

To the best of my knowledge and belief this thesis contains no material previously published by any other person except where due acknowledgment has been made.

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university.

The work described in this thesis was undertaken by the author and is original. The work of study design, ethics approval, writing up of the thesis and manuscripts for publication were conducted under the supervision of Professors Gill Lewin, Duncan Boldy and Lindy Clemson.

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Abstract

It is well established that being physically active at any stage in life is good for a person's health and wellbeing. However, the present knowledge about physical activity and older people who receive a home care service is limited. In Australia, there are many different types of home care services available to older people living in the community, to help them remain living at home and avoid premature institutionalisation. The most commonly accessed home care services are funded through the Home and Community Care (HACC) program, and include services such as: personal care; home help; nursing; transport; and, meals on wheels. HACC services are designed to assist people to remain living in the community by providing home-based health services and assistance with everyday activities of living and rarely include physical activity promotion or exercise programs.

Over the last decade an additional type of home care service has become available in some Australian states (also the United Kingdom, New Zealand and the United States), namely, restorative home care services. Restorative home care services are short-term, with an episode length between 6-12 weeks, and are comprised of a number of different components such as task analysis and redesign, medication management, goal setting and exercise and falls prevention programs. They aim to assist the individual to maximise their functioning and either return to living independently without ongoing home care assistance or to minimise the amount of ongoing help required. Little is known currently about the effectiveness of the physical activity component within these restorative services or more generally about home care clients' physical activity levels and preferences. This thesis comprises a three stage study, which begins to close this gap in knowledge.

The three stages included:

- Stage 1: Identified physical activity levels, barriers and motivators for being physically active and physical activity preferences of older people receiving a home care service
- Stage 2: Determined whether a lifestyle activity program was appropriate and could be delivered within a restorative home care service
- Stage 3: Conducted a randomised controlled trial (RCT) to determine the effectiveness and adherence to a lifestyle activity program compared to the current structured exercise program used within a restorative home care service.

Stage 1 was a mail-out survey to 1,490 older home care clients who had received either usual HACC services or a restorative home care service. The mail out (34% response rate) was followed-up with 20 semi-structured interviews. Results showed that older people who had received a restorative home care service were significantly more physically active than those who received a usual HACC service ($p=.049$). Younger individuals, in better physical condition, with good mobility and no diagnosis of dementia were the most likely to be active. Restorative home care clients also used incidental exercise, such as household chores, walking to the shops and gardening as their main form of activity, whereas HACC clients did less incidental exercise.

Stage 1 also explored the motivational factors and barriers for older home care clients being physically active. Wellbeing and health and fitness were the top two reasons participants gave for being active. Ongoing injury and illness and feeling too old were the highest ranked barriers to being physically active. The qualitative

findings confirmed that older home care clients knew that being physically active was good for them, yet injury or illness or feeling too old often stopped them from being as active as they could be. This could impact the number of home care services they need over the longer term.

The findings in stage 1 showed restorative home care clients liked to exercise using everyday activities such as gardening and housework, and often did not keep up with exercise programs prescribed after illness or injury. This therefore suggested that the current structured exercise program delivered as part of the restorative home care service may not be the best approach to being and staying physically active for this population, and that a lifestyle activity program may be better. In order to ascertain whether this was the case, it was first necessary to determine whether a lifestyle activity program, which incorporates exercise into everyday activities, could be delivered within a restorative home care service (stage 2).

The lifestyle and functional exercise program known as LiFE, was trialled in a pilot study by four care managers and eight clients. The paperwork involved in delivering the full LiFE exercise program proved prohibitive for both care managers delivering, and clients receiving, a restorative home care service. However, a simplified (i.e. limited/no paperwork) LiFE exercise program was deemed appropriate for this population and suitable for delivery within a restorative home care service. It was therefore possible to proceed with the next stage of the study - a randomised controlled trial to determine the effectiveness and adherence to LiFE compared to the current exercise program delivered within the restorative home care services (stage 3).

Eighty clients participated in stage 3; the RCT. Forty clients were randomly allocated to each of the LiFE and current exercise groups. Baseline, 8-week (post-intervention) and 6-month follow-up data were collected. There were no significant differences between the groups for demographic, level of dependency or outcome measures (Functional Reach, Falls Efficacy Scale, Sit to stand 1 and 5 times, Timed Up and Go, 10-item Vitality Plus Scale, Activities Specific Balance Scale, tandem walk, and Late Life Function and Disability Items) at baseline. The average age of the LiFE clients was 80.2 years and 79.6 for the current exercise group. At the end of the restorative home care service the LiFE clients had undertaken exercise 4.91 times a week on average compared to the structured exercise group 4.42 times per week, with no significant difference shown between the groups. However, the LiFE group significantly improved in 95% of the outcome measures compared to 70% for the structured exercise group. The LiFE group was more effective than the structured exercise group in terms of 40% of the outcome measures, and at least as effective on the other 60%.

Many intervention studies only investigate the effectiveness of the intervention during the designated intervention period. However, an important aspect of restorative home care services is that the client maintains their independence many years after the home care service has ceased. Therefore, it was important to determine whether either exercise program was maintained after the service finished. Again no difference was found on the amount of exercise undertaken by either group. However, the LiFE group showed significantly better progress on a quarter of the outcome measures compared to the structured exercise group, over the 6 months. It is therefore recommended that health and community care organisations consider

delivering the LiFE exercise program with their clients in order to improve their function and confidence in living independently. In particular, lifestyle exercise programs were suited to older people who suggested they do not have time to participate in structured exercise programs or prefer not to work out with weights.

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Abbreviations

ABC Scale	Activities-specific Balance Confidence Scale
ACLS	Aerobics Centre Longitudinal Study
ACSM	American College of Sports Medicine
ADL	Activities of Daily Living
BMI	Body Mass Index
BSL	Blood Sugar Levels
CHD	Cardiovascular Heart Disease
CVD	Cardiovascular (heart) Disease
EU	European Union
FES	Falls Efficacy Scale
FR	Functional Reach (test)
GDP	Gross Domestic Product
GDS	Geriatric Depression Scale
HACC	Home and Community Care
HIP	Home Independence Program
IADL	Instrumental Activities of Daily Living
LiFE	Lifestyle and Function (Falls) Exercise program
LLFD	Late Life Function and Disability (instruments)
MET	Metabolic Equivalent
NHANES	National Health and Nutrition Examination Survey
NHMRC	National Health and Medical Research Council
OECD	Organisation for Economic Co-operation and Development
PASE	Physical Activity Scale for the Elderly
PEP	Personal Enablement Program

RCT	Randomised Controlled Trial
SD	Standard Deviation
TAFE	Technical and Further Education
TUG	Timed Up and Go (test)
UK	United Kingdom
US	United States (of America)
US CDC	US Centre for Disease Control
VPS	Vitality Plus Scale
WHO	World Health Organisation

Glossary

Activities of daily living (ADLs): Activities required for everyday living, including eating, bathing, toileting, dressing, getting into or out of bed or chair, and basic mobility (Physical Activity Guidelines Advisory Committee, 2008, p. C2).

Aerobic exercise/activity: Exercise that primarily uses the aerobic energy-producing systems, can improve the capacity and efficiency of these systems, and is effective for improving cardiorespiratory endurance (Physical Activity Guidelines Advisory Committee, 2008, p. C2).

Ageing: of the individual in the strictest sense means growing old. It can also signify life-long growth and development in physical, economic, psychological, cultural spiritual and other ways (United Nations General Assembly, 1995).

Balance: A performance-related component of physical fitness that involves the maintenance of the body's equilibrium while stationary or moving (Physical Activity Guidelines Advisory Committee, 2008, p. C5).

Cardiorespiratory fitness: The capacity of the cardiorespiratory system to take up and use oxygen; the capability to carry out activities that use large muscle groups at moderate intensities, that use oxygen for the production of energy, and that can be sustained for more than a few minutes (Dishman, Heath, & Lee, 2013, p. 557).

Commuting physical activity: the use of cycling, running or walking as a form of transport to the workplace (C. Jones & Ogilvie, 2012).

Disability: The interactions between individuals with health conditions and barriers in their environment (Dishman et al., 2013, p. 558).

Dose-response: The relation between the dose of physical activity and the health or fitness outcome of interest is considered the dose response. The dose can be measured in terms of a single component of activity (e.g., frequency, duration,

intensity) or as the total amount. This concept is similar to the prescription of a medication where the expected response will vary as the dose of the medication is changed. The dose-response relation can be linear, exponential, or hyperbolic, and the dose-response relation is likely to vary depending on the primary measure of interest. For example, improvements in cardiorespiratory fitness, bone health, or adiposity are common dose-response measures of interest. A dose of physical activity may exist below which no effect has been detected as well as a dose above which no effect has been detected. These seemingly lowest and highest doses of activity may be called “thresholds,” but the term should be used cautiously as these apparent limits may be more related to limitations of measurement than to true biological limits (Physical Activity Guidelines Advisory Committee, 2008, p. C3).

Endurance exercise/activity: Exercises that are repetitive and produce dynamic contractions of large muscle groups for an extended period of time (e.g., walking, running, cycling, swimming) (Physical Activity Guidelines Advisory Committee, 2008, p. C2).

Energy expenditure: The amount of energy used, for example, in an activity. The most common unit of energy expenditure is the kilocalorie, but in scientific work the joule is preferred. The daily energy expenditure of an individual is dependent on sex, basal metabolic rate, body mass, body composition and activity level. The approximate expenditure of an adult male lying in bed is $1.0 \text{ kcal}^{-1}\text{h}^{-1}\text{kg body mass}^{-1}$; for slow walking at 25 mm mile^{-1} (1.6 km), $3.0 \text{ kcal}^{-1}\text{h}^{-1}\text{kg body mass}^{-1}$; and for fast steady running at 6 mm mile^{-1} , $16.3 \text{ kcal}^{-1}\text{h}^{-1}\text{kg body mass}^{-1}$. Females have an energy expenditure 10% lower than males doing a comparable activity (M. Kent, 2007).

Exercise: A subset of physical activity consisting of planned, structured, repetitive bodily movements with the purpose of improving or maintaining one or more components of physical fitness or health (Dishman et al., 2013, p. 559).

Frequency: The number of times an exercise or activity is performed. Frequency is generally expressed in sessions, episodes, or bouts per week (Physical Activity Guidelines Advisory Committee, 2008, p. C3).

Health-related Quality of Life: is an individual's overall sense of wellbeing and includes such factors as pain, mood, energy level, family and social interactions, sexual function, ability to work, and ability to keep up with routine daily activities (Physical Activity Guidelines Advisory Committee, 2008, p. C6).

Home care (client): an older person who is receiving a home care service.

Household physical activity: Physical activity derived from activities undertaken within and for the house, such as mowing the lawn, moderate-intensity gardening, heavy housework and repairs.

Independent living: A living arrangement that maximises independence and self-determination, especially of disabled persons living in a community instead of in a medical facility (Farlex, 2009).

Instrumental activities of daily living: Activities related to independent living, including preparing meals, managing money, shopping for groceries or personal items, performing housework, and using a telephone (Physical Activity Guidelines Advisory Committee, 2008, p. C2).

Leisure time physical activity: Physical activities performed by a person that are not required as essential activities of daily living and are performed at the discretion of the person. These activities include sports participation, exercise conditioning or

training, and recreational activities such as going for a walk, dancing, and gardening (Physical Activity Guidelines Advisory Committee, 2008, p. C2).

Lifestyle activities: This term is frequently used to encompass activities that one carries out in the course of one's daily life, that can contribute to sizeable energy expenditure, e.g., taking the stairs instead of using the elevator, walking to do errands instead of driving, getting off one bus stop earlier, or parking further away than usual to walk to a destination (Physical Activity Guidelines Advisory Committee, 2008, p. C2).

MET: Metabolic equivalent or metabolic equivalent of task. The ratio of work metabolic rate to a standard resting metabolic rate. Metabolic rate is the rate at which a person uses energy, or burns calories, 1 MET is considered a resting metabolic rate (Townsend et al., 2012, p. 8).

Moderate-intensity physical activity: physical activity requiring 3-4 METS (i.e. 3-4 times as much energy as at rest). It is also often described as activity that causes some increases in breathing and heart rate (Saarloos, Nathan, Almeida, & Giles-Corti, 2008).

Occupational physical activity: physical activity that occurs within a person's employment. High occupational activity includes: waiters and waitresses; cleaning and builder services; farm and nursery works; construction trades and services; labourers; and stock, freight and material movers (G. King et al., 2001).

Physical activity: bodily movement produced by skeletal muscle contraction that requires energy expenditure. Characterised by features including frequency, intensity, timing and type (Dishman et al., 2013, p. 565).

Physical fitness: The capacity to meet the present and potential physical challenges of life successfully; a set of personal attributes, such as muscular strength,

cardiorespiratory capacity, and agility, that relate to the ability to perform physical activity (Dishman et al., 2013, p. 565).

Physical function: being able to eat, bathe, dress, walk, and take medications (Resnick, Boltz, Galik, & Pretzer-Aboff, 2012).

Physically inactive: Adults not participating in any sessions of light to moderate or vigorous leisure-time physical activity of at least 10 minutes and/or being unable to perform leisure-time physical activity (Pleis, Lucas, & Ward, 2009).

Power (training): A performance-related component of physical fitness that describes the rate (or speed) at which work can be applied (Physical Activity Guidelines Advisory Committee, 2008, p. C5).

Reablement service: see restorative care service.

Residential aged care: Refers to facilities (other than hospitals) which provide accommodation and aged care as a package to people requiring ongoing health and/or nursing care due to chronic impairments and a reduced degree of independence in activities of daily living (ADLs) (Productivity Commission, 2011, p. XIX). Aged care institutions include specially designed institutions where the predominant service component is long-term care and services are provided to people with moderate to severe functional restrictions (Productivity Commission, 2011, p. XIX).

Researcher: throughout the thesis and publications where the Researcher (researcher) is referred to, this is the author of this PhD, who collected all data at every stage of the study.

Resistance training (strength training, muscle-strengthening activities, or muscular strength and endurance exercises): Exercise training primarily designed

to increase skeletal muscle strength, power, endurance, and mass (Physical Activity Guidelines Advisory Committee, 2008, p. C2).

Restorative care service: creates independence, improves self-image and self-esteem, and reduces the level of care required through the delivery of an individualised program (Atchison, 1992, p. 8).

Sedentary: a condition of inaction. (Sedentary lifestyle: the condition indicates a habit of life that is characterised by a low physical activity level) (Mosby's Medical Dictionary, 2009).

Strength: A health and performance-component of physical fitness that is the ability of a muscle or muscle group to exert force (Physical Activity Guidelines Advisory Committee, 2008, p. C6).

Vigorous-intensity physical activity: physical activity requiring 7+ METS (i.e. over 7 times as much energy as at rest). This is often described as activity that causes some ‘huffing and puffing’ (Saarloos et al., 2008).

Volume: Physical activity volume is the product of frequency or episodes per week, often expressed as days per week (D. Brown, Heath, & Martin, 2010).

CHAPTER 1

Introduction

1.1 Statement of the Problem

Australia's population is ageing; with baby boomers nearing retirement the percentage of the 65 year and over population will increase markedly over the next 50 years to levels never seen before. To remain living independently and without assistance it is important for older people to maintain their function and wellbeing for as long as possible. In order to do this, it is necessary to be physically active every day, preferably at a moderate intensity. However, evidence shows that as people grow older there is a tendency to be less physically active (Australian Bureau of Statistics, 2011a).

As older people become less physically active, they experience a decrease in strength, mobility, balance, power and endurance. All of these are crucial for an older person to remain living independently, without assistance from family, friends, and/or health and home care organisations. As strength decreases, getting off the toilet becomes more challenging; when balance is affected the risk of falling is markedly increased, which in turn affects confidence, if a fall does actually occur. The ability to walk to, and catch, public transport is also affected by a reduction in mobility, stamina, strength and balance. As the ability to complete these tasks becomes more difficult, gaining assistance from home care services is the most common response from both the older person and their family, as well as from the service providers themselves. The alternative - regaining/increasing functional abilities (i.e. strength, balance and mobility) through being more physically active is rarely considered.

Over a million older Australians receive home care services throughout Australia (Productivity Commission, 2011), the vast majority of which are funded through the Home and Community Care (HACC) program (Australian Government Department of Health and Ageing, 2012c). The most common HACC services are assistance with showering, transport, meals on wheels or domestic assistance; and the current delivery of these services involves “doing” the task for the older person, rather than assisting them to work towards completing it themselves. Very few services work with the older person to help them regain strength, mobility or balance in order to return to living without assistance.

A new paradigm for the provision of home care services, namely restorative home care services, has been developed over the last decade. Restorative care services aim to restore function and improve the wellbeing and self-esteem of the older person. A range of strategies have been found to be effective in improving function, wellbeing and self-esteem in older people thus most restorative care services have multiple components. These include: goal setting, health education management (including medicine, nutrition, and skin), exercise programs, occupational therapy, falls prevention, equipment, home modification and social rehabilitation (Ryburn, Wells, & Foreman, 2009). Physical activity or exercise is an intervention included in restorative home care services that has been demonstrated across multiple conditions to have a large impact on function and wellbeing for older people. There is a plethora of physical activity/exercise programs that have been found to significantly improve function, health, wellbeing and self-esteem. However, the effectiveness of different types of programs within a restorative care service has not been evaluated. This study aims to fill this current gap in knowledge.

This study focused on the levels, types, reasons for being and not being active and the effectiveness of physical activity programs in restoring independence for older people receiving restorative home care services. This research was framed in terms of Gill and colleague's (2002) work that investigated the prevention of functional decline in physically, frail older community dwelling people, through the implementation of a home-based intervention that focused on improving function, balance, strength, mobility and the ability to transfer from one position to another. Gill et al. (2002) suggested that exercise could slow or prevent functional decline in frail, older people living in the community. This study was designed to determine whether different exercise programs were differentially effective in their impact on the functioning of older people receiving restorative home care services.

1.2 Study Location

This three stage study was essentially undertaken in Perth, Western Australia, although a proportion of the questionnaires (stage 1) were posted to older home care clients receiving services in regional Western Australia. The subsequent study (stages 2 and 3), however, only included older people living in metropolitan Perth.

Perth is the largest city in Western Australia with over 1.7 million residents, of whom 12% are 65 years or over (Australian Bureau of Statistics, 2012). It is the fastest growing city in Australia with a relatively high standard of living.

In 2010-2011, 68,649 Western Australians and 47,366 residing in Perth received a home and community care service (HACC) (Australian Government Department of Health and Ageing, 2012c). Silver Chain is one of Western Australia's largest

community health and aged care organisations and all participants in this study had been, or still were, receiving a Silver Chain service.

1.3 Scope of the Project

This PhD incorporated three study stages. Stage 1 used a questionnaire and semi structured interviews to address project objectives 1-4 (see below). Stage 2 piloted a lifestyle exercise program to determine whether it was suitable for delivery in a restorative home care service (objectives 5-6) and stage 3 was a randomised controlled trial to determine the effectiveness, over the short and longer term, of a lifestyle exercise program compared to the current exercise program included in a restorative home care service (objectives 7-11). Limitations of the study have been outlined within each relevant published article.

1.4 Series of Published Papers

This thesis is presented as a series of published papers. Copyright permission has been obtained to use the published or ‘in-press’ papers for this purpose. Chapters 4 to 9 include original reprints from papers that have been accepted for publication and are either ‘in press’ or published. The title and objectives of each paper are listed below for each of the study stages:

1.4.1 Stage 1: To identify the physical activity levels, barriers and motivators for being physically active and physical activity preferences of older people receiving a home care service.

Physical Activity Levels of Older Adults Receiving a Home Care Service

Burton, E., Lewin, G., & Boldy, D. (2013). *Journal of Aging and Physical Activity*, 21(2), 140-154.

Objectives:

- To compare the physical activity levels of older people (70 years and over) who had received a restorative home care service (HIP) with those of older adults who had received usual home care services (HACC)
- To explore factors that predict being physically active among older home care clients
- To determine whether either home care service group (HIP or HACC) met the minimum recommended levels of activity promoted by the Australian government.

Barriers and Motivators to Being Physically Active for Older Home Care Clients.

Burton, E., Lewin, G., & Boldy, D. (2013). *Physical and Occupational Therapy in Geriatrics*, 31(1), 21-36. DOI: 10.3109/02703181.2012.751474.

Objectives:

- To identify the motivators and barriers to physical activity for older people receiving a usual (HACC) home care service compared to those receiving HIP, a restorative home care service,

1.4.2 Stage 2: To determine whether a lifestyle activity program is appropriate for, and can be delivered within, a restorative home care service.

Determining the feasibility of a lifestyle activity program for inclusion in a restorative home care service: A pilot study.

Burton, E., Lewin, G., Clemson, L. & Boldy, D. *Activities, Adaptations & Aging*, accepted for publication 9 June 2013. Estimated publication Volume 38(2), June 2014.

Objectives:

- Determine the recruitment rate and identify any potential recruitment issues for a RCT study
- Determine what the expected dropout rate might be in a RCT study
- Determine whether a Lifestyle Functional Exercise program (LiFE), and its associated documentation, was suitable to be delivered as part of a restorative home care service, as perceived by both care managers and clients
- Determine which data collection tools are appropriate for a RCT study within the context of the restorative home care services.

1.4.3 Stage 3: A randomised controlled trial to determine the effectiveness of a lifestyle exercise program compared to the current structured exercise program used within a restorative home care service.

Effectiveness of a lifestyle exercise program for older people receiving a restorative home care service: Study protocol for a pragmatic randomised controlled trial.

Burton, E., Lewin, G., Clemson, L., & Boldy, D. (2013). *BMC Health Services Research*, 13: 419. DOI:10.1186/1472-6963-13-419.

This paper describes the study protocol to test the following objectives:

Whether a Lifestyle Functional Exercise (LiFE) program

- is undertaken more often
- is more likely to be continued over the longer term
- will result in greater functional gains

compared to a standard exercise program for older people receiving a restorative home care service.

Effectiveness of a lifestyle exercise program for older people receiving a restorative home care service: A pragmatic randomized controlled trial.

Burton, E., Lewin, G., Clemson, L., & Boldy, D. (2013). *Clinical Interventions in Aging*, 8: 1591-1601. DOI: <http://dx.doi.org/10.2147/CIA.S44614>.

Hypotheses tested:

1. That the lifestyle exercise intervention would be undertaken more often than the structured exercise program, and
2. That the lifestyle exercise intervention would result in greater functional gain than the structured exercise program.

Long term benefits of a lifestyle exercise program for older people receiving a restorative home care service: A pragmatic randomized controlled trial.

Burton, E., Lewin, G., Clemson, L., & Boldy, D. (2014). *Healthy Aging & Clinical Care in the Elderly*, 6: 1-9. DOI: 10.4137/HACCE.S13445.

Hypotheses tested:

1. That the lifestyle exercise program would be undertaken more often compared to the structured exercise program, and
2. Result in greater functional gains,
at six month follow-up.

1.5 Significance of the Study

This study is significant because Australia's ageing population is rapidly increasing in size and it is therefore expected that the number of people requiring home care services will also increase. In order for older people to maintain their quality of life, reduce physical decline and maintain functional ability, they will need to become or remain physically active. Understanding what motivates or prevents older people receiving home care services from being physically active is under researched. It is also not known what type of physical activity older home care clients prefer to undertake. It is important that the motivators and barriers and activity preferences are understood prior to initiating physical activity strategies, in order to improve compliance and maintenance.

This study also investigated two different physical activity programs for older people receiving a restorative home care service, comparing a traditional 'structured' style exercise program with a program which incorporates physical activity into daily living routines and tasks. There is a dearth of research examining different physical activity programs for this population and few that examine maintenance of activity over time. By filling this knowledge gap the results of the study will inform the development of physical activity programs for older people generally, as well as assist the providers of restorative home care to deliver the most effective programs.

CHAPTER 2

Review of the Literature

2.1 Introduction

This chapter reviews the literature relating to population ageing, physical activity and home and community care services for older people. The section on physical activity reviews: the importance of being physically active; the health benefits; recommended levels of physical activity; reasons why people are or are not active; and, physical activity programs that have been proven effective for older people. The home and community care services section reviews: services in Australia and the rest of the world; physical activity programs that have been trialled in home care services; and, restorative care services in Australia and around the world. The final section provides a summary of the literature review and identifies the gaps in the literature.

Relevant publications were identified through a search of the following databases: CINAHL, Medline (Ovid and Web of Knowledge), PsychInfo, Sport Discuss, PubMed and Cochrane reviews. Additional papers, books and reports were also found through scanning reference lists, journal alerts, organisation websites and google scholar for citations from included research. Exclusion criteria were: studies undertaken in a long term care setting or residential care setting; people with dementia or neurodegenerative disorders; and people with specific conditions, for example people recovering from cardiac surgery, cancer or stroke. Restorative care services included only those with multiple components that promoted independence such as: goal setting, home hazards, physical activity/exercise programs and medication management. Single component services were excluded. Due to not wanting to exclude seminal papers in any section of the literature review, no time limit was placed on when research was published.

2.2 Population Ageing

The world's population is ageing. Population ageing is defined as "the process by which older individuals become a proportionally larger share of the population" (United Nations, 2001, p. 1). This greying of the population is expected to continue as population fertility rates continue to decrease. In 1950, there were 205 million people around the world aged 60 years and over, that tripled to 606 million by 2000 and is projected to reach almost two billion by 2050 (United Nations, 2001).

Europe currently has the world's largest proportion of people aged over 60 years (20% in 2000) and this is expected to continue until at least 2050, when the percentage is projected to have risen to 37% (United Nations, 2001). Conversely, Africa had the smallest population of older people in 2000 with only 5% of their population aged 60 years and over. This situation is expected to continue over the coming decades (United Nations, 2001). More than 20% of the populations of European countries, such as France, Greece, Italy, Sweden and the United Kingdom are 60 years and older (Australian Bureau of Statistics, 2007a). Whereas, the population proportions of Canada (17.8%), New Zealand (16.6%) and the United States of America (16.6%) are more similar to the proportion of older people in the Australian population (17.8%) (Australian Bureau of Statistics, 2007a).

Australia has seen a steady increase in its proportion of people aged 65 years and over. In 2007, approximately 2.73 million people aged 65 years and over lived in Australia and this number is expected to rise to 8.16 million (23%) by 2056 (Australian Bureau of Statistics, 2008). The older populations of Australia, namely those aged 70 and 85 plus years are also expected to rise in proportions never before

seen. As illustrated in Figure 1, by 2050 Australians aged 70-85 years will form 17.4% of the total Australian population and those aged 85 years and over, 5.1% or 1.8 million people. This is a considerable increase for the 85+ year age group, as they only made up 1.6% of Australia's population in 2010 (Productivity Commission, 2011).

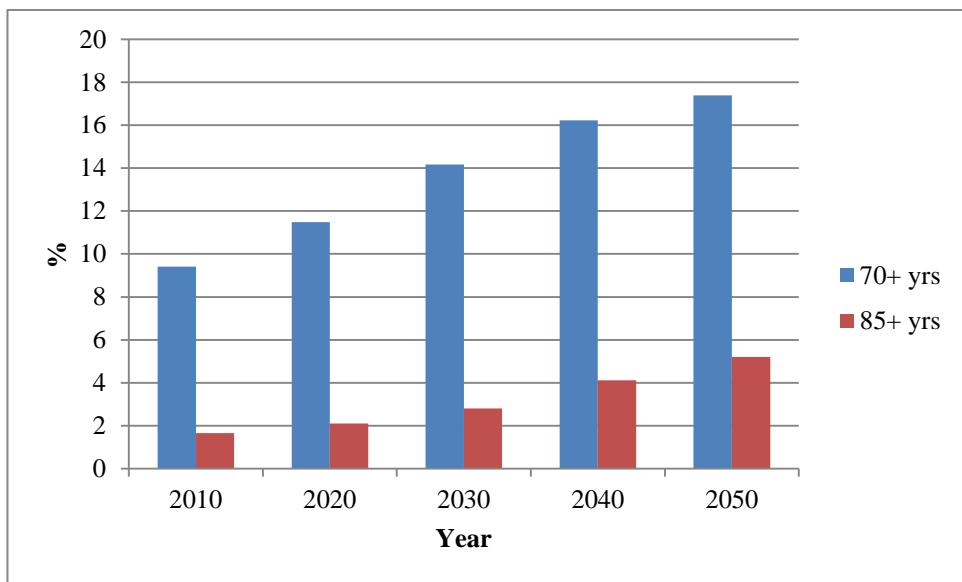


Figure 1. Projected size of selected Australian cohorts compared to total population (Australian Bureau of Statistics, 2008).

Throughout the ageing process physiological changes occur. As people grow older and pass 50 years of age physical capacity begins to decline, particularly for those who have not been physically active on a regular basis throughout their life (Signorile, 2011). Being physically active has many benefits and this does not change as a person grows older, as it is essential for maintaining function and living independently, which is important for the majority of Australians aged over 65 who live at home and particularly for the 28.7% that live alone (Australian Institute of Health and Welfare, 2007).

2.3 Importance of Physical Activity for Older People

The link between physical activity and health benefits was first established in 1953 by Morris, Heady, Raffle, Roberts and Park (1953) in their study comparing coronary heart disease (CHD) of London bus drivers who sat all day, to their conductors, who walked up and down the bus stairs all day. They found physical activity to have a protective effect against CHD for the active conductors compared to the sedentary drivers. Since then, there has been a vast amount of evidence supporting the importance of physical activity in the primary and secondary prevention of several chronic diseases, including benefits for older people (Bean, Vora, & Frontera, 2004; A. King & King, 2010; Ku, Fox, Chen, & Chou, 2012; Paterson, Jones, & Rice, 2007; Paterson & Warburton, 2010; A. Taylor et al., 2004; Vogel et al., 2009; Warburton, Charlesworth, Ivey, Nettlefold, & Bredin, 2010; Warburton, Katzmarzyk, Rhodes, & Shephard, 2007; Warburton, Nicol, & Bredin, 2006).

Physical activity may reduce the risk of over 25 chronic conditions, particularly, coronary heart disease, stroke, hypertension, breast cancer, colon cancer, type 2 diabetes, and osteoporosis (Warburton et al., 2007). The benefits for older people being physically active can also relate to functional mobility and independent living, health related quality of life, and psychological, cognitive or mental health (A. Taylor et al., 2004). Due to the very large number of studies examining the relationship between physical activity and health benefits, the following section is restricted to an outline of the evidence concerning: all-cause mortality; chronic diseases that are thought to be reduced greatly with on-going physical activity; mental health benefits; and, activity benefitting continued functional mobility and living independently, which is so important to older people living alone.

2.4 Health Benefits

There is evidence that there are many physical and psychological benefits to being physically active. A summary of the effects of physical activity in terms of physiological and psychological changes as people age, is presented in Table 1 below and outlined in the following section of the literature review.

Table 1

Effects of physical activity in terms of physiological and psychological changes as people age

Cardiovascular health	Decreased heart rate and blood pressure Decreased low density lipoprotein cholesterol Increased high density lipoprotein cholesterol Decreased maximal and submaximal aerobic capacity Improvement in blood lipids
Cancer	Decreased body fat Decreased oestrogen levels
Metabolism	Increase in total energy expenditure Reduced cholesterol Increased glucose tolerance Increased lipoprotein lipase activity
Musculoskeletal/function	Reduced risk of musculoskeletal disability Increased muscle strength, power, endurance, flexibility Improved static and dynamic balance Increased muscle mass Improved motor coordination Improved reaction time Improved gait speed, speed length and gait stability Reduced risk of falls Decreased fear of falling Increased bone density Increased overall activity levels and mobility Improves functional performance

Psychological	Improved attention span Improved wellbeing and happiness Improved memory Increase self-efficacy Decreased anxiety Improved sleep
<hr/>	

(Fiatarone Singh, 2002, 2004; Vogel et al., 2009)

2.4.1 All-cause mortality

In a systematic review of physical activity and premature mortality Warburton et al. (2010) reviewed 70 articles, encompassing 1,525,377 participants, at an average of 21,791 per study. They reported a total of 111,125 cases of premature all-cause mortality, the average length of the studies being 11.1 years. The articles were published between 1985-2007 (Warburton et al., 2010). Warburton et al. (2010) found a mean 31% (median 32%) lower risk for all-cause mortality in the most physically active persons, which was consistent with the findings of the 2008 Physical Activity Guidelines Advisory Committee in their review of 73 studies published after 1996 (Dishman et al., 2013).

Brown and colleagues (2012) explored the benefits of physical activity on all-cause mortality for Australian men and women aged 65 years and over. The study consisted of 18,748 participants, with mean ages of 75.3 years for women and 72.1 years for men (W. J. Brown et al., 2012). Proportionally more male participants reported being moderately, highly or very highly physically active compared to their female counterparts. Results showed that a dose-response was evident for all participants, with higher levels of physical activity associated with lower mortality risk ($p<.001$) (W. J. Brown et al., 2012). They also suggested that even low levels of

physical activity may have survival benefits for older people, in particular for women.

The inverse dose-response relationship between physical activity and all-cause mortality is well established and Warburton et al. (2010) suggest a risk reduction of approximately 45% for both men and women for aerobic type exercise, which in some cases has been reported above 50%. It has also been found that the type of activity, be it leisure-time, occupational, household or commuting based does not matter, the important aspect is the overall volume of energy expended (Dishman et al., 2013). The data are clear that 2-2.5 hours per week of moderate-intensity physical activity is sufficient to significantly decrease all-cause mortality rates (Dishman et al., 2013). National and International guidelines e.g. Australia and US (Australian Government Department of Health and Ageing, 2009; US Department of Health and Human Services, 2008) and WHO (World Health Organisation, 2010b) therefore promote this as the minimum amount of activity to be undertaken each week. This is being promoted as the minimum because the greater the volume and level of intensity of activity per week, the greater the health benefits will be for the older person (Warburton et al., 2010).

2.4.2 Cardiovascular disease

Cardiovascular disease (CVD) contributed to the greatest number of deaths of Australians in 2008 from any disease, making up 34% of the total that year. The proportion increases markedly with age (Australian Institute of Health and Welfare, 2011a). CVD cost Australia \$5.9 billion in 2004-2005 and remains the highest burden of disease overall in Australia, the United States and many other countries

throughout the world (Australian Institute of Health and Welfare, 2011a; Dishman et al., 2013).

As described earlier, the relationship between physical activity and CVD has been known for over half a century since Morris et al. (1953) determined that individuals with physically active jobs, in this case bus conductors, were less likely to suffer from CVD than their sedentary, driver, counterparts. Since this first seminal study, many other occupational activity studies, leisure-time activity studies, retrospective and prospective cohort studies have shown similar findings.

Warburton et al. (2010) conducted a systematic review of the relationship between physical activity and the incidence of CVD. They found 49 articles, spanning 32 years (from 1975 to 2007) which included 726,474 participants with a total of 34,815 reported cases of CVD. The majority of articles were prospective cohort studies and they found a graded inverse dose-response relationship between physical activity and fitness, with a 33% relative mean risk reduction and a 36% median risk reduction in the incidence of CVD (Warburton et al., 2010).

The majority of research conducted on the relationship of physical activity and the incidence of CVD has been in middle-aged men and women. There is much less known about the association in older adults. A systematic review conducted by Batty (2002) found 12 articles that examined the relationship of physical activity in older men and women to CVD; again the majority were prospective cohort studies. Eight of the 11 studies involving men showed an inverse relationship between physical activity and CVD (Batty, 2002). However, owing to the lack of evidence

available for older women it was not possible for the authors to draw any conclusions concerning the population as a whole, and future research in this area was suggested.

More recently, 4,060 adults (3,057 men, 1,003 women) aged 60 years and over were included in the Aerobics Centre Longitudinal Study (ACLS) in the United States. This prospective study had an average follow-up of 13.6 years and the mean age of the participants at baseline was 64.7 years (Sui, Laditka, Hardin, & Blair, 2007). The results showed that participants with high cardiorespiratory fitness had a markedly lower CVD mortality risk than those with low fitness levels. This was true for both older men and women (Sui et al., 2007). Cardiorespiratory fitness is an objective measure of physical activity, and studies have shown that regular physical activity can increase cardiorespiratory fitness (Sui et al., 2007).

In 2011, a meta-analysis of 33 prospective cohort studies was conducted to determine the dose-response relationship between physical activity and CVD (Sattelmair et al., 2011). It was found that individuals meeting the minimum United States physical activity guidelines (150 min activity a week) had a 14% lower risk of CVD, compared with those who were not physically active (Sattelmair et al., 2011). Individuals meeting the advanced guidelines (300 min activity a week) had a 20% lower risk of CVD. They also noted the association between physical activity and CVD was stronger in women than men (Sattelmair et al., 2011).

It is widely accepted that the physical activity guidelines promoted in many western countries are sufficient to lower CVD at any age for both men and women (Dishman et al., 2013). Small bouts of aerobic physical activity, in 10 minute blocks, such as

walking, contributes to this reduction and although greater amounts and more vigorous-intensity activity reduces the risk further, it is to a diminishing degree, and the exact volumes and intensities required remain unclear (Dishman et al., 2013).

2.4.3 Cancer

Cancer is predominantly a disease of older people. In Australia in 2012, approximately three quarters of new cancer diagnoses for men and 65% for women were in people aged 60 years and over (Australian Institute of Health and Welfare & Australasian Association of Cancer Registries, 2012). It is estimated that one in three Australian males and one in four females will have been diagnosed with cancer by the age of 75 (Australian Institute of Health and Welfare & Australasian Association of Cancer Registries, 2012).

Cancer of the breast and colon have the strongest evidence about the relationship with physical activity and will be the only cancers discussed in this literature review. Warburton et al. (2010) included 33 studies in their systematic review of the relationship between physical activity and colon cancer. A total of 1,433,103 participants, at an average of 43,427 per study, comprising 17,959 cases of colon cancer were included (Warburton et al., 2010). The average length of study was 10.7 years, involving regions throughout the world and the published articles spanned 1985 to 2008 (Warburton et al., 2010). A dose response relationship was present in many of the studies, when comparing physically active with physically inactive persons and a mean risk reduction of 30% (median 32%) was found across the studies (Warburton et al., 2010). Warburton et al. (2010) have suggested that the new Canadian physical activity guidelines (see *Recommendations for Older People*

section below) which are similar to the US, WHO and Australian physical activity guidelines, are of sufficient volume to lower the risk for the development of colon cancer for asymptomatic adults. Therefore, 30 to 60 minutes of moderate- to vigorous-intensity activity undertaken daily has been suggested. Currently the evidence is for aerobic type activity to be undertaken, such as jogging, swimming, running, and cycling (Physical Activity Guidelines Advisory Committee, 2008).

The most commonly diagnosed cancer for women in Australia is breast cancer, with 14,560 cases diagnosed in 2012 (Australian Institute of Health and Welfare & Australasian Association of Cancer Registries, 2012). A systematic review of 19 cohort studies and 29 case-control studies was conducted to determine the strength of the association between physical activity and breast cancer risk (Monninkhof et al., 2007). The studies included in the review were published between 1994 and 2006, with the case numbers ranging from 46 to 3,424 participants in the cohort studies and 81 to 6,888 in the case-control studies (Monninkhof et al., 2007). Strong evidence was found for an inverse relationship between women being post-menopausal and being physically active, with risk reductions averaging between 20-80% (Monninkhof et al., 2007). Similar results were found by the United States Physical Activity Guidelines committee in their review of 60 observational epidemiological studies (Physical Activity Guidelines Advisory Committee, 2008). However, for some reason the published figure, a 20% lower risk of developing breast cancer for active women, included pre-menopausal women even though the risk reduction is less for pre- as compared to post-menopausal women (Physical Activity Guidelines Advisory Committee, 2008).

As was the case for colon cancer, 30-60 minutes of moderate- to vigorous-intensity activity a day is recommended to lower the risk of developing breast cancer. Monninkhof et al. (2007) went further to suggest that for each additional hour of physical activity undertaken each week, a 6% decrease in breast cancer risk was possible if the activity is sustained. Therefore, if the current physical activity guidelines promoted around the world are followed they will lower the risk of developing colon and breast cancers for older people.

2.4.4 Type 2 diabetes

The prevalence of type 2 diabetes in Australia increases with age. In 2007-2008, 787,500 Australians were diagnosed with type 2 diabetes and 43% were aged 65 years and over (Australian Institute of Health and Welfare, 2011b).

There are four well known interventions for type 2 diabetes, these are: weight control; diet (less saturated fat); insulin or hypoglycaemic drugs; and, exercise (Dishman, 1994). The benefits of physical activity in controlling body weight and type 2 diabetes have been demonstrated widely in a variety of studies.

The United States Diabetes Prevention Program conducted a large randomised controlled trial of 3,234 adults aged between 25 and 85 years (mean 51 years). Participants were randomised to one of three interventions: 1082 to placebo; 1073 to the drug metformin; and 1079 to the intensive lifestyle intervention, which included diet and physical activity aimed at reducing weight by 7% and exercising for 150 minutes per week (Knowler et al., 2002). After an average of three years, 29% of the placebo group, 22% of the metformin group and just 14% of the exercise and diet group had developed diabetes. This equated to more than a 50% risk reduction for

the exercise and diet group (Knowler et al., 2002). The lifestyle intervention was effective for men and women and all minority groups (African Americans, American Indians etc) within the study, including older people aged 60 years and above (Knowler et al., 2002). Metformin on the other hand, was not effective for older people nor those with less weight loss (Knowler et al., 2002). They concluded that type 2 diabetes could be prevented or delayed in persons at high risk through the use of a lifestyle intervention which includes physical activity (Knowler et al., 2002). Trials in Finland, China, and Japan have found the risk to be reduced by similar degrees for participants undertaking 210 min/week, 140-280 min/week, and 210-280 min/week respectively (Hordern et al., 2012).

Exercise and Sport Science Australia released a position statement in 2012, advising exercise prescription for patients with type 2 diabetes or pre-diabetes (Hordern et al., 2012). They recommended 210 minutes of moderate-intensity aerobic (walking, running, cycling or swimming) exercise per week or 125 minutes of vigorous-intensity per week, and for there to be no more than two consecutive days without exercising (Hordern et al., 2012). Within the recommendations (125 or 210 minutes) they also suggested that 60 minutes of resistance training be performed, a minimum of twice a week (Hordern et al., 2012). This position statement is similar to the United States physical activity guidelines, although it does provide more guidance regarding vigorous-intensity exercise and the incorporation of resistance training within the week.

2.4.5 Obesity

Older Australians are much heavier now than they were a generation ago, with the average weight being 6-7 kilograms heavier compared to 20 years ago (Australian Institute of Health and Welfare: Bennett, Magnus, & Gibson, 2004). In 1980 approximately 11% of older Australians were obese compared to 23% in 2000 (Australian Institute of Health and Welfare: Bennett et al., 2004). In 2004, 30% of older Australian men and 44% of older women were at substantially increased risk of disease due to abdominal obesity; this number having increased as obesity rates in older Australians have continued to rise (Australian Bureau of Statistics, 2011b; Australian Institute of Health and Welfare: Bennett et al., 2004).

Physical activity plays an important role in the prevention of obesity or being overweight, although its role is still not fully understood. The latest Australian Dietary Guidelines released in 2013, suggest a minimum of 60-90 minutes of moderate-intensity physical activity per day is necessary to prevent weight gain or for those trying to lose weight, and for adults who are currently within a normal weight range 45-60 minutes of moderate-intensity activity is required each day (National Health and Medical Research Council, 2013). These recommendations, accompanied by further recommendations about reduced calorie intake and environmental strategies, are targeted at overweight or obese people as the way to lose weight and then maintain the weight loss. However, these recommendations are greater than the current physical activity guidelines promoted throughout the western world.

2.4.6 Musculoskeletal

Sixty-four percent of Australians aged 65 years and over suffer from a musculoskeletal condition such as arthritis, rheumatism, back pain or connective tissue injuries (Australian Bureau of Statistics, 2013). Up to 20% of adults who have a musculoskeletal condition suffer from pain which can be particularly debilitating for older people trying to complete their everyday activities (Woolf & Pfleger, 2003). Musculoskeletal conditions are the most common cause of functional limitations in older people (Woolf & Pfleger, 2003).

There is strong evidence that participation in low-impact, moderate-intensity exercise has specific benefits such as pain relief and improved function, quality of life and mental health, for people suffering from musculoskeletal conditions (Physical Activity Guidelines Advisory Committee, 2008). Adults of any age who suffer from osteoarthritis benefit from strength (resistance) and aerobic exercise, although the benefits may be less in old age (Physical Activity Guidelines Advisory Committee, 2008). The Physical Activity Guidelines advise that older people with musculoskeletal conditions undertake the recommended levels of physical activity promoted by the WHO and governments around the world. These include 30-60 minutes of moderate-intensity physical activity, in particular walking, 3-5 days a week (Physical Activity Guidelines Advisory Committee, 2008).

2.4.7 Function/Daily activities

Functional limitations can result in an older person having difficulties completing activities of daily living and therefore affect their ability to live independently. If the limitation in function is not addressed it may lead to the older person no longer being

able to live independently. Studies have shown older people who are physically active are less likely to experience functional difficulties than those who are inactive (A. Taylor et al., 2004; Vogel et al., 2009).

In a systematic review of physical activity and functional limitations in older adults, 35 studies with a total of 83,740 participants from around the world were included (Paterson & Warburton, 2010). Results suggest a 30-50% risk reduction of functional limitation/disability may be possible for older people, if moderate-intensity (aerobic) physical activity is undertaken as often, or more often, than currently recommended (Paterson & Warburton, 2010). Walking was recommended as the activity of choice to gain benefits in daily function and to prevent mobility disability. However other aerobic activities such as cycling, sport participation or household chores such as mowing the lawn or vacuuming were among other recommendations (Paterson & Warburton, 2010).

The case for using resistance or strength training only, for improvement in functional health, remains more unclear. Paterson and Warburton (2010) found in their review that resistance or strength training alone had not shown strong evidence of reducing functional limitation or disability, even though improvement may have been seen in some functional tasks. Vogel et al. (2009) suggested similar findings in their review of the health benefits of physical activity in older patients, where a number of studies they included did not find physical disability was prevented or minimised by resistance training. It is necessary to note they were discussing disability rather than functional ability specifically. The US Physical Activity Guidelines committee also suggested there was little evidence that physical activity (in general) in older adults

with functional limitations prevented disability (Physical Activity Guidelines Advisory Committee, 2008).

A systematic review of progressive resistance to reduce physical disability in older people found improvements to strength, some effect on functional limitations, but no evidence of an effect on physical disability for the 62 studies included ($n = 3,674$) (Latham, Bennett, Stretton, & Anderson, 2004). However, a more recent meta-analysis study by Liu and Latham (2011) found progressive resistance training showed reduced physical disability in older adults. The effect size was small (standardised mean difference = 0.14, 95% CI = 0.05 to 0.22) and the authors did recommend a multi-component intervention was preferred for success.

In 2009, Rice and Keogh (2009) completed a systematic review on the effects of power training in improving functional ability of older adults and also compared the effectiveness of power training to strength training. Strength represents the greatest load lifted in one (maximal) repetition, whereas power is the product of force (strength) and velocity (speed) and usually requires moderate levels of weight to be lifted at moderate to high velocity (Rice & Keogh, 2009). They found power and strength of the participants were both significantly improved in all of the training programs included in the review. Ten of the 12 power training studies showed significant improvement in functional performance compared to only four of the nine strength studies (Rice & Keogh, 2009). They concluded that power training may be more effective for improving functional ability than strength (resistance) training for older people (Rice & Keogh, 2009).

In a more recent systematic review that looked at resistance training interventions for older adults in nursing homes, Valenzuela (2012) found 13 studies met the inclusion criteria. The mean age range of the participants was 70-90 years, study sizes varied between 10 to 191 and nine of the studies were RCTs (Valenzuela, 2012). The review suggested that resistance training had a positive effect on both the strength and functional outcomes related to mobility in older people living in a nursing home (Valenzuela, 2012). It must be noted that a number of the trials did include small sample sizes which may be a limitation. However, the quality of the studies were moderate to high and therefore provided sufficient evidence to conclude that resistance training was beneficial to this population. It was also suggested that training begin at a low-intensity level but move through to high-intensity over time, as most functional gain was found at this level (Valenzuela, 2012). Three sessions per week of approximately 30-60 minutes were recommended and the strength exercises should be functionally specific, such as overloading the muscles used to get in and out of a chair, as this is an important task for being functionally independent (Valenzuela, 2012).

In order to maintain function as a person ages it is recommended that they undertake the recommended amount of physical activity under the WHO and various government guidelines. Aerobic physical activity in particular is necessary to prevent a decline in function, and power and strength training appears to increase function as well, although this is less clear. The benefits of strength (resistance) training are better established for falls prevention than for functional ability.

2.4.8 Falls prevention

In 2009-2010, there were 83,800 hospital admissions because of falls related injury in older people living in Australia. This was an increase of 6.1% from the previous year (AIHW: Bradley, 2013). Falls are the leading cause of injury-related hospitalisation for older people in Australia, and account for 40% of injury-related deaths for the over 65 year age group (Lord, Sherrington, Menz, & Close, 2007). It has been suggested that 30% of people aged 65 years and over living in the community will fall each year (Gillespie et al., 2012). The most common self-reported injuries from falling are bruises, scratches or sprains (Lord, Sherrington, Menz, & Close, 2007).

Many older people living in the community have a fear of falling. It is estimated that this may be up to 92% of older people who have already fallen and between 12-65% of those who have not fallen (Lord, Sherrington, Menz, & Close, 2007). More women than men are frightened of falling and the prevalence increases with age (Lord, Sherrington, Menz, & Close, 2007). Fear of falling is a barrier to physical activity for some older people and may result in them being less active and ultimately in reducing their strength, mobility and balance, all of which are necessary to prevent falls and maintain function to stay living independently (Moschny, Platen, Klaassen-Mielke, Trampisch, & Hinrichs, 2011; Rasinaho, Hirvensalo, Leinonen, Lintunen, & Rantanen, 2006).

A review of physical activity interventions for the prevention of unintentional falls among older people by Sherrington, Lord and Finch (2004) found six systematic reviews and three additional RCTs. Their review found clear evidence that a home

based activity program encompassing strength, balance and walking and delivered by a trained health professional could prevent falls in this community dwelling population (Sherrington et al., 2004).

Another systematic review of 17 trials ($n = 3,985$), related to community dwelling older adults was undertaken by Michael and colleagues (2010). They found the exercise interventions were protective with the relative risk of falling in the intervention group being 0.86 (95% CI, 0.80-0.92). When the control groups were stratified by rate of falling, they found the interventions were primarily effective for those older people with an increased risk of falling (Michael et al., 2010). Despite a reduction in falls risk there was limited evidence to show that there was improvement related to functional limitations because of the intervention (Michael et al., 2010).

Gillespie et al. (2012) conducted the most recent Cochrane review looking at interventions for preventing falls. Their review included 159 studies with 79,193 participants. Exercise interventions were found to be the most common, as a single (59 trials) or multi component intervention (40 trials). They found that multi component group exercise significantly reduced the rate of falls and risk of falling, as did multi component home based exercise, and that overall, exercise interventions significantly reduced the risk of a fall related fracture (Gillespie et al., 2012). Tai Chi was also found to reduce the risk of falling. They suggested that exercise programs used to reduce the rate of falling for an older person should include both strength and balance training in order to have the most effect (Gillespie et al., 2012).

Based on the presented evidence, the most effective type of intervention for an older person with a high fall risk is an exercise program incorporating strength, balance and mobility (walking) exercises.

2.4.9 Psychological benefits

Mental health is defined by the WHO “as a state of wellbeing in which every individual realises his or her own potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to her or his community” (World Health Organisation, 2011b). The majority of older Australians experience good mental health, however 9.5% experience one or more mental or behavioural disorders, 10.9% high level psychological distress and 24% take medication for their mental wellbeing (Australian Institute of Health and Welfare, 2007).

There is evidence that physical activity is associated with improvements in psychological health and wellbeing (Chodzko-Zajko et al., 2009). In a meta-analysis of 36 studies linking physical activity and wellbeing in older adults, Netz, et al. (2005) found overall wellbeing, self-efficacy and view of self, were significantly positively affected by physical activity. They also suggested aerobic training was most beneficial for psychological wellbeing in older adults, followed by resistance training, and that moderate-intensity exercise also provided benefit, although the evidence was less conclusive (Netz et al., 2005). This is consistent with the American College of Sports Medicine’s Position Statement on ‘Exercise and Physical Activity for Older Adults’ which recommends both aerobic and resistance

training at moderate- to high-intensity improves overall wellbeing and quality of life in older people (Chodzko-Zajko et al., 2009).

Since 1995, more than 100 population based observational studies have supported the notion that physical activity protects against the onset of depression, and that the odds of suffering depression lower by 30-45% in active people compared to inactive (Physical Activity Guidelines Advisory Committee, 2008). Twenty-eight of these studies used a prospective cohort design of physical activity and depression in 40,000 participants, across 11 countries and they found the odds of elevated symptoms to be reduced 25-40% for active compared to inactive adults (Physical Activity Guidelines Advisory Committee, 2008). There is however currently not sufficient evidence for a relationship between physical activity and bipolar or other mood disorders to be able to draw any conclusions as to any protective effect (Physical Activity Guidelines Advisory Committee, 2008).

There is evidence though that physical activity reduces the symptoms of depression in people diagnosed with depression (Physical Activity Guidelines Advisory Committee, 2008). A decline in depressive symptoms of up to 50% has been found (Physical Activity Guidelines Advisory Committee, 2008). The guidelines do however state that a number of the studies on which the recommendations were based, had small sample sizes and therefore detecting differences in effect sizes was difficult and larger studies need to be undertaken in the future (Physical Activity Guidelines Advisory Committee, 2008).

One of the types of physical activity interventions explored for depression is walking. A recent systematic review on the effects of walking for depression or depressive symptoms found eight RCT articles which met the inclusion criteria. In total they included 341 participants, with a mean age of 72.5 years (Robertson, Robertson, Jepson, & Maxwell, 2012). Participant numbers in any one trial were however small, ranging from 11-127, at an average of 43. When the results of these studies were combined in a meta-analysis the mean difference was -0.86 (95% CI: -1.12, -0.61) showing walking has a statistically significant, large effect on symptoms of depression (Robertson et al., 2012). The review concluded that walking could produce a reduction in symptoms of depression comparable to other forms of activity (Robertson et al., 2012).

There is a dearth of research exploring the effects of physical activity on depression in older people specifically. However, it has been shown that physical activity does benefit depression regardless of age and gender (Dishman et al., 2013). Moderate to high-intensity physical activity is recommended to reduce the odds of developing depressive symptoms, particularly compared to low-intensity or no activity at all, although the exact dose and volume needed is still unknown (Chodzko-Zajko et al., 2009; Physical Activity Guidelines Advisory Committee, 2008).

2.4.10 Health effects of physical inactivity

Physical inactivity was identified as the fourth leading risk factor for worldwide mortality (6%), behind blood pressure (13%), tobacco use (9%) and high blood glucose (6%) (World Health Organisation, 2010a). There is strong evidence that physical inactivity increases the risk of adverse health conditions, such as coronary

heart disease, cancer (breast and colon), type 2 diabetes, and shortened life expectancy (Lee et al., 2012). Lee et al. (2012) estimated population attributable fractions for the above mentioned health conditions and found for Australia that 6.3% (0.8 – 13.1) of coronary heart disease; 7.8% (1.0 – 15.4) of type 2 diabetes; 10.4% (0.9 – 20.2) of breast cancer; 11.2% (1.4 – 21.2) of colon cancer; and 10.1% (2.8 – 18.0) of all-cause mortality were a consequence of being physically inactive.

As people age there is a tendency to reduce the amount of physical activity undertaken, which can affect muscle strength, endurance, flexibility and balance. The maintenance of muscle strength is vital for living independently. For example, an 80 year old woman will use maximal quadriceps strength to rise from the toilet, if this strength is diminished due to illness or a period of inactivity, her ability to function independently will be reduced and she may need assistance to continue living alone, until the strength in her legs is regained (Dishman et al., 2013). This will only occur by performing leg strengthening activities or being more physically active in general (i.e. meeting the recommended physical activity guidelines for older people).

Pain and impairment of joint range of motion are common health problems that affect flexibility, strength and mobility in older people (Dishman et al., 2013). Forty-eight per cent of Australians aged over 65 years suffered from either arthritis or osteoporosis in 2007-2008, the proportion being higher for women than men (Australian Bureau of Statistics, 2011c). The reduction in joint movement and an increase in pain can lead to a reduction in the ability to perform many normal activities of daily living such as dressing or getting into a car and can lead to a need

for services to assist with these tasks (Australian Institute of Health and Welfare, 2007; Dishman et al., 2013). There are five main treatments for arthritis, including: medications; dietary supplements (e.g. glucosamine); physical therapy; surgery; or leading a healthy lifestyle including a healthy diet and regular exercise (Australian Institute of Health and Welfare, 2010).

2.4.11 Prevalence of physical inactivity

Almost a third (31.1%) of the worldwide adult population is physically inactive (Hallal et al., 2012). In this study physical inactivity was defined as not meeting the WHO's physical activity guidelines. These recommend 30 minutes of moderate-intensity physical activity at least five times a week or 20 minutes of vigorous-intensity activity on at least three days a week (World Health Organisation, 2010a) or an equivalent combination, achieving 600 metabolic equivalent (MET) minutes per week (Hallal et al., 2012). The proportion of the population that is physically inactive differs greatly from region to region, with 17% (16.8-17.2) of southeast Asian adults being inactive compared to 43.3% (43.0-43.6) in the Americas (Hallal et al., 2012). Women (33.9%) were more physically inactive than men (27.9%) and physical inactivity increased with age in all of the WHO regions (Hallal et al., 2012). Interestingly, older people living in southeast Asia were more physically active than all other regions and were also more active than young adults (15-29 years) from the Americas, the eastern Mediterranean, Europe and the western Pacific, which included Australia (Hallal et al., 2012).

The proportion of Australians aged 65 years and over who are leading inactive or sedentary lifestyles has increased over the last 15 years (see Figure 2). Of particular

concern is the increase in sedentary behaviour of Australians aged 75 years and over. Over half of the Australian 75 years and over population were sedentary in 2007-2008 and in 2011-2012 65.6% of women aged 75 years or more were sedentary; 50% more than their male counterparts (Australian Bureau of Statistics, 2011a, 2013). This lack of activity contributes to a considerable number of health problems, a decrease in quality of life and makes living independently and completing everyday tasks more difficult (Dishman et al., 2013).

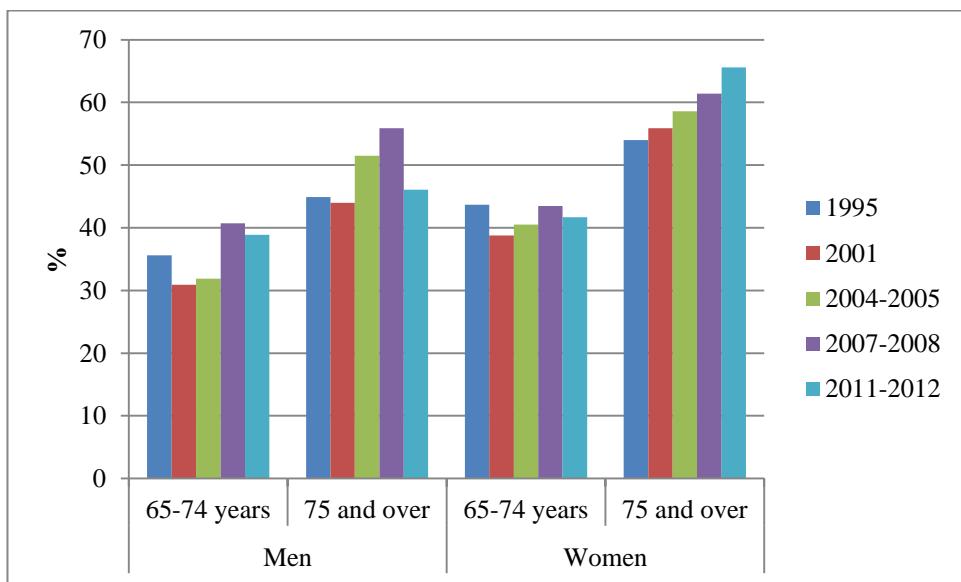


Figure 2. The prevalence of sedentary behaviour in older Australians 1995 to 2011-12

(Australian Bureau of Statistics, 2011a, 2013; Australian Government Department of Health and Ageing, 2009).

2.5 Recommended Levels of Physical Activity

Physical activity guidelines were initially established in the 1970s to improve fitness of the general population. The original US guidelines stated that fitness improvements were expected with 20 to 60 minutes of moderate- to vigorous-intensity endurance exercise, undertaken three or more times a week (Pate et al.,

1995). Then in the mid-90s the US Centre for Disease Control and Prevention (CDC) and the American College of Sports Medicine (ACSM) developed the most well-known evidence-based physical activity recommendations for health (Pate et al., 1995). These guidelines suggested every American adult should exercise for at least 30 minutes, at a moderate-intensity, on most days (or preferably all) days of the week. Moderate-intensity was defined as activity performed between 3-6 MET (work metabolic rate/resting metabolic rate) or the equivalent to brisk walking at around 5 kilometres per hour (Pate et al., 1995). Other activities identified as moderate-intensity included general gardening, social bike riding, ballroom dancing and doubles tennis (Centers for Disease Control and Prevention, 2011). The recommendation when the activity was of vigorous-intensity was for 30 minutes, three to four times a week. The WHO describes vigorous activity as requiring a large amount of effort, causing rapid breathing and a significant increase in heart rate, or performing activity over 6 MET (World Health Organisation, 2013). Activities defined as vigorous included jogging, running, swimming laps, and heavy gardening such as continuous digging.

The European Union (EU) published their physical activity guidelines in 2008, yet many countries in the EU promote their own guidelines and in varying forms, such as pie charts, written form, or in a pyramid diagram (Oja, Bull, Fogelholm, & Martin, 2010). These can be confusing given they are interpreted and displayed differently. The EU guidelines for adults follow those of the WHO, which follow the US guidelines, recommending 30 minutes of moderate-intensity exercise be undertaken on at least five days a week (EU Working Group on Sport & Health, 2008).

In Australia, in 1996 the Federal Government launched ‘Active Australia’, and in 1997 a National Participation Framework was released by Australian Sport and Health Ministers (National Public Health Partnership, 2005). In 1999, the Australian National Physical Activity Guidelines were released (Department of Health and Ageing, 1999), which closely mirrored the United States guidelines, recommending Australians “put together at least 30 minutes of moderate-intensity physical activity on most, preferably all days” (Department of Health and Ageing, 1999, p. 1). The guidelines also recommended that additional health and fitness benefits would occur if some vigorous intensity exercise was undertaken. These guidelines were also supported by Sims, Hill, Hunt & Haralambous (2010) a decade later when they reported five evidence based recommendations on physical activity to improve the health of older Australians.

Another relevant set of guidelines are the Australian nutritional guidelines which were updated in 2013 and for the first time included recommendations about physical activity. Physical activity now forms part of Guideline 1 in the complete guidelines and is also referred to in the summary document. Thirty minutes of moderate-intensity activity most days of the week was recommended. The complete guidelines, also suggest 45 minutes to an hour of moderate-intensity physical activity per day is necessary to combat obesity in adults, or at the least to assist those who continue to eat large amounts of energy-dense foods, in order to not gain additional weight (National Health and Medical Research Council, 2013, p. 23).

2.6 Recommendations for Older Adults

The major organisations and governments that promote physical activity guidelines, such as the United States, the WHO, the Australian Government and Canada also provide specific guidelines for children, young adults, adults and older people aged 65 years and above. The wording and the number of recommendations varies between countries (see Table 2). For example, the United States has four recommendation that are the same for all adults and then make a further four recommendations specifically for older people.

There are common points within all four physical activity guidelines summarised in Table 2, however the Australian guidelines are worded somewhat differently to the others and at times are vague on the amount of activity that should be undertaken.

The similarities and differences between the guidelines are summarised below:

- participate in 150 minutes of moderate-intensity aerobic activity per week, although the Australian guidelines state 30 minutes on most days
- complete muscle strengthening exercises on at least two days per week, the Australian guidelines do not suggest a frequency
- aerobic activity should be performed in at least 10 minute bouts, the Australian guidelines do not include this
- for older adults who cannot undertake the recommended 150 minutes per week, they should at least do as much as their abilities allow (included in the US and the WHO guidelines). Australia suggests regardless of age, weight, health problems or abilities, some form of physical activity should be undertaken (this is in line with the first US guideline), Canada does not recommend related to this guideline

- Canada, the US and the WHO all suggest those with poor mobility should do activities to enhance balance and prevent falls, this is not included in the Australian guidelines
- For additional health benefits increased amounts of physical activity have been recommended by the WHO, US and Canada. Australia suggests for those older people who have always participated in vigorous-intensity activity that they should continue to do so.

Comparing physical activity guidelines of countries and organisations, Australia's guidelines differ, often not being as clear or prescriptive as the others. This could be considered to be inferior to the other current guidelines related to older people being physically active.

Table 2

Physical Activity Guidelines for Older Adults

Australia (2009)	United States (2008)	WHO (2011)	Canada (2012)
Consists of 5 recommendations	Consists of 4 guidelines that are the same for all adults and four additional guidelines specific for older adults	Consists of 6 recommendations	Consists of 4 recommendations
<p>1. Older people should do some form of physical activity, no matter what their age, weight, health problems or abilities.</p> <p>2. Older people should be active every day in as many ways as possible, doing a range of physical activities that incorporate fitness, strength, balance and flexibility.</p>	<p>1. All adults should avoid inactivity. Some physical activity is better than none, and older adults who participate in any amount of physical activity gain some health benefits.</p> <p>2. For substantial health benefits, adults should do at least 150 mins a week of moderate-intensity, or 75 min a week of vigorous-intensity aerobic physical activity, or an equivalent combination of moderate- and vigorous-intensity aerobic activity. Aerobic activity should be performed in episodes of at least 10 minutes, and preferably, it should be spread throughout the week.</p>	<p>1. Older adults should do at least 150 minutes of moderate-intensity aerobic physical activity throughout the week or do at least 75 minutes of vigorous-intensity aerobic physical activity throughout the week or an equivalent combination of moderate- and vigorous-intensity activity.</p> <p>2. Aerobic activity should be performed in bouts of at least 10 minutes duration.</p>	<p>1. To achieve health benefits, and improve functional abilities, adults aged 65 years and older should accumulate at least 150 minutes of moderate- to vigorous-intensity aerobic physical activity per week, in bouts of 10 minutes or more.</p> <p>2. It is also beneficial to add muscle and bone strengthening activities using major muscle groups, at least 2 days per week.</p>

3. Older people should accumulate at least 30 minutes of moderate intensity physical activity on most, preferably all, days.	3. For additional and more extensive health benefits, adults should increase their aerobic physical activity to 300 minutes a week of moderate-intensity, or 150 minutes a week of vigorous-intensity aerobic physical activity, or an equivalent combination of moderate- and vigorous-intensity activity. Additional health benefits are gained by engaging in physical activity beyond this amount.	3. For additional health benefits, older adults should increase their moderate-intensity aerobic physical activity to 300 minutes per week, or engage in 150 minutes of vigorous-intensity aerobic physical activity per week, or an equivalent combination of moderate-and vigorous-intensity activity.	3. Those with poor mobility should perform physical activities to enhance balance and prevent falls.
4. Older people who have stopped physical activity, or who are starting new physical activity, should start at a level that is easily manageable and gradually build up to the recommended amount, type and frequency of activity.	4. Adults should also do muscle-strengthening activities that are moderate- or high-intensity and involve all major muscle groups on 2 or more days a week, as these activities provide additional health benefits.	4. Older adults, with poor mobility, should perform physical activity to enhance balance and prevent falls on 3 or more days per week.	4. More physical activity provides greater health benefits.
5. Older people who continue to enjoy a lifetime of vigorous physical activity should carry on doing so in a manner suited to their capability into later life, provided recommended safety procedures and guidelines are adhered to.	5. When older adults cannot do 150 minutes of moderate-intensity aerobic activity a week because of chronic conditions, they should be as physically active as their abilities and conditions allow.	5. Muscle-strengthening activities, involving major muscle groups, should be done on 2 or more days a week.	
	6. Older adults should do exercises that maintain or improve balance if they are at risk of falling.	6. When older adults cannot do the recommended amounts of physical activity due to health conditions, they should be as physically active as their abilities and conditions allow.	

-
7. Older adults should determine their level of effort for physical activity relative to their level of fitness.

 8. Older adults with chronic conditions should understand whether and how their conditions affect their ability to do regular physical activity safely.

References: (Australian Government Department of Health and Ageing, 2009; Canadian Society for Exercise Physiology, 2012; US Department of Health and Human Services, 2008; World Health Organisation, 2010a)

2.7 Physical Activity Patterns of Older People

Almost seventy per cent of the world's population say they meet the recommended levels of physical activity endorsed by the WHO (Hallal et al., 2012). When looking specifically at older people (65 years and older) however, only 30.5% of Americans reported meeting the aerobic activity guidelines in 2010 and 15.4% met the muscle-strength guidelines (National Center for Health Statistics, 2012). These figures represented an increase from 1998 when 26% said they met the aerobic guidelines and 8.6% the muscle-strength guidelines (National Center for Health Statistics, 2012). Those aged 65-74 years were physically more active than those aged 75 years and above.

Tucker, Welk and Beyler (2011) compared self-reported physical activity with accelerometer readings for 3,082 Americans as part of the 2005-2006 National Health and Nutrition Examination Survey (NHANES) and found large differences between the two types of measure. Sixty three percent of the 60-69 and 50.8% of the 70 years and over age groups had met the guidelines according to self-report. However, only 26.2% and 10.4% respectively met the guidelines according to the accelerometer readings (J. Tucker et al., 2011). It is widely accepted that self-report data is often inflated but accelerometers also have limitations. The use of the upper body in carrying loads and walking/running uphill, cycling or swimming are not recorded accurately by accelerometers, so that household and non-locomotor activity are often under-recorded (J. Tucker et al., 2011). Given that it is not viable to have a large number of the population wearing accelerometers or pedometers to record their activity levels over a week or more, governments continue to utilise self-report questionnaires or interviews to gain their population data on physical activity.

The latest data from the United Kingdom to identify the proportion of older people (65-74 and 75 years and over) who met the physical activity guidelines followed the worldwide trend of women being less likely to meet the guidelines and the 75 and over age group being about half as likely to meet the guidelines as the 65-74 age group (Townsend et al., 2012). Figure 3 illustrates the percentage of men and women meeting the United Kingdom physical activity guidelines by country and age. In general, the results for the United Kingdom show fewer people are meeting their Government's recommended physical activity levels than their American counterparts.

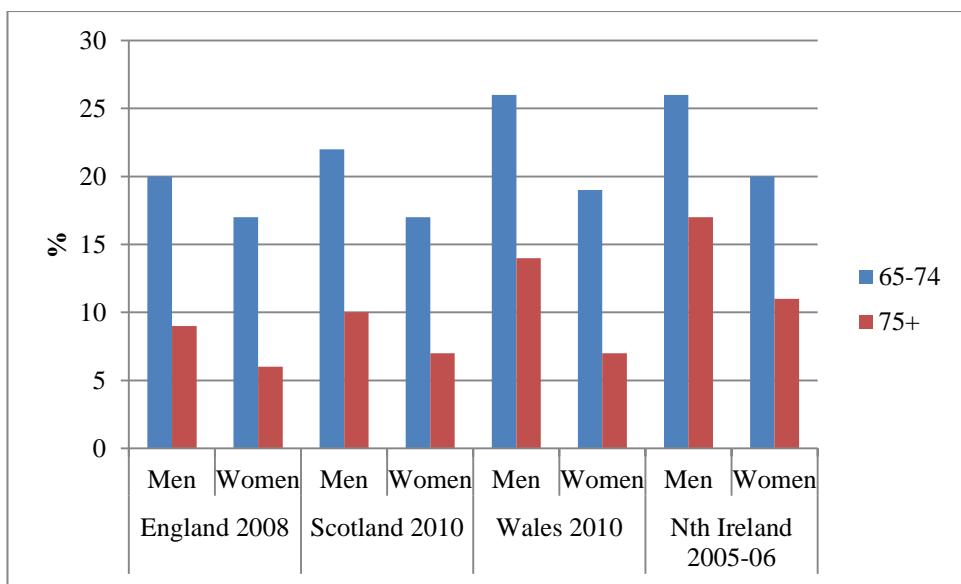


Figure 3. Population percentage meeting physical activity guidelines in the United Kingdom
(Townsend et al., 2012)

The percentage of older Australians meeting the Government's 2007-2008 recommended activity levels was 33.9% of 65-74 year olds and 21.1% of those aged 75 years and older. Again women were less likely to be physically active, as were

people aged 75 years and older (Australian Bureau of Statistics, 2011a). However, a study of ‘old-old’ (80 years and above) Victorians found 56.5% of their 80-84 year old participants achieved sufficient physical activity to gain health benefits, again this declined to 44% for the 85+ age group (Sims, Hill, Davidson, Gunn, & Huang, 2007).

Data have also been collected on the physical activity levels of older Western Australians. In 2006, more than two thousand adults aged over 45 years completed a telephone survey about their weekly physical activity (Saarloos et al., 2008). Over half (51.6%) of Western Australians in the 64-74 year age group reported they were sufficiently active compared to 38% of the 75 years and older age group (Saarloos et al., 2008). This was higher than other Australian figures but was based on a much smaller sample size than the figures provided by the Australian Bureau of Statistics. These results were however similar to those found by Tucker et al. (2011) and compare to the American population statistics discussed earlier.

In summary, a large percentage of older people throughout the world are not sufficiently active to meet their Governments’ guidelines or the WHO recommendations. Of particular concern is the decrease in physical activity levels of people aged over 75 years, at a time when physical disability and frailty can affect their ability to function and live independently in the community. In order to encourage this age group to become or remain physically active it is important to firstly know what would motivate them to be physically active.

2.8 Motivators of Physical Activity for Older People

Prior to prescribing an exercise program it is important to understand what motivates someone to be physically active or conversely what puts them off or prevents them being more active. Healthway, Western Australia's leading health promotion agency, suggested all organisations delivering physical activity programs in Western Australia should understand their target population including what encourages or discourages them from becoming physically active (Healthway, 2008). It is likely that the motivators and barriers to activity differ between population groups, in which case, if we are to maximise the effectiveness of an activity intervention with any particular group, it is important we understand what these are.

Much research has been conducted on the reasons why older people are motivated to be physically active, with most involving community dwelling older people living either with or without illness or injury. Specific populations such as older women, Asian Indians living in America, Tongans and stroke survivors have all been investigated. Table 3 lists all the published motivational factors identified in studies conducted since 2000.

Health, having a social experience or being with family, improved wellbeing and simply 'enjoyment', were the most commonly stated reasons found in the 15 studies identified. The sample populations for these studies were all aged 50 years and over. The studies that included the oldest participants (Cohen-Mansfield, Marx, & Guralnik, 2003; Dergance et al., 2003; Guerin, Mackintosh, & Fryer, 2008; Mathews et al., 2010; Newson & Kemps, 2007; Rasinaho et al., 2006; Resnick & Spellbring, 2000; Stathi et al., 2012) found that they, like their younger counterparts, first and

foremost gave health and wellbeing reasons for exercising, although they also identified being social and doing something with another family member as being important. Improving self-esteem and environmental reasons, were also more prevalent within an older group. Environmental reasons included: good weather, the neighbourhood being suitable, having services (e.g. shops, medical) in close proximity, and facilities suitable for older people exercising (Cohen-Mansfield et al., 2003; Mathews et al., 2010; Rasinaho et al., 2006; Stathi et al., 2012).

Horne and Tierney (2012) found similar results in their systematic review of the barriers and facilitators to exercise and physical activity adherence among South Asian older adults. Their review of qualitative studies found 11 papers that met their inclusion criteria and established that positive reinforcement, relatives being receptive to the older person being active, having group or peer support and engaging in community activities were all motivating factors for this population (Horne & Tierney, 2012). The ability of the review to provide an understanding of older adults was however limited by nine of the eleven papers including subjects both younger and older than 60 years of age (Horne & Tierney, 2012). Those suffering chronic illness were not looked at separately either, due to the limited number of studies in this area.

A systematic review of 44 studies identifying motivators and barriers for physical activity in the oldest of old (80 years and over) found 36 motivating factors (Baert, Gorus, Mets, Geerts, & Bautmans, 2011). All of the reasons found in the studies, other than those in Baert et al.'s (2011) review, are shown in Table 3. Baert et al.

(2011) noted that no specific studies investigating only the oldest of old group (80 years and above) were found.

The majority of the studies included in the above reviews focused on community dwelling older people. None of them were specific to older people receiving home care services. One study did, however, explore older people living in residential care (Guerin et al., 2008).

Table 3

Motivating factors for older people being physically active

Reference	Age of Cohort	Sample	Hlth	Fitness	Well being	Enjoy	Social Family	Past Exer	Goal setter	Mental health	Enviro	More time	↑ SE	Main Indep
(Horne, Skelton, Speed, & Todd, 2012)	60-70	South Asian (11 studies in systematic review)	✓		✓	✓	✓			✓		✓	✓	
(Stathi et al., 2012)	70+	CD English (n = 25)	✓				✓	✓			✓		✓	
(Sawchuck et al., 2011)	50-74	American Indians (n = 75)	✓		✓	✓	✓				✓		✓	
(Buman, Yasova, & Giacobbi, 2010)	50-75	Sedentary (n = 23)	✓			✓								
(Fuller, Stewart Williams, & Byles, 2010)	60+	New South Wales (n = 99)			✓	✓	✓		✓	✓	✓		✓	
(Mathews et al., 2010)	50-90	Min Gr in US (n= 396)	✓		✓		✓			✓	✓			
(Guerin et al., 2008)	X	Residential Care (n = 23)		✓			✓	✓					✓	
(Damush, Plue, Bakas, Schmid, & Williams, 2007)	M = 59	Stroke Survivors (n = 13)	✓				✓				✓		✓	
(Kolt, Paterson, &	60-79	Tongans	✓			✓	✓							

Cheung, 2006)		(n= 815)						
(Rasinaho et al., 2006)	75-81	Mob Limitations (n = 645)	✓	✓			✓	✓
(P. Martin & McCann, 2005)	50+	Women (n = 10)	✓	✓	✓		✓	
(Wagstaff, 2005)	65+	Snr Housing (n = 5)	✓	✓	✓		✓	✓
(Cohen-Mansfield et al., 2003)	74-85	CD Americans (n = 324)	✓	✓	✓		✓	✓
(Dergance et al., 2003)	60+	Euro US & Mexicans (n= 210)	✓				✓	✓
(Resnick & Spellbring, 2000)	81	CCRC (n = 23)	✓	✓		✓	✓	

Note. Title abbreviations include, Hlth: Health; Exer: Exerciser; Enviro: Environment; ↑ SE: Increased Self Esteem; Main Indep: Maintain Independence. Sample abbreviations include, CCRC: Continuing Care Retirement Community; US: United States of America; CD: Community dwelling; Euro: European; Mob: Mobility; Min Gr: Minority Groups; Snr: Senior. X is unknown.

2.9 Barriers to Physical Activity for Older People

Across a lifetime, a person will experience times when they find it more or less difficult to be physically active. What motivates someone to be physically active or what they see as making it difficult, can reasonably be expected to change over time. For a child it may be lack of transport, a young adult not enough money, or someone in their early thirties not having enough time due to having children. As described earlier, there are many and varied benefits from being physically active. If we are to increase physical activity levels across the population it is therefore important to understand and try to minimise the barriers that people experience.

Baert et al. (2011) in their systematic review of the oldest of old, identified 59 reasons that older people gave for being inactive. Barriers were classified into three domains: intrapersonal; interpersonal; and community. The most common intrapersonal barriers were: health or physical impairment; lack of time; being too tired; lack of interest and no knowledge of exercise (Baert et al., 2011). Interpersonal barriers included: no one to exercise with; lack of support; and other commitments (Baert et al., 2011). Cost, lack of access to exercise facilities, bad weather and unsuitable class times were all considered barriers to being active in the community domain (Baert et al., 2011).

In addition to the articles included in Baert et al.'s review, another 23 articles were identified that explored the barriers to being physically active for older people and had been published after 2000. These are shown in Table 4. The studies in these articles ranged in size from a sample of five to a sample of 1,937, and encompassed both quantitative and qualitative methodologies. As in Baert et al's review, the most

common reasons cited were: having a chronic illness; fear of injury; no interest; lack of time; and, having no one to be active with. All of the barriers identified by the studies included in Table 4 were also identified by Baert and her colleagues.

The studies discussed have included older people from a range of different populations, including community dwelling older people and those living in nursing homes or residential care. A gap however exists in terms of any studies that have specifically looked at older people who receive home care services. As a group these individuals can be expected to be more frail/disabled/physically unwell than community dwelling elders who are not receiving any services and less frail/disabled/ill than those living in residential care. They are also potentially a population who would particularly benefit from engaging in physical activity to help them regain (or slow down the loss of) their independence and improve their health. Stage one of this research was designed to fill this gap in knowledge and identified what motivated an older person receiving home care services to be physically active and what barriers they saw to such activity. Once these were determined, the type of physical activity programs suitable for this older population could be identified.

Table 4

Barriers for older people being physically active

Author	Age of Cohort	Sample	Chronic injury illness	Fear of injury	Lack of time	No int	No one to be active with	Temp injury or illness	Other injury illness	Lack of transport	Pain	Nowhere to be active	Do not know how	Fatigue
(Horne & Tierney, 2012)	60-70	South Asian (11 studies in sys review)	✓		✓	✓	✓	✓	✓	✓		✓	✓	
(Stathi et al., 2012)	70 and over	CD English (n = 25)		✓		✓	✓			✓		✓		✓
(Moschny et al., 2011)	72-93	Germany (n = 1937)	✓	✓	✓	✓	✓			✓		✓		
(Sawchuck et al., 2011)	50-74	American Indians (n = 75)			✓	✓	✓			✓				
(Buman et al., 2010)	50-75	Sedentary (n = 23)		✓	✓									
(Chen, 2010)	over 65	Taiwan Nursing Homes (n = 90)	✓	✓				✓	✓			✓	✓	
(Fuller et al., 2010)	over 60	New South Wales (n = 99)	✓		✓	✓		✓	✓		✓	✓	✓	
(Mathews et al., 2010)	50-90	Minority Groups in US	✓	✓	✓			✓	✓	✓	✓	✓	✓	

		(n = 396)							
(Annear, Cushman, & Gidlow, 2009)	77	New Zealand (n = 63)	✓		✓	✓	✓	✓	
(Guerin et al., 2008)	X	Residential Care (n = 23)	✓	✓	✓	✓	✓	✓	✓
(Dawson, Hillsdon, Boller, & Foster, 2007)	over 65	England/ Scotland (n = 551)	✓	✓	✓			✓	
(Stumbo, Pegg, & Lord, 2007)	X	Lit Review							
(Kolt et al., 2006)	60-79	Tongans (n= 815)	✓	✓		✓	✓	✓	✓
(Rasinaho et al., 2006)	75-81	Mobility Limitations (n = 645)	✓	✓	✓	✓		✓	✓
(Wilcox et al., 2006)	58	Arthritis (n = 68)	✓	✓	✓	✓	✓	✓	✓
(Aubertin-Leheudre, Rousseau, Melancon, Chaput, & Dionne, 2005)	65 & over	Women (Lit Review)	✓			✓	✓		✓
(Lamb, Engel, & Hollinger-Smith, 2005)	X	Assisted living (Lit Review)	✓	✓	✓	✓		✓	✓
(Wagstaff, 2005)	65 and over	Senior Housing (n = 5)					✓		

(Cohen-Mansfield et al., 2003)	74-85	CD Americans (n = 324)	✓	✓	✓		✓	✓
(Dergance et al., 2003)	73.8	Euro US & Mexicans (n = 210)			✓			✓
(Booth, Bauman, & Owen, 2002)	over 60	Australians (n = 402)	✓	✓		✓	✓	
(Cooper, Bilbrew, Dubbert, Kerr, & Kirchner, 2001)	60-80	Elderly Primary Care (n = 212)					✓	✓
(Resnick & Spellbring, 2000)	81	CCRC (n = 23)	✓	✓			✓	

Note. Title abbreviations include, int: interest; Temp: Temporary. Sample abbreviations include, Sys: Systematic; CD: Community dwelling; Lit: Literature; Euro: European; CCRC: Continuing Care Retirement Community. X is unknown.

2.10 Physical Activity Programs for Older People

There are a large number of studies that have investigated physical activity interventions for older people (for example, Cheng et al., 2009; de Vreede, Samson, van Meeteren, Duursma, & Verhaar, 2005; Jancey, Clarke, et al., 2008; Jancey, Lee, et al., 2008; B. Martin & King, 2008; McAuley et al., 2013). These studies vary in a number of aspects including: length of study; frequency and duration of exercise; whether the exercise program is home, facility or community based, supervised or unsupervised; different outcome measurements used to determine effectiveness; and, the type of exercise considered most appropriate and effective for older people.

The length of exercise interventions for older people generally varies between six weeks (Rosie & Taylor, 2007) and two years (Campbell, Robertson, Gardner, Norton, & Buchner, 1999), with many lasting for 8-10 weeks (Kwok et al., 2011; Rosie & Taylor, 2007; Siqueira Rodrigues, Ali Cader, Bento Torres, Oliveira, & Martin Dantas, 2010). Most studies required participants to exercise at least two to three times a week for approximately 30-60 minutes duration. Although there are recommendations for the duration, frequency and intensity of physical activity for this population (Australian Government Department of Health and Ageing, 2009; Singh, 2002; US Department of Health and Human Services, 2008) very few studies met these targets. However, two studies did. Rosie & Taylor (2007) used daily sessions and Campbell et al. (1999) required participants to walk three times a week and resistance train three times per week. Conn et al. (2003) also found in their systematic review of 42 RCT studies that few studies met the accepted standards required to achieve worthwhile health outcomes. The lower levels of exercise frequency found in many of these studies may be due to the participants initially

being inactive, and as suggested previously, it is important when returning to physical activity that the loads and intensity are built up slowly. It may also be the case that the researchers felt the burden would be too large to ask participants to work out for more than three days per week.

Exercise programs studied were mainly conducted at home or in a facility. The majority required assistance by a therapist, fitness trainer or equivalent, in at least the start-up phase to run through the program and safety aspects. The duration of their support varied from one meeting to multiple visits over a number of months. Some studies used phone calls after the initial set up to maintain motivation (Cyarto, Brown, Marshall, & Trost, 2008) and others provided an instructional manual for the participant to keep (Clegg, Barber, Young, Forster, & Iliffe, 2011; Lubans, Mundey, Lubans, & Lonsdale, 2013). The difference between home or facility workouts did not appear to affect the outcome; however there may be issues if the target population has difficulty travelling to a facility as this may become a barrier. This re-emphasises the importance of understanding the barriers to exercising for the population group involved, before beginning an exercise intervention.

Outcome measurement approaches have differed widely, from self-report measures, such as the Physical Activity Scale for the Elderly (PASE) (Roth, Goode, Clay, & Ball, 2003), body mass index (Jancey et al., 2007) and Activities of Daily Living (Dunlop et al., 2005), to performance tests using basic equipment, such as the 6-minute walk (de Vreede et al., 2005) or those requiring expensive equipment based at a facility, such as the Cybex isokinetic dynamometer used by Bird et al. (2010). Due to the different outcomes measured it is difficult to directly compare studies.

Studies have investigated different aspects or outcomes of physical activity, for example, the promotion and retention of physical activity (Jancey et al., 2006), the prevention of falls (Campbell et al., 1999), types of physical activity to prevent or delay the onset of disability in daily living activities (Penninx et al., 2001) and improve daily function (de Vreede et al., 2005). Most of these studies involved community dwelling older people who were often insufficiently active and also had a particular health condition, for example, arthritis. Others have explored older people living in residential care facilities. Two such studies found 17 women coordinated their own walking program without assistance from staff or researchers, set their own goals, and achieved significant improvement in outcomes (mobility, modified Barthel Index and functional reach) from baseline to post-testing during the nine week study (L. Taylor, Whittington, Hollingsworth, Ball, King, Diwan, et al., 2003; L. Taylor, Whittington, Hollingsworth, Ball, King, Patterson, et al., 2003). Conn et al. (2003) suggested the use of untested measures as outcomes was a methodological weakness of many of the intervention studies that they reviewed. Warren et al. (2010) agreed and identified a number of limitations in self-report instruments, particularly questionnaires and activity diaries. When using self-report instruments it is recommended they be valid and reliable and generated for the specific population, in this case older people, for example the PASE survey (Warren et al., 2010).

Most physical activity interventions for older people have used either a resistance training program (Manini et al., 2007; D. Tucker & Allen, 2002), a walking program (Cheng et al., 2009; Sullivan, Allegrante, Peterson, Kovar, & MacKenzie, 1998) or combined the two (Bird et al., 2010; Buchner et al., 1997; Penninx et al., 2001). Additionally a small number have used functional exercises, for example: movement

with vertical and horizontal components; carrying an object; and moving between lying, sitting and standing positions (de Vreede et al., 2005). For the last decade, evidence has accumulated that resistance training combined with aerobic training (walking) assists older people in preventing falls, improving balance and increasing functional independence (Lord, Sherrington, Menz, Close, & Whitney, 2007). The combination of strength and aerobic training also meets the physical activity guidelines of many countries, which is important as many interventions for older people in the past have not met these guidelines (Australian Government Department of Health and Ageing, 2009; US Department of Health and Human Services, 2008; World Health Organisation, 2010b).

Campbell et al. (1997) explored a home based strength and balance retraining program for 233 (exercise group n = 116, control group n = 117) community living women aged 80 years and over and followed them over two years. Each program was individually tailored for the first two months, including four visits by the physical therapist. Exercises appropriate for the participant were prescribed along with the use of weight cuffs (0.5 kg and 1.0 kg) which were increased in weight as they progressed. Participants were asked to complete the exercise three days a week plus walk outside the house on another three days each week. The rate of falls significantly decreased for those exercising compared to the control group, at both one year and two years follow up. Campbell's Otago Exercise Program has been found to be effective in reducing the number of falls and injuries resulting from falls, for both men and women in four randomised controlled trials, involving over 1000 participants (Campbell & Robertson, 2003).

In a less traditional format, lifestyle exercise programs incorporate exercises/activities into a person's daily routines and tasks. A major benefit of this type of exercise program is that it does not require the person to find set periods of time during the day to undertake a structured exercise program. Dunn et al. (1998) reviewed 14 lifestyle activity programs and found the majority increased the amount of physical activity of the participants to above government recommended levels. However, at the time, there was limited research on older populations using this type of exercise program. Over the last five years, three randomised trials have compared lifestyle exercise programs to structured exercise programs for older community dwelling people, one with a focus on older people who had not exercised consistently during the previous two years (Van Roie et al., 2010), another a pilot study determining the efficacy and feasibility of a structured resistance training program combined with a lifestyle program and compared to a control group (Lubans et al., 2013) and lastly a three arm RCT (lifestyle, structured exercise and control groups) looking at the incidence of falls and function with older people (Clemson et al., 2012).

Van Roie et al. (2010) in their RCT with 186 older people living in Belgium, compared a structured exercise program and a lifestyle exercise program to a control group. The structured exercise group conducted their program at a fitness facility under supervision. The home based lifestyle program included instruction from a professional, and participants were given a booklet illustrating strength, flexibility and balance exercises. For their strength exercises they were given elastic tubes and for their endurance they were asked to include either walking, jogging, cycling, swimming or another cardiovascular exercise (Van Roie et al., 2010). They were

then advised on opportunities where they could incorporate these into their daily routines. Both intervention groups (lifestyle and structured exercise group) were found to be more effective in improving function than the control group (Van Roie et al., 2010). The description of their intervention as a lifestyle exercise program can however be considered somewhat at odds with others' use of the term when it is used to describe a program in which specific exercises are incorporated into daily activities or routines.

Lubans et al. (2013) also included a lifestyle exercise program in their intervention study and found a significant difference in lower body strength between the intervention (resistance training and lifestyle exercise combined) and control groups. However it was only a pilot study ($n=44$) and no differences were found between the groups for any of the secondary outcomes, which may have been due to the small sample size. Even by combining the two exercise programs together, the study was unable to shed any light on which intervention was more effective, or how much each component had contributed to any improvement.

Clemson et al. (2010) developed a 'Lifestyle approach to reducing Falls through Exercise' (LiFE) program which involved embedding balance and lower limb strength and balance training into daily living tasks (Clemson et al., 2010). This approach differed from other exercise programs in that it did not require the participant to set aside specific times to exercise but rather to change how they performed their daily tasks. For example, when bending over to pick something up off the ground, instead of bending from the waist, participants were asked to bend their knees into a squat, to develop leg and buttock strength. The LiFE program did

not require additional equipment and the principle and philosophies of the program were taught by an allied health worker with the assistance of a manual. Similar to other exercise programs, the number and intensity of activities was increased as the participant progressed. As all of the exercises are completed as part of an individual's daily routine rather than at specific times per week, this type of program may be a more attractive option than a more traditional exercise program, for people who do not like 'working out'.

The initial pilot study for LiFE included 34 people aged 70 years and over, living in the community (Clemson et al., 2010). Outcome measures were taken at baseline and repeated at three and six months. These included measures of: rate of falls; physical capacity (balance and strength); quality of life; and self-efficacy (Clemson et al., 2010). A significant reduction in falls rate was found for the LiFE group compared to the control group, accompanied by improvements in dynamic balance and self-efficacy (Clemson et al., 2010). The pilot was followed by a large randomised controlled trial ($n=317$), which included three interventions groups (LiFE, a structured exercise program and a sham exercise group-control) (Clemson et al., 2012). The LiFE group had a 31% reduction in the rate of falls, and was significantly better than the control group for static balance, ankle strength, function and participation (Clemson et al., 2012). No significant differences were found between the structured and lifestyle exercise groups (Clemson et al., 2012).

There are many exercise program options for older people to maintain or improve their strength, balance, mobility and function. It is important for practitioners/researchers to understand their client group/target population, what the

group/population view as the motivations and barriers to becoming or staying active and to know what type of exercise/physical activity their target group prefer, before considering a particular exercise program. Prior to this research we did not have an understanding of this for older adults receiving home care services.

However, in stage one of this research it was identified that older home care clients preferred being active via daily activities, such as gardening and housework, rather than participating in structured exercise programs. Due to these findings, the LiFE program was trialled in stages two and three to determine firstly, whether it was possible to deliver LiFE within a restorative care service and secondly whether it was more effective and undertaken more often, than the structured exercise program. LiFE was chosen because it was an exercise program that had been demonstrated to effectively improve function for older people by embedding exercises within the older person's daily activities.

2.11 Home Care Services

The WHO describes the aim of home care as “satisfying people’s health and social needs while in their home by providing appropriate and high-quality home-based health care and social services, by formal and informal caregivers, with the use of technology when appropriate, within a balanced and affordable continuum of care” (World Health Organisation, 2008, p. 1).

Many people are involved in providing home care to older people. They include both professional and non-professional personnel, such as nurses, therapists

(physical, occupational and speech), home care assistants, social workers, physicians, dieticians, volunteers, family and friends (World Health Organisation, 2008).

Older people who need assistance to manage their health or complete everyday activities are increasingly expressing a preference to remain living in the community rather than move to residential care. This preference is being strongly supported by many Governments as home care is seen as a cheaper alternative to residential care at a time when population ageing is adding to their Nations' fiscal challenges. The history, policies, funding, government involvement and delivery of home care services varies around the world, with many less developed countries having no government funded services available at all. As populations age over the coming decades the demand for home care services is expected to rise.

2.12 Australian Home and Community Care

Australian Home and Community Care (HACC) services were established in 1985 and are currently available to older people aged 65 and over or Aboriginal and Torres Strait Islanders over 50 years of age, who are having difficulty performing activities of daily living without help due to functional limitations, or are at risk of premature or inappropriate admission to long term residential care, or care for an older person eligible for HACC (Australian Government Department of Health and Ageing, 2012b). People under the age of 65 years can also access HACC services; however these services are funded by the state rather than federal government. In July, 2012 new HACC funding rules were employed and all HACC services were fully funded by the federal government except in Victoria and Western Australia (Australian

Government Department of Health and Ageing, 2012b). The principles of HACC in Victoria and Western Australia remain similar to those federally funded.

HACC comprises a number of services, including:

- Nursing care
- Allied health services such as podiatry, physiotherapy and speech pathology
- Domestic assistance, including help with cleaning, washing and shopping
- Personal care, such as help with bathing, dressing and eating
- Social support
- Home maintenance
- Home modifications
- Assistance with food preparation in the home
- Delivery of meals
- Transport
- Assessment, client care coordination and case management
- Counselling, information and advocacy services
- Centre-based day care, and
- Support for carers including respite services.

(Australian Government Department of Health and Ageing, 2012a).

Almost a million older people throughout Australia accessed a HACC service in 2010-2011. The majority (61.1%) were aged between 70-89 years of age (Australian Government Department of Health and Ageing, 2012c). Four percent of the total Australian population accessed a HACC service in 2010-2011, with 27.7% of the total Australian population aged over 65 years receiving a HACC service during that time (Australian Government Department of Health and Ageing, 2012c). Over 60%

of HACC clients were women, 71.4% were born in Australia, 11% in north-west Europe and 10% in south and eastern Europe (Australian Government Department of Health and Ageing, 2012c). Ninety percent spoke English, 26.1% Italian and 14.6% Greek. Almost a third (29.2%) of older people referred themselves for a HACC service, followed by family or friend (15.3%), hospital (14.6%) and their doctor or medical practitioner (10.2%) (Australian Government Department of Health and Ageing, 2012c).

The main reasons for a HACC service finishing were: an improvement in status (37.1%); other reasons not stated (15%); client deceased (10.7%) and similar to the main reason, the client no longer needs assistance from agency due to improved status (9.3%) (Australian Government Department of Health and Ageing, 2012c).

The main characteristics of HACC clients in Australia in 2010-2011 were: female; spoke mainly English at home; received a pension; lived with family; had no carer; and received one type of service (Australian Government Department of Health and Ageing, 2012c). Unless the older person was receiving a physiotherapy or restorative home care service through HACC, they would not be given an exercise/activity program and no specific improvements in strength, balance, mobility or function would be expected due to the introduction of the service.

2.13 Rest of the World Home and Community Care

In many countries in Europe home care is provided by the health sector and includes services such as rehabilitation, specific nursing care for both chronic and acute illnesses, occupational therapy and speech therapy (World Health Organisation, 2008). In contrast, the home help services, which include cleaning, shopping,

gardening, transport and socialising are often coordinated by the social sector of government (World Health Organisation, 2008). Table 5 outlines the different government departments in a number of European countries that service health and social care in their communities.

Table 5

Country-specific organisation of home health and social care in selected EU countries

Country	Health care at home	Social care at home
Belgium	Central or regional government	Local government or municipality
Denmark	Local government or municipality	Local government or municipality
Finland	Local government or municipality	Local government or municipality
France	Social insurance and local government or municipality	Local government or municipality
Germany	Social insurance	Social insurance
Ireland	Central or regional government	Central or regional government
Italy	Central or regional government	Local government or municipality
Netherlands	Social insurance	Social insurance
Portugal	Central or regional government	Local government or municipality
Spain	Social insurance	Local government or municipality
Sweden	Local government or municipality	Local government or municipality
United Kingdom	Central or regional government	Local government or municipality

Note. Reprinted with permission (Tarricone & Tsouros, 2008)

Genet et al. (2011) examined the literature on home care in Europe in which 74 articles published between January 1998 and October 2009 met their inclusion

criteria. They found a great diversity of home care services, funding, assessment process and quality of services across the 18 countries (Genet et al., 2011). The typical characteristics of a person living in Europe and receiving a home care service were: advanced age; female; frail; higher or lower educational attainment depending on the country and consideration of the recipients income (Genet et al., 2011).

Large proportions of the older population were seen to be receiving home care in the 15 European countries examined. For example, one-third of the French population over 75 years and a quarter of the Polish population in a specific rural area were receiving services from a home nurse (Genet et al., 2011). Interestingly, Denmark places a large emphasis on preventive home care services and 60% of the Danish population over 75 were receiving preventive home visits (Genet et al., 2011).

Due to the large number of older people requesting assistance, some European countries, such as England and Germany, have had to set thresholds for people accessing health and home care services (World Health Organisation, 2008). Funding for these services and who receives the funding varies between countries in Europe and can involve public, family and private resources (Genet et al., 2011). Public spending on home care accounts for around 30% of the resources spent on long-term care by many Organisation for Economic Co-operation and Development (OECD) countries (World Health Organisation, 2008).

The percentage of gross domestic product (GDP) spent by OECD countries on long-term care ranged from 0.2% to 3% in 2000. Only Norway and Sweden spending more than 2% (Organisation for Economic Co-operation and Development, 2005).

Australia was the 8th highest spender on long-term care among OECD countries in 2000. Those countries that spent a greater percentage of their GDP were Canada, USA, Germany, UK, Netherlands, Sweden and Norway (Organisation for Economic Co-operation and Development, 2005).

Over a million Americans received home health care in 2007 and more women than men over 65 years received this type of service (A. Jones, Harris-Kojetin, & Valverde, 2012). Eighty percent of American home care clients aged 65 years and over had a primary caregiver, and males were three times more likely than females to have their spouse as the primary caregiver, whereas women were more than twice as likely to have a child or non-spousal family member assisting them (A. Jones et al., 2012). Women were found to be more likely to have an extended episode of home care and to have Medicaid as their primary payer compared to their male counterparts who were more likely to have had an inpatient stay (e.g. hospital) prior to receiving home health care (A. Jones et al., 2012). Many males who received home care services in America were found to have needed specific care such as wound care or physical therapy, whereas females were more likely to have needed homemaker (social) services, such as domestic assistance (A. Jones et al., 2012). Home care services in America include nursing, physical therapy, assistance with daily living activities, homemaker services, occupational therapy, wound care and dietary counselling (A. Jones et al., 2012).

Many OECD countries recognise their populations are ageing and as a consequence have been eager to find service models that will assist older people to maintain their independence and reduce their reliance on government home care services. As

described earlier, physical activity can improve health at any age and particularly affect muscle strength and function, which is crucial for completing activities of daily living and living independently; the main goal for home care services throughout the world.

2.14 Physical Activity and Older People Receiving Home Care Services

As already noted, there have been many studies looking at physical activity programs for older adults living in the community but, only four were found that examined programs specifically targeted at older recipients of home care services.

The first of the four, conducted by McMurdo & Johnstone (1995) in the UK, compared the outcomes for home care clients who received either: mobility exercises ($n = 20$); strength exercises ($n = 21$); or health education ($n = 28$). The physical activity programs took around 15 minutes to complete each day and no differences between the activity and health education groups were found on any of the outcome variables (timed up-and-go, sit-to-stand, grip strength, functional reach, ADLs and quality of life).

The second study was undertaken by the Canadian Centre for Activity and Aging and had quite different results. They developed a home support exercise program for frail older adults receiving ‘usual’ home care services and published the results of both the program’s development and the outcomes of the evaluation (Johnson, Myers, Scholey, Cyarto, & Ecclestone, 2003; Tudor-Locke et al., 2000). The program was delivered by home care workers, rather than health care professionals such as physiotherapists, occupational therapists or registered nurses. It involved

clients completing a series of 10 exercises which were functional and progressed in difficulty over time. The program ran for four months and included people (exercise group n = 60, control group n = 38) who had received home care services for up to seven years (Johnson et al., 2003). Good compliance and significant improvement were found on a number of indicators (timed up-and-go, sit-to-stand, 6-min walk, balance confidence and wellbeing) for the intervention group compared to the control group, whose performance declined on many of the tests (Johnson et al., 2003).

The third study, conducted by Cameron, Chahine, Selig and Newton (2008), was a pilot study exploring physical activity promotion as part of the Home and Community Care (HACC) service delivery in Victoria, Australia. Thirty-one older people were invited by the home care workers (not randomly) to take part and they were asked to determine their own physical activity program with the assistance of an exercise physiologist and regular motivation from the home care workers. The Stanford Health Assessment Questionnaire Disability Index (HAQ-DI) and the Trans-theoretical Stages of Change Exercise Questionnaire were used to measure outcomes at baseline, three and six months. No statistically significant improvements were found (Cameron et al., 2008). However, there were a number of limitations to the study including small sample size and selection bias in recruiting participants, as they were already interested in being physically active and were therefore more likely to be physically active and progress through (trans-theoretical) stages of change than general HACC clients who may not have been thinking about being more physically active in the future (Cameron et al., 2008). It is not clear what the individualised exercise programs developed included (ie balance, strength, or mobility focused or a combination), as it was not stated in the article.

The fourth study was conducted in France and included a population of older old people (median age 84 years) receiving home help (domestic) assistance for no more than two hours a week (Bonnefoy et al., 2012). Fifty-three people were assigned to the intervention group and 49 to the control group. The intervention included 13 exercises as well as nutritional supplements. The exercises incorporated strength, balance, mobility and endurance and included increasing walking distance and duration (Bonnefoy et al., 2012). Participants were asked to complete the physiotherapist prescribed exercises once a day. They were expected to take around 20 minutes. The study found the intervention group maintained their maximum walking speed over time, whereas speed of the control group decreased by 25%. The control group also showed a significant reduction in IADL performances compared to the intervention group (Bonnefoy et al., 2012). All other outcome measures showed no statistically significant difference between the groups.

2.15 Restorative or Reablement Services

The aim of restorative home care has been defined as to... “create independence, improve self-image and self-esteem, and reduce the level of care required” through the delivery of an individualised program (Atchison, 1992, p. 8). A number of restorative home care services and restorative approaches to home care have been developed around the world and although the service models and origins differ, all share the aim of maximising functioning and reducing the need for services (Ryburn et al., 2009). Restorative services can include multiple components/strategies to promote independence or they can focus on just one type of intervention. This review restricts itself to examining services that include multiple-components which are brought to bear in an individually tailored service. Often the components

include: goal setting; occupational therapy; health education; and management (including medicine, nutrition, skin management); physical activity for improved function and falls prevention; equipment and home modification; and, social rehabilitation (Ryburn et al., 2009).

According to Ryburn et al.'s (2009) review, the body of evidence regarding the effectiveness of restorative home care services is currently small, but growing, and clearly suggests that a restorative approach to home care has significant advantages over the traditional approach. The strongest evidence comes from the four controlled trials that have been conducted and reported on: a large trial ($n = 1382$) by Tinetti et al. (2002) in America; a smaller trial ($n = 200$) in Western Australia with the Home Independence Program (HIP), with a larger randomised controlled trial having just been completed; and an even smaller trial in the United Kingdom ($n = 57$) (J. Kent, Payne, Stewart, & Unell, 2000).

2.15.1 Australia

In Australia, the first restorative home care service developed was Silver Chain's Home Independence Program (HIP), in response to the organisation finding itself unable to meet the demand for services. Other more recent versions of a restorative approach in Australia have been at the state funder level with the Victorian and West Australian HACC programs adopting the active service model and wellness approach respectively, as a new way of encouraging providers to adopt a restorative approach to home care. New South Wales has recently funded four agencies to develop and test reablement home care services (Lewin, 2011; Ryburn et al., 2009). Phase one of their reablement care service research included the development of the reablement

model and phase two, the design of policies and practices to operationalise the model (Cartwright, Cosgrove, Gooden, & Carpenter, 2009; Cartwright, McCrae, & Gooden, 2010). The evaluation of the reablement services was due for completion by May 2011, however the report is currently unavailable.

More recently, an evaluation has been completed by Care Assess in Tasmania of its HACC Home-based Independence Program (HHIP). Two hundred and thirty clients aged over 60 years were included in the evaluation and they found a significant improvement in client independence outcomes (83% improved functional ability and 16% maintained functional outcomes) (Care Assess, 2013). They also found an 11% reduction in service delivery hours for those clients receiving HACC services prior to the HHIP intervention (Care Assess, 2013). HHIP was coordinated by registered nurses and occupational therapists and included an exercise physiologist to assess, plan and consult on the exercise component of each program (Care Assess, 2013). The report did not provide any further information on the exercise programs utilised within the service.

2.15.2 Silver Chain

Silver Chain's HIP program has been evaluated with increasingly rigorous trials. The initial study was a pilot study (Lewin et al., 2008), followed by an operational trial (Lewin, Vandermeulen, & Coster, 2006), a non-randomised controlled trial (Lewin & Vandermeulen, 2010) and most recently a randomised controlled trial (De San Miguel & Lewin, 2008; Lewin, De San Miguel, et al., 2013). Fifty-six older people participated in the pilot study which found that 32% of those who completed the trial did not require ongoing home care services and 39% had a reduction in the

need for services (Lewin et al., 2008). Significant improvements were found in functioning, mobility, confidence and morale (Lewin et al., 2008).

Following the success of the pilot study, the program was implemented as a service from one of Silver Chain's metropolitan services centres and a non-randomised controlled trial was conducted between 2001 and 2003. Two hundred people (100 in each group), aged 60 years and over took part in the study. Clients in the intervention group received the restorative home care service until they reached their goals or for a maximum of 12 weeks (Lewin & Vandermeulen, 2010). Service outcomes were measured at baseline, three months and one year. Significant improvements were shown in all outcome measures compared to the control group, except morale (Lewin & Vandermeulen, 2010). The results suggested "older individuals referred for home care who participated in a programme to promote their independence had better individual and service outcomes than individuals who received usual home care" (Lewin & Vandermeulen, 2010, p. 91).

The aim of the RCT was to test the effectiveness of HIP in reducing the need for ongoing home care services when delivered as the front end of a standard home care service. Participants were recruited between June 2005 and August 2007, with 750 participants included in the intention-to-treat analysis (Lewin, De San Miguel, et al., 2013). Data were collected at referral, 3 months and one year and although no differences were found between the groups over time in their overall ADL scores (both improved), there were statistically significantly lower proportions of the HIP group that required assistance with showering and bathing at 3 and 12 months (Lewin, De San Miguel, et al., 2013). The results supported the earlier research which showed participation in restorative home care services appeared to reduce the

need for on-going services. Further evidence has also shown that clients who received Silver Chain's restorative services were less likely to need personal care over the next five years and any type of home care service over the next three (Lewin, Alfonso, & Allan, 2013).

2.15.3 Rest of the world

The majority of restorative home care services have been developed in the United Kingdom (UK) by local government councils who are responsible for the provision of social care and almost a quarter of UK councils now have a reablement (their term) service. A number of studies of these services have been completed, including a large prospective longitudinal study (Glendinning et al., 2010; J. Kent et al., 2000; Newbronner et al., 2007).

Kent et al. (2000) evaluated three 'Promoting Independence' pilot studies. For the first pilot they found: fewer reablement service users were admitted to hospital, nursing or residential care; home care packages were far more likely to be discontinued by reablement service users; and home care packages were twice as likely to be reduced for reablement users. The results were so positive from the first pilot study that the researchers concluded there was no doubt that the restorative service was extremely successful.

Newbronner et al. (2007) conducted a larger study investigating the long term impact of reablement. They found in three out of the four services examined, that at least a third of those who received reablement had no other service use either before, or up to two years later (Newbronner et al., 2007). The fourth service found 80% of users

had no other home care service use before, or up to two years post reablement (Newbronner et al., 2007).

Glendinning et al. (2010) looked at the longer-term impact for clients from five reablement services in the UK and found little cost difference between reablement and usual care services over a 12 month period. They did discover that older people receiving reablement services had significantly better health related quality of life and to a lesser extent, better social-care related outcomes (Glendinning et al., 2010). In the qualitative interviews participants reported: improved independence; increased motivation to continue to improve self-gains; increased confidence due to improvements in mobility and self-care skills related to personal care and meal preparation (Glendinning et al., 2010). Reablement services in the UK represent the first point of the gateway to using home care services in the UK.

There have been a small number of trials of multi-component restorative services targeted at older people in the United States. The first study was prompted by researchers finding during a trial of home-based rehabilitation that home care workers frequently worked at cross purposes with rehabilitation therapists (Baker, Gottschalk, Eng, Weber, & Tinetti, 2001; Tinetti et al., 2002). Tinetti et al. (2002) in their controlled trial compared the results of a restorative home care service to ‘usual’ home care, for people aged 65 years and over living in the community. Whilst, the restorative home care service included various combinations of exercises they found participants who received the restorative home care service were less likely to be admitted to an emergency department, had a lower number of home care service visits, and had a greater likelihood of remaining at home, than those receiving a traditional home care service (Tinetti et al., 2002).

Baker (2006) in her review of home-based research studies that improve functional outcomes, concluded that restorative or multi-dimensional home care services benefitted older people more than one-dimensional services. She also found that not infrequently health personnel believe bed rest is beneficial despite the fact that, research has shown that immobility increases functional decline for older adults (Baker, 2006). For example, an older person remaining in a hospital bed will decrease their strength by 5% each day, particularly in the lower extremities, which as discussed earlier affects function, the risk of falls, mobility and the ability to live independently (Baker, 2006). Baker (2006) suggested that increasing the amount of physical activity undertaken by an older home care recipient and having all health and home care employees reinforce this increase is crucial to increasing clients' activity levels over the short and longer term.

Tinetti, Charpentier, Gottschalk and Baker (2012) recently reported on the comparison of the restorative home care and usual home care clients' readmissions to hospital during the homecare episode. They found the restorative care clients were 32% less likely to be readmitted than those receiving usual home care (Tinetti et al., 2012).

In New Zealand the development of restorative home support services has been in response to major issues in the home care sector, together with the notion that older people have considerable potential to recover fitness and that disuse plays a major role in poor health and functional loss (Parsons et al., 2007). One of the first trials of this approach involved a restorative service for older people with high and complex needs, a different target group to most other restorative services (Parsons et al.,

2007). Nevertheless the results were positive in that individuals' functional independence improved and the risk of dying or entering residential care were decreased (Parsons et al., 2007).

Another New Zealand study evaluated the impact of restorative home care services for community dwelling older people in a cluster RCT (A. King, Parsons, Robinson, & Jorgensen, 2012). One hundred and eighty-six older people participated in the trial comparing restorative home care to usual home care services. Significant benefits were found for the intervention group in health related quality of life at seven months. No changes in other scale measurements were found in either group over time. A statistically significant reduction in home care hours or discharge (29%) was found for the restorative home care group compared to the usual home care group (0%) (A. King et al., 2012). This study used repetitive activities of daily living exercises for older people which were designed to optimise independence (A. King et al., 2012). These exercises were based on the work by de Vreede et al. (2005) who found functional exercises to be more effective than structured resistance training in improving functional task performance, which is important in maintaining independence in older community dwelling people. The exercises were undertaken in a structured exercise class at the local leisure complex near where participants lived (de Vreede et al., 2005).

A trial of an intervention that operated very similarly to restorative home care services, but was tested with older community dwelling Americans, was conducted by Gitlin and her colleagues (Gitlin et al., 2006). Three hundred and nineteen people, aged 70 years and older who reported having difficulty with one or more

activities of daily living took part. The intervention included: home modifications and training to use them; problem-solving strategies; energy conservation; safe performance and fall recovery techniques; and balance and muscle strength training. Outcome measures included ADLs, mobility/transferring and IADLs, Tinetti et al.'s (1990) Falls Efficacy Scale and Powell et al.'s (1995) Activities-specific Balance Confidence Scale. At six months, intervention participants had less difficulty than controls with daily living activities, particularly bathing and toileting, and these benefits were maintained at 12 months for most outcomes. The study was limited by only using self-reported measures not including performance based measures, for example timed up and go, or the functional reach test. Gitlin et al. (2006) suggested further research was required that included functional performance measures and explored the unique contribution of the different treatment components, such as balance and muscle strength training.

2.16 Conclusion

The ageing population is growing worldwide and the associated increase in demand for home care services could cost governments millions of dollars. Countries such as the UK, New Zealand, Denmark and Australia recognise this and have introduced restorative (reablement) or preventive services to help people regain functional independence and so reduce the demand for home care. Physical activity or exercise, which has been demonstrated to have many benefits for older people, is an important component of these services.

As people age there is a tendency to decrease the amount of activity undertaken which leads to a loss of strength, power, aerobic capacity, balance, flexibility and

function. Insufficient activity is associated with higher prevalence of chronic conditions, risk of falling and a decrease in functional capacity. As a consequence, inactive older individuals are more likely to need assistance to complete activities of daily living. There is however, strong evidence that being physically active should not decrease as we age and older people can start exercising well into retirement, to help them function independently for longer and avoid dependence on others.

It is well understood that prior to identifying and testing an exercise intervention, it is important to understand the population group involved and the type of exercise or activity they like to participate in. It is also imperative to understand the reasons why a group are motivated to exercise and why they are not, or do not want to be active. The current literature on what motivates older community dwelling people to be active is replete, as is the vast body of knowledge on the barriers to older people being active. However, there is little that has explored what factors motivate or prevent older home care recipients from being active and what type of activity they prefer to undertake.

Similarly, although many physical activity or exercise interventions for older community dwelling people have been trialled few have included older people receiving home care services. As Australia's ageing population increases, the need for home care services is expected to rise, suggesting restorative home care services with their limited time period, cost effectiveness and ability to reduce service demand will become a greater focus. Understanding the effectiveness of individual components (i.e. exercise) within a restorative home care service is an important requirement for their continued improvement.

CHAPTER 3

Methodology

3.1 Introduction

This research project incorporated three study stages:

- Stage 1: Identify physical activity levels, barriers and motivators for being physically active and physical activity preferences of older people receiving a home care service
- Stage 2: Determine whether a lifestyle activity program is appropriate and can be delivered within a restorative home care service
- Stage 3: Randomised controlled trial to determine the effectiveness of a lifestyle activity program compared to the current structured exercise program used within a restorative home care service.

This methodology chapter provides details of each stage that were not included in the accepted publications, due to publication word limits.

3.2 Stage 1: Physical Activity Levels; Barriers and Motivators to Being Physically Active; and, Type of Physical Activity Preferred by Older Home Care Clients (Restorative Home Care and Usual Home Care Clients)

Objectives:

- To compare the physical activity levels of older people (70 years and over) who had received a restorative home care service (HIP) with those of older adults who had received usual home care services (HACC)
- To explore factors that predict being physically active among older home care clients

- To determine whether either home care service group (HIP or HACC) met the minimum recommended levels of activity promoted by the Australian government
- To identify the motivators and barriers to physical activity for older people receiving a ‘usual’ (HACC) home care service compared to those receiving HIP, a restorative home care service.

3.2.1 Study design

The study design was cross-sectional and descriptive using mixed methods: questionnaires and interviews. The study inclusion criteria were: aged 70 years and over; received a minimum of four weeks or four visits of HIP or HACC between 2006 and 2009; and, living in the community. Exclusion criteria included: not being able to communicate in English or having been diagnosed with dementia. These criteria were given to the Silver Chain Reporting Officer who extracted the data from the client information system and created databases for the HIP and HACC client populations meeting the inclusion criteria. The questionnaires were mailed to a random selection of HIP and HACC clients in March 2010 and interviews were conducted in August-September 2010, with 20 respondents.

For the interviews, five participants from each of the four groups: HIP active; HIP not-active; HACC active; and HACC not-active were interviewed. The types of physical activity they had undertaken throughout their lives, the barriers and motivators to being physically active and their experiences and opinions on being physically active were explored.

3.2.2 Study setting

Silver Chain is a large Australian health and community care organisation, predominantly based in Western Australia but having recently established a service presence in three other Australian states. They deliver a myriad of services to the community, including HACC funded home care services, which include ‘traditional’ services such as: personal care (bathing, dressing), domestic assistance, nursing, allied health, social support, home maintenance, transport and the delivery of meals (Australian Government Department of Health and Ageing, 2012a).

Silver Chain also delivers short term restorative home care services, namely the Home Independence Program (HIP) and the Personal Enablement Program (PEP). The restorative home care services comprise a number of components including: the promotion of active engagement in daily living activities; an exercise program; chronic disease self-management, falls prevention strategies; improvement and maintenance of skin integrity; and medication, continence and nutrition management (Silver Chain Nursing Association, 2007). Registered nurses, physiotherapists and occupational therapists are care managers who deliver the restorative services for Silver Chain.

HIP is delivered to older people living in the community who require short term assistance in order to regain their independence and their service generally runs for 12 weeks. Whereas, PEP is delivered to older people who have been discharged from hospital and need short term assistance to help them return to living independently. PEP is usually delivered for a maximum of eight weeks. Where HIP

is stated throughout the thesis it encompasses both restorative home care services delivered by Silver Chain - HIP and PEP.

3.2.3 Study population and sample

The population of interest was individuals who had been referred to Silver Chain for home care services between 2006 and 2009, both those who participated in a restorative program (HIP) and others who received ‘usual’ home care (HACC). Seven hundred and forty-five HIP and 745 HACC clients randomly selected from the 9,199 (4844 HIP and 4355 HACC) clients who met the inclusion criteria were surveyed by mail. Semi-structured interviews were then undertaken with 20 of the survey respondents who had agreed to be considered for an interview. Sample size and power calculations were included in Chapter four.

3.2.4 Data collection

Questionnaires and reply paid return envelopes were mailed, together with an invitation to participate from Silver Chain’s Director of Research, to the selected clients. The researcher was not involved in this process to ensure anonymity of the clients sampled. Consent was assumed on completion and return of the questionnaire.

Of the 506 people who completed the postal questionnaire, 190 expressed an interest in being interviewed (38%). Names of willing participants were entered into a database together with their status in terms of the following variables: home care service (HIP or HACC); age cohort; and, physical activity status (active, not active). Active or not active status was determined by the Physical Activity Scale for the

Elderly (PASE) score; zero being not active and above zero being active. A sample of 20 was anticipated to provide sufficient information to reach data saturation related to the research objectives (Guest, Bunce, & Johnson, 2006). Purposive sampling, aimed at ‘range’ and ‘variety’ in relation to the descriptor variables in the database, was used to select the interviewees.

In the initial sample of 20, four replacements were necessary. The reasons for this were: not interested anymore (2); did not speak or understand English well (1); and had died (1). Prospective interviewees were sent a letter reiterating their initial intent to participate, with a consent form and information sheet. The letter explained that they would be contacted by phone in the coming days to confirm their interest and to set a time, date and place for the interview.

With one exception, all interviews were conducted in people’s homes (the other was by phone). In two cases, the spouse of the interviewee also participated in the interview. Prior to commencing the interviews, the interviewer obtained written consent from the informant and confirmed permission to tape record the interview. Interview times ranged from 20 minutes to just under one and a half hours. The researcher conducted all of the interviews.

The semi-structured interviews were based on an interview guide that was designed to explore in more depth the respondents’ survey answers around physical activity throughout their life, why they chose the barriers and motivators to being physically active and their opinions on the importance of being physically active throughout one’s life. A copy of the interview guide is contained in Appendix B.

3.2.5 Data collection tools

The questionnaire was developed utilising a number of previously validated tools that were specifically for older people (65 years and over). These tools covered physical activity levels, health, and depression in older people. Questions to identify individuals' motivators and barriers to physical activity were included as were a number of basic demographics, including education levels, housing status, body mass index, chronic illness and mobility. An optional section was included at the end, whereby respondents could indicate if they were interested in participating in an interview and record relevant contact details. The final version of the questionnaire is in Appendix C.

The questionnaire was pilot tested using 10 older people living in the community; however they were not receiving home care services at the time. Suggestions of change in language were responded to in relation to questions formulated by the researcher by making changes where there was group consensus, but no language changes were made to the included validated tools.

Details of each of the tools included in the questionnaire are provided below.

3.2.6 Physical Activity Scale for the Elderly (PASE)

Physical activity levels were measured using the Physical Activity Scale for the Elderly, commonly known as PASE. PASE, is a 12-item instrument specifically designed to assess physical activity levels in large samples of older people over a one week period (Washburn, McAuley, Katula, Mihalko, & Boileau, 1999). The PASE instrument combines physical activity information from several areas including

leisure, household and occupational activity (McAuley, Jerome, Elavsky, Marquez, & Ramsey, 2003). The higher the PASE score, the more physically active the person is and PASE scores range from 0 through to 400.

PASE has been demonstrated to be a valid and reliable measure of physical activity for older people in epidemiological studies (Hagiwara, Ito, Sawai, & Kazuma, 2008; Schuit, Schouten, Westerterp, & Saris, 1997; Washburn et al., 1999; Washburn, Smith, Jette, & Janney, 1993). Two hundred and twenty-two subjects aged between 65 and 100 years were involved in research to determine the initial validity of PASE in comparison with physiological and health status data collected in the home (Washburn et al., 1993). PASE scores were found to be significantly correlated with balance, grip strength, leg strength, self-assessed health status and Sickness Impact Profile scores (Washburn et al., 1993). In general, these correlations were consistent by age group, gender and mode of administration (Washburn et al., 1993). In a later study of validity, PASE was also found to be significantly correlated with peak oxygen uptake, systolic blood pressure and balance (Washburn et al., 1999). It was therefore determined that there was strong evidence for convergent validity of the PASE scoring algorithm due to the pattern of significant correlations across a number of health and physiological measures for older people (Washburn et al., 1993).

Hagiwara, Ito, Sawai and Kazuma (2008) also assessed the validity and reliability of PASE for older people living in Japan ($n=325$). They found PASE to be significantly correlated with walking steps, energy expenditure, mid-thigh muscle area per

bodyweight and static balance (Hagiwara et al., 2008). The intra-class correlation coefficient for PASE for this group was 0.65 (Hagiwara et al., 2008).

Martin et al., (1999) also examined the validity of PASE among older people with a disability. PASE scores for the sample of 471 participants were significantly correlated with the 6-minute walk, knee strength, frequency of knee pain during transfer and perceived difficulty with functioning (K. Martin et al., 1999).

Test-retest reliability testing of the PASE involved 254 participants over a three to seven week period and was found to be 0.75 (95% CI = 0.69-0.80) (Washburn et al., 1993). Administration of the PASE by mail displayed higher reliability ($r = 0.84$) than for telephone administration ($r = 0.68$) (Washburn et al., 1993).

A number of other physical activity questionnaires were considered but found not to be suitable for the population included in the research. For example, the Active Australia Survey is appropriate for people aged 18-75 years; however, many home care clients are older than this making it inappropriate for this study population. Therefore, given the amount of research illustrating the validity and reliability of PASE for older people, including those with a disability, and the higher reliability found when distributing the survey by mail, it was determined that PASE would be a satisfactory tool to use for this population and appropriate for exploring the research questions. The PASE was purchased from the New England Research Institutes, Inc © 1991. A copy of the contract is found in Appendix D.

3.2.7 SF-12 version 2® Health Survey

The SF-12v2® is a commonly used tool that measures general health functioning and wellbeing (Ware, Kosinski, Turner-Bowker, & Gandek, 2002). The 12 items reflect eight sub-domains: self-perceived general health; bodily pain; physical functioning; physical role; vitality; social functioning; mental health and emotional role (McBride, Adamson, Bunting, & McCann, 2009). It can compare and analyse the population burden of disease and monitor population health and is a valid and reliable tool (QualityMetric, 2011).

Cheak-Zamora, Wyrwich, & McBride (2009) demonstrated reliability of the SF12-v2® Health Survey in the 2003-2004 Medical Expenditure Panel Survey, finding high internal consistency for both the mental- and physical-component summary scores ($\alpha > .80$). The physical-component summary score (PCS) had high test-retest reliability (ICC = .78) while the mental-component summary score (MCS) showed moderate reliability (ICC = .60) (Cheak-Zamora et al., 2009). The PCS had high convergent validity for the EuroQol-5 dimension items ($r > .56$) except for self-care and physical health status (Cheak-Zamora et al., 2009). Moderate convergent validity was shown for MCS on EuroQol-5 dimension and mental health items ($r > .38$) (Cheak-Zamora et al., 2009).

It was necessary to have a standard instrument that measured the health status of the population involved. The SF-12v2® was identified as a validated tool that had been frequently used with older people as it was short (only five questions) and easy to understand. The SF12-v2® Health Survey was purchased in accordance with Quality Metric Inc license agreement which is found in Appendix E.

3.2.8 Geriatric Depression Scale – 5

The Geriatric Depression Scale (5-Item) is a screening tool specifically designed for older people aged 60 years and over. Reliability and validity for a number of older populations has been established (Hoyle et al., 1999; Rinaldi et al., 2003; Weeks, McGann, Michaels, & Penninx, 2003) including those involved in an exercise program (Marquez et al., 2006). Sensitivity (88%) and specificity (86%) have been deemed adequate, with an overall accuracy cut off point of 87% also deemed adequate (Marquez et al., 2006). A substantial proportion of older people report feeling depressed or low (Marquez et al., 2006) it was therefore considered important to include a depression screening tool. The five-item GDS was selected because it: has been validated with an older home care population (Hoyle et al., 1999; Rinaldi et al., 2003; Weeks et al., 2003); includes five very short and easy to understand questions; and, has been shown to be a useful tool for epidemiological studies (Rinaldi et al., 2003).

3.2.9 Questions about motivators and barriers to physical activity

The questions about barriers and motivators to physical activity asked respondents to identify which options on a list applied to them. The lists for each were compiled from the results of previous studies investigating barriers and motivators for older people being physically active (Australian Bureau of Statistics, 2007b; Booth et al., 2002; W. J. Brown, Fuller, Lee, Cockburn, & Adamson, 1999; Kolt, Driver, & Giles, 2004). A space for any additional motivators or barriers that participants wished to add was also provided.

3.2.10 Data analysis

Data analysis for Stage 1 is described in the first two published papers found in Chapters 4 and 5. The calculation which used the PASE to determine whether home care clients were meeting the Australian physical activity guidelines of 30 minutes of exercise on most days was based on PASE questions 2-6 (see Appendix C), which cover types and amounts of physical activity, from walking through to high intensity and muscle strength training. A score to reflect individuals' answers to questions 2-6 was calculated to provide a comparison with the guidelines. For example, walking 3-4 days a week, for one but less than two hours, was considered the minimum amount of activity to reach the recommended government levels. Any scores of less than one hour regardless of intensity or type of exercise, even if completed every day, were excluded. Participants were judged as meeting, or not meeting, the guidelines based on these scores.

3.3 Stage 2: Pilot Study to Determine Whether a Lifestyle Activity Program Could be Delivered in a Restorative Home Care Service

Objectives:

- Determine the recruitment rate and identify any potential recruitment issues for a RCT study
- Determine what the expected dropout rate might be in a RCT study
- Determine whether LiFE, and its associated documentation, was suitable to be delivered as part of a restorative home care service, as perceived by both care managers and clients

- Determine which data collection tools are appropriate for a RCT study within the context of the restorative home care services.

3.3.1 Study design

Stage 2 consisted of a pilot study to determine the feasibility of delivering a lifestyle activity program (LiFE) as part of a restorative home care service.

3.3.2 Study setting

This study was set in Silver Chain which has already been described as an Australian health and community care organisation which delivers a large range of services throughout Western Australia, Adelaide, Sydney and Brisbane. Silver Chain was the first organisation in Australia to develop and deliver short term restorative home care services. Both Silver Chain's restorative home care services, HIP and PEP, employ the same model of care and at the time of this study were delivered by an interdisciplinary health professional team of care managers (physiotherapists, occupational therapists and registered nurses).

Both HIP and PEP are designed to assist older people to maximise their health and function in order to get back to living independently. A Silver Chain care manager visits the client at home to complete an assessment, set goals and agree on the strategies in the support plan. Over the coming weeks these strategies are implemented (for example: task analysis and redesign plus gradually reducing personal assistance and rails in the bathroom to help client return to independence in showering/bathing) and, usually during the second or third client visit the care manager will, if he/she has determined it is appropriate, suggest that a physical activity (exercise) program be added to the support plan. While the service model

promotes physical activity for the majority of clients, in day to day implementation of the model the care managers choose to use their “clinical judgement” as to whether an activity program is appropriate for each client.

3.3.3 Study population and sample

The population of interest was individuals who have been referred to Silver Chain for a restorative home care service and were deemed by their care manager as potentially benefitting from an exercise program to assist in their recovery to maximise their independence. The sample was receiving Silver Chain services between February and May 2011.

3.3.4 LiFE exercise program

The LiFE program was developed by a collaborative group whose backgrounds included occupational therapy, physiotherapy and gerontology (Clemson et al., 2012; Clemson et al., 2010; Clemson, Singh, Cumming, Weissel, & Manollaras, 2007). LiFE was originally designed to prevent falls in older community dwelling people, however after the initial research it was also found to improve function in older people (Clemson et al., 2010).

The principles of LiFE are to teach balance and strength strategies and then to apply them to everyday activities. The four balance strategies are: *reduce base of support; move to the limits of sway; shift weight from foot to foot; and step over objects* (Clemson et al., 2010). The strategies for strength training are: *bend your knees; on your toes; on your heels; up the stairs; sit to stand; move sideways; and tighten muscles*, with the main aim being to load the muscles through repetition, slow

movements and gradually increasing the amount of weight lifted (Clemson et al., 2010).

When LiFE was introduced as a stand-alone exercise program the participants were evaluated using the LiFE Assessment of Functional Balance and Strength. They completed a plan of their daily activities and developed a profile of: the outings they engaged in; the transport they used; and what physical activity they were undertaking at the time (Clemson et al., 2010). The person delivering LiFE would then teach the philosophies and principles using the LiFE manual for reference; together they would plan activities and create prompts as a reminder of specific exercises to be completed during the day (Clemson et al., 2010). Issues of safety were discussed throughout the delivery of the exercise program and as the participants improved, the number and intensity of activities progressed (Clemson et al., 2010). In the study described here, LiFE was delivered as part of Silver Chain's restorative home care services and not as a stand-alone program.

3.3.5 Training the care managers

Prior to training care managers to deliver the LiFE exercise program Silver Chain management asked all twenty care managers if they would like to be involved. One care manager from each of the four metropolitan bases was interested and therefore four care managers were trained to deliver LiFE and be involved in the pilot.

One of the developers of the LiFE program travelled from Sydney to Perth for a day to present to four care managers. The day included the following: an outline of the research that had been conducted up to that point on the effectiveness of LiFE; a

description of the principles of LiFE; and instruction in how to complete the LiFE Intervention Assessment Tool, deliver the LiFE activities; use the counter clickers; and progress clients through manuals one and two. The process by which clients would be recruited was also described by the researcher and discussed by all involved.

3.3.6 Recruitment procedures for data collection

If a client met the study inclusion criteria the care manager would outline the research project and leave a letter of invitation, information sheet and consent form and ask if a researcher could contact the client regarding their involvement in the research project. On verbal consent, the care manager would email the researcher who would then contact the client and organise a date to go to their home. At this visit she would answer any questions the client had about the research project and their involvement and obtained their written consent to participate.

3.3.7 Data collection procedures

After signing the consent form clients were given the option of completing the baseline testing that day or have the researcher return another day. Data collected included demographic (age, living status, carer or no carer etc.) and background information (home care and health care service information, organised activities, falls history over previous 6 months and height and weight), physical and psychometric test data, of which the tools/instruments included, are described below. Participants were given a demonstration and instruction of how to wear the accelerometer for the following seven days also.

The data collection process took approximately one to one and a half hours to complete. The researcher returned a week later to collect the accelerometer (see data collection tools section for more information). Post-intervention data were collected at 8-weeks and included a series of questions about the LiFE exercise program (see Appendix F). A week later the accelerometer was collected.

Data collected by the researcher was different to that accrued by the care managers. All data collected by the researcher is described in this section, whereas the care managers collect their own client information which was not used in this study. Care managers were however, asked to collect and provide the results of the LiFE Assessment Tool (which is described below), to the researcher.

3.3.8 Data collection instruments/tools

3.3.8.1 Functional reach

The Functional Reach (FR) test was developed to measure balance and is determined by measuring the distance between arm's length and maximal forward reach using a fixed base of support (Duncan, Weiner, Chandler, & Studenski, 1990). The test may also be used to identify balance impairment and to detect a change in balance over time (Duncan et al., 1990).

To perform the test a measuring device was placed on a wall at the participant's right acromion height (Duncan et al., 1990). Participants extended their arm to horizontal and a measurement was taken at the most distal point, they were then asked to extend their arm forward as far as possible without losing their balance (or taking a step) and a second measurement was taken (Duncan et al., 1990). No communication was

given as to the method of reaching forwards. Three separate measurements were taken with the difference between position one and two calculated for each. The mean FR was the average of these three measures.

The test-retest reliability of the FR test is high, with an intra-class coefficient of 0.92 and the coefficient of variation at 2.5% (Duncan et al., 1990). The intra-class coefficient for inter-observer measurements was 0.98, both measurements relating to a group of 128 healthy participants (Duncan et al., 1990).

The age related norms for the FR were provided in inches and when adjusting to centre metres (cms) the following apply: Men aged 41-69 years 37.85 cms \pm 5.59 and 70-87 years 33.53 cms \pm 4.06; Women aged 41-69 years 35.05 cms \pm 5.59 and 70-87 years 26.67 cms \pm 8.89. Using the FR as a falls risk interpretation tool, a score of 15.24 cms or less indicates a significant increased risk for falls and a score between 15.24-25.4 cms indicates a moderate risk of falling (Duncan, Studenski, Chandler, & Prescott, 1992; Duncan et al., 1990).

3.3.8.2 Falls Efficacy Scale

The Falls Efficacy Scale (FES) was developed by Tinetti, Richman and Powell (1990) as an instrument to measure fear of falling. The FES uses a 10-item rating scale (1= very confident, 10 = not confident at all) to assess an older person's confidence in completing daily tasks without falling. For this study, participants were given an illustrated scale enlarged on an A4 laminated sheet and asked each question individually.

Validity and reliability of the FES has been tested in at least two samples, (sample 1: n = 18, sample 2: n = 75) of older community dwelling people (Tinetti et al., 1990). Test-retest reliability using Pearson's correlation was $r = 0.71$ over four to seven days (Tinetti et al., 1990). The FES was significantly associated with having difficulty getting up from the ground after a fall, anxiety trait, general fear score, and a number of balance and gait measures (Tinetti et al., 1990). Usual walking pace ($p < .0001$), anxiety trait ($p < .001$) and depression ($p < .001$) were all associated independently with the FES scores (multiple $R^2 = 0.487$) (Tinetti et al., 1990). A score of greater than 70 indicates a fear of falling and a score greater than 80 increases the older person's risk of falling (Tinetti et al., 1990).

3.3.8.3 Chair sit-to-stand

The chair sit-to-stand tests (one time and five times) are measures of lower body strength and balance. For the chair sit-to-stand test one time, participants were instructed to sit in a shower chair, set at a height of 45 cms and asked to stand and sit once on the word "Go", preferably without using their hands for assistance to stand. Participants were timed using a stopwatch and it was noted whether hands or an aid were used for assistance. Participants were then asked to complete sit-to-stand one time again, with a rest in between each trial. Both times were recorded however the fastest time was used in the analysis. If hands or aids were used to assist this was also recorded.

After another rest period, participants were then asked to complete the sit-to-stand five times test, which involved standing from the chair five times without stopping. Participants were advised to complete this as fast and as safely as possible under the

same conditions as the sit-to-stand one time test. The researcher also counted out loud as each stance was completed so the participants knew what number they were up to. The timer was stopped when the participant had fully stood up on the fifth stand. If the participant was able to complete two trials with a rest period in between, then both trials were recorded, if they were unable to complete a second trial it was noted. The best time was also recorded as was the use of hands or aids to assist.

Binder, Miller and Ball (2001) tested the one time sit-to-stand and found it to be a valid and reliable (ICC above 0.83) test for older nursing home residents. Validity of the chair sit-to-stand five times has been shown by a number of studies (Schaubert & Bohannon, 2005; Whitney et al., 2005). For example, Schaubert and Bohannon (2005) found the sit-to-stand five times test was highly correlated with the Timed Up and Go (0.73-0.92) in their study of older community dwelling people. Reliability has also been demonstrated for the chair sit-to-stand five times with intra-class correlation coefficients ranging between 0.73 (Seeman et al., 1994) and 0.81 (Schaubert & Bohannon, 2005) for older people living in the community. When predicting falls in older people, Tiedemann, Shimada, Sherrington, Murray & Lord (2008) found excellent reliability (0.89, 95% CI = 0.79, 0.95) for the chair sit-to-stand five times. Optimal sensitivity (61%) and specificity (59%) were achieved at 14.2 seconds for people over 60 years of age (Whitney et al., 2005) which compares with Buatois, Gueguen, Gauchard, Benetos, and Perrin (2006) whose times ranged between 14.6-15.2 seconds for their intervention groups of fallers and non-fallers.

Normative standards for the five time chair sit-to-stand are: 60-69 year olds 11.4 seconds; 70-79 year olds 12.6 seconds; and 80-89 year olds 14.8 seconds (Whitney et al., 2005).

3.3.8.4 Activities-specific Balance Scale

The Activities-specific Balance Confidence (ABC) scale is a 16-item questionnaire used to measure the psychological impact of balance impairment and/or falls in daily situations that become progressively more challenging (Myers, Fletcher, Myers, & Sherk, 1998). Participants were asked to rate their confidence in performing the activities on a scale of 0 (no confidence) to 100% (complete confidence) and an average was then calculated from the 16-items. Myers et al., (1998) suggest that a score of 90-100% is expected for a well older person, 50-80% shows a moderate level of physical functioning and under 50% suggests a low level of physical functioning. LaJoie and Gallagher (2004) also advise a score of under 67% may show the older person at risk of falling or is predictive of a fall in the future.

The ABC scale has been shown to be valid across a number of older populations including lower ABC scores being associated with falls (Lajoie & Gallagher, 2004) and lower levels of mobility (Powell & Myers, 1995). Significant correlations were also found between the ABC scale and balance and mobility scores for older people with mild balance impairments (Cho, Scarpace, & Alexander, 2004). Validity has also been illustrated for the ABC scale in a group of older people who avoided being active due to a fear of falling (Myers et al., 1996). Powell and Myers (1995) explored the reliability of the ABC scale and found high test-retest reliability for the

overall scale and for many of the individual items in older community dwelling samples ($r = 0.92$).

3.3.8.5 Timed Up and Go

The Timed Up and Go (TUG) measures the basic functional mobility of an older person (Podsiadlo & Richardson, 1991). Participants were asked to sit in a shower chair (height 45cms), on the word “Go” the participant stood up, if possible without lifting themselves using the chair arms, they were then instructed to walk three metres, turn around safely, walk back to the chair and sit down. The clock stopped once the participant was seated. The time taken, needing assistance to get out of the chair, aids used (i.e. walker or stick), floor surface and type of shoe worn during the test, were all recorded.

The TUG was validated with a group of 60 older clients from a geriatric day hospital and significant correlations were found with the Berg Balance Scale ($r = -0.81$), gait speed ($r = -0.61$) and Barthel Index ($r = -0.78$) (Podsiadlo & Richardson, 1991). The TUG has also been shown to have both high sensitivity (87%) and specificity (87%) as a measure for identifying older adults who are prone to falls (Shumway-Cook, Brauer, & Woollacott, 2000).

The normative values of TUG for the following age groups are: 60-69 years 8.1 seconds (95% CI: 7.1-9.0); 70-79 years 9.2 seconds (95% Confidence Interval: 8.2-10.2); and 80-99 years 11.3 seconds (95% Confidence Interval: 10.0-12.7) (Bohannon, 2006). TUG is also used to predict falls in older people: for community dwelling frail older adults a score of >14 is associated with a high fall risk

(Shumway-Cook et al., 2000); at the time of discharge post-operative, hip fracture patients who present with a score >24 are predicted to have a fall within 6 months after the hip fracture (Kristensen, Foss, & Kehlet, 2007); and frail older adults with a score ≥ 30 are predicted to require an assistive device for ambulation and being dependent in ADLs (Podsiadlo & Richardson, 1991).

3.3.8.6 10-Item Vitality Plus Scale

The Vitality Plus Scale (VPS) was developed to measure potential health-related benefits of exercising for older people, such as improved sleep, energy levels, aches and pains and feeling ‘good’, that are often missing from other measures (Myers et al., 1999). A copy of the survey was placed in front of the participant and they were asked to score each question on a scale of one through five. The researcher went through each question verbally and visually with the participant to ensure understanding. The scores can range from 10 to 50, the higher the score the more positive the results.

The 10-item VPS has illustrated good internal consistency (initially ICC = 0.83 and revised version ICC = 0.81) and test-retest reliability (0.87; 95% CI = 0.76-0.93) over a one-week period with 38 participants (Myers et al., 1999). For construct validity, scores of the VPS were negatively correlated with the total number of self-reported health problems ($r = 0.45$), as well as with using medications, being overweight, and being limited in the type or amount of physical activity due to injury, illness, and/or disability. VPS scores placed a high importance on being physically active on a regular basis and were positively correlated with current levels of physical activity (Myers et al., 1999).

3.3.8.7 Timed tandem walk

The timed tandem walk is used as a measure of dynamic balance. Participants were asked to place both feet behind a line then walk heel-to-toe for three metres in a straight line. A stop watch was used to time the participant starting on ‘Go’ and finishing when both feet passed the three metre line. The time taken to complete the test and the number of errors were recorded. Errors included hanging onto something, feet not moving in a heel-to-toe motion and using a walking aid. Participants were asked to complete the test twice and the fastest score was used for analysis.

According to MacKnight and Rockwood (1995) tandem walking consistently correlates with or predicts the ability or impairment of the participant. Test-retest reliability was high (mean ICC = 0.91), the inter-rater ICC was good (0.88) and the 95% limits of agreement indicated good reproducibility between the tests (Rinne, Pasanen, Miilunpalo, & Oja, 2001).

3.3.8.8 Late Life Function and Disability Instrument

The Late Life Function and Disability instruments (LLFD) were developed to assess disability and lower and upper body function for older people (Haley et al., 2002; Jette et al., 2002). Participants were provided with an enlarged copy of each scale and each of the scale points was explained. For example, as regards the function questions, participants were asked to describe their ability to complete the tasks on a typical day. Clients were asked the question “how much difficulty do you have”, choices included none, a little, some, quite a lot and cannot do. Initial questions required participants to describe their levels of difficulty without the use of

a walking aid and if they normally used an aid additional questions were asked at the end.

The raw scores for both the disability and functional instruments were transformed into scaled (summary) scores in order to have all of the dimension and domain scores on a similar metric (0-100) and to allow for easier interpretation (Haley et al., 2002; Jette et al., 2002). Low scores approaching zero indicate poor capability and scores nearing 100 illustrate good capability and frequent performance (Haley et al., 2002; Jette et al., 2002). Validity has been illustrated for both the disability (Jette et al., 2002) and function (Haley et al., 2002) instruments. Test-retest reliability for the disability instrument was moderate to high (ICC 0.68-0.82) and for the function instrument it was high (ICC 0.91-0.98) (Haley et al., 2002; Jette et al., 2002).

3.3.8.9 Actical accelerometer

The Actical accelerometers were used to determine energy expenditure for each participant over a seven day period, to allow for comparison with the PASE. The accelerometers weigh approximately 17 grams and are a small square shaped device that attaches onto a rubber waist band. The accelerometer measures movements through all planes, but is most sensitive in the plane that the blue arrow is pointing in (Crouter, Churilla, & Bassett, 2006). The accelerometer is sensitive to movements in the range of 0.5-3Hz, is calibrated at the factory and Crouter et al., (2006) found it to be within 1% of the initial calibration when testing in their study. The accelerometer is a valid measure of activity energy expenditure (Heil, 2006).

Each participant was given an accelerometer, shown how to fit it around the waist and onto the right hip and the waist band was adjusted as necessary to fit the client. A photo and instructions on how to wear the accelerometer were also provided because it was important that the direction of the accelerometer was correct (i.e. arrow facing up). Participants were asked to wear the accelerometers all of the time except when in the shower (or swimming). They were also advised if they were in any pain due to wearing the accelerometer, they were to cease wearing it immediately.

3.3.8.10 *Physical Activity Scale for the Elderly (PASE)*

The PASE was used to compare physical activity of the participants over the seven day period in comparison to the accelerometer reading. Information about the PASE, including validity and reliability has been outlined in the stage 1 data collection tools section. The PASE was administered verbally at the conclusion of the seven day period when the accelerometer was picked up from the participant.

3.3.8.11 *LiFE Assessment Tool*

The LiFE Assessment Tool was created by Clemson et al., (2007) to assist the therapist, or in the case of this research - the care manager, to obtain a history of the client and also complete a functional assessment using the tool. The tool consists of 14 questions on musculoskeletal and functional balance history and 19 balance and strength activities to determine the ‘level’ the participant was at. A copy of the LiFE Assessment Tool is in Appendix G.

The care managers completed the LiFE Assessment Tool as part of the Silver Chain restorative care service initial assessment.

3.3.8.12 *Counter Clickers*

Participants were given a counter clicker and asked to use it on two days per week to count each time they completed an assigned activity. For example, a care manager may have assigned the chair stand as the activity for the week and on Tuesday and Thursday the participant was asked to count (using the counter clicker) how many times they completed the activity and then record the number of times on their activity sheets. Participants were shown how to use the counter clicker, record the data (on the LiFE Activity Record sheet) and how to roll the counts back to zero. They were also given instructions for completing the exercise recording sheets.

3.4 Stage 3: Randomised Controlled Trial Testing the Effectiveness, in the Short and Longer Term, of LiFE Compared to the Current ‘Structured’ Exercise Program Being Used as Part of a Restorative Home Care Service

The methodology (study protocol) for stage 3 of the study is detailed in (Burton, Lewin, Clemson, & Boldy, 2013c) and can be found in Chapter 7. Assessment data, including demographics and dependency were collected by the care managers, using a Department of Health (Western Australia) mandated assessment instrument as a routine aspect of care provision in addition to the research data. Clients were classified as having low, medium or high dependency. Low dependency was defined as only needing assistance with IADLs; medium as needing assistance with at least one ADL, some of the time; and, high as always needing assistance with at least one

ADL. Chapters 8 and 9 include discussions on recruitment issues, a reduction in sample size and the prospect of the study being underpowered, as well as the impact it had on the findings.

3.4.1 Ethics

Informed written consent was obtained from all participants during each stage of the study (Appendix H). Participants received a cover letter (Appendix I) with the information sheet and consent. The information sheet about the study included: the purpose of the study; who the researchers were; that withdrawal could occur at any time with no effect on their Silver Chain services; what their participation included; and, that confidentiality would be maintained throughout (Appendix J). Each stage of the study received ethics approval from both the Curtin University and Silver Chain Human Research Ethics Committees (see Appendix K for approval letters).

3.4.2 Confidentiality and data storage

All data were entered into electronic files with each participants' data identified by study IDs, all of which were stored in a password protected folder, accessible only to the researcher. Consent forms were kept in a locked filing cabinet, separate from other stored data. Interview data (interview summary, notes and recordings were identified by study ID number only (i.e. no names)) were stored in a locked filing cabinet and password protected file for the duration of the study. No names or other personally identifying information are contained in this thesis or any publications.

All project data were kept in a secure location, either on password protected computers or in locked cabinets at Silver Chain or Curtin University. Data will be

kept for a minimum of five years. When the required time frame has passed and/or there is no further interest in the study results, all data will be destroyed in accordance with Curtin's University's disposal policy.

CHAPTER 4

Physical Activity Levels of Older Adults Receiving a Home Care Service

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Physical Activity Levels of Older Adults Receiving a Home Care Service

Elissa Burton, Gill Lewin, and Duncan Boldy

The 3 study objectives were to compare the activity levels of older people who had received a restorative home care service with those of people who had received "usual" home care, explore the predictors of physical activity in these 2 groups, and determine whether either group met the minimum recommended activity levels for their age group. A questionnaire was posted to 1,490 clients who had been referred for a home care service between 2006 and 2009. Older people who had received a restorative care service were more active than those who had received usual care ($p = .049$), but service group did not predict activity levels when other variables were adjusted for in a multiple regression. Younger individuals who were in better physical condition, with good mobility and no diagnosis of depression, were more likely to be active. Investigation of alternatives to the current exercise component of the restorative program is needed.

Keywords: restorative home care services, aging, exercise

It is well accepted that being physically active at any age is good for a person's health and well-being, and many Western countries and health-related organizations such as the World Health Organization (WHO) have recommended levels of physical activity for all age groups to encourage people to exercise sufficiently (WHO, 2010). The Australian government recommends that older people accumulate a minimum of 30 min of moderate-intensity physical activity every day and choose a range of activities including strength, fitness, balance, and flexibility to achieve this (Australian Government Department of Health and Ageing, 2009a; Sims, Hill, Hunt, & Haralambous, 2010). Older Americans are encouraged to complete a minimum of 150 min of moderate-intensity aerobic exercise each week plus two sessions of strength and balance exercises (U.S. Department of Health and Human Services, 2008). The WHO has a number of recommendations for people age 65 years and above, providing options for those who choose moderate-intensity exercise (150 min/week) and those preferring vigorous-intensity exercise (75 min/week; WHO, 2011).

Being physically active increases strength, balance, and stamina and decreases the risk of, or helps control, many chronic diseases (Cress et al., 2006; Taylor et al., 2004). As people age there is a tendency to be less physically active, and this

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decrease in activity has been shown to have a negative effect on a person's strength, balance, and stamina (Pope, Lane, Tolma, & Cornman, 2008; Warburton, Nicol, & Bredin, 2006). The loss of strength and balance can lead to an increase in falls for older people, which often results in injury or, at the least, a loss of confidence (Campbell, Robertson, Gardner, Norton, & Buchner, 1999; Warburton et al., 2006). To reduce the likelihood of falling and to maintain functional independence for older people, the WHO and a number of countries recommend strength training at least 2 days/week, in conjunction with other activities such as walking (WHO, 2010).

Given the health benefits of being physically active, it is important to understand the variables influencing activity. A number of factors have been identified as influencing activity participation among older people, including age and demographic factors (e.g., level of education, ethnicity, living status), history of exercise activity, attitude toward being active, health status, functional-mobility status, and psychological, social, and environmental factors (Boyette et al., 2002; King & Guralnik, 2011; Rhodes et al., 1999; Stead, Wimbush, Eadie, & Teer, 1997).

As people reach their latter years, some become frail or experience injury or illness and need assistance to manage their health and undertake everyday living activities. As older people who are experiencing these difficulties wish, in the main, to remain living in their own homes, the Australian government funds a range of home care services to support this aim. Many of these are funded through the Home and Community Care (HACC) program, a joint federally and state-funded program. Until the last few years, these services, which can include nursing or allied health care, personal care, domestic assistance, meals, and transport (Department of Health and Ageing, 2010), have generally focused on providing assistance with the activities with which older adults are having difficulty. More recently, there has been a move toward a focus on a more capacity-building approach that emphasizes maximizing what older people can do for themselves rather than simply doing things for them.

The adoption of this change in focus has been gradual in Australia over the last decade but has been more apparent in the United Kingdom, where there has been government support for a reablement approach in which a restorative service is provided to people referred for home care services before ongoing care is considered. The aim of a restorative care service has been defined as to "create independence, improve self-image and self-esteem, and reduce the level of care required" through the delivery of an individualized program (Atchison, 1992, p. 8). Restorative care services are generally short term (6–12 weeks in length) and multidimensional, including components such as goal setting, a strength and balance exercise program, task analysis and design, use of aids and equipment, and medication management. They are usually delivered by allied health professionals or, as in the UK, by specifically trained home care staff.

In Australia, Silver Chain, a large West Australian community care organization, developed the first restorative home care service, the Home Independence Program (HIP), over 10 years ago and subsequently subjected it to increasingly rigorous testing. A nonrandomized controlled trial found that older people who participated in HIP had better individual and service outcomes than older people who received "usual" HACC services (Lewin & Vandermeulen, 2010). These findings were then confirmed in a larger randomized controlled trial (De San Miguel & Lewin, 2008). A recent systematic review of the evidence on the effectiveness of restorative home

care services concluded that although the body of evidence is currently small, it clearly suggests that a restorative approach has significant advantages over the traditional approach (Ryburn, Wells, & Foreman, 2009).

Although restorative home care services differ somewhat in their constituent parts, depending on the country, provider, and difficulties being experienced by the older person, the majority have a physical activity component that includes balance and/or strength exercises (Lewin & Vandermeulen, 2010; Tinetti et al., 2002). It is not known, however, whether individuals who participated in an exercise program as part of their restorative service continue being physically active after the service has finished, whether they are more physically active than people who received "usual" home care services, or whether they are as active as they "should be" according to the recommended levels for older people.

The first objective of this study was to compare the physical activity levels of older people (70 years and over) who had received a restorative home care service (HIP) with those of older adults who had received usual home care services (HACC). The second was to explore factors that predict being physically active among older home care clients, and the third was to determine whether either home care service group met the minimum recommended levels of activity promoted by the Australian government (Australian Government Department of Health and Ageing, 2009a).

Methods

Study Design

This was a cross-sectional descriptive study in which clients were surveyed by mail 1–4 years after having been referred for home care services.

Survey Population and Sample

The study population included the 9,199 individuals who had been referred to Silver Chain for home care between 2006 and 2009 and who had received HIP (4,844) or usual HACC (4,355) services.

Fifteen percent ($n = 745$) of HIP and 17% ($n = 745$) of HACC clients who met the inclusion criteria were randomly selected from this population to be surveyed. The inclusion criteria for participants were being 70 or more years of age, having received a minimum of 4 weeks or 4 visits of HIP or HACC between 2006 and 2009, and living in the community (i.e., not in residential care or hospital at the time of the study). The exclusion criteria were not being able to communicate adequately in English or having been diagnosed with dementia.

A study by Saarloos et al. (2008) exploring the physical activity levels of Western Australian adults was used to help determine the sample size. They found that 53% of the 65-year and older population undertook sufficient amounts of physical activity to gain health benefits. It was thought that as the population in this study was age 70+ years and had been referred for home care it could be expected to be about half to two thirds as active as the general population and, to be able to detect this sort of difference in the proportion of the two groups (i.e., 26% vs. 36%) that were exercising sufficiently with 80% power and an alpha level of .05, that a sample of 335 was needed in each group (Dupont & Plummer,

1990). Anticipating approximately a 50% return rate, we therefore surveyed 750 HIP and 750 HACC clients.

Survey Tool

A questionnaire was developed that incorporated a number of tools including the Physical Activity Scale for the Elderly (PASE), the SF-12v2© Health Survey, and the Geriatric Depression Scale-5 (GDS-5). All three tools have demonstrated validity and reliability when used with older people. The PASE is a 12-item instrument specifically designed to assess physical activity levels in large samples of older people over a 1-week period (Washburn, McAuley, Katula, Mihalko, & Boileau, 1999). It combines physical activity information from several areas including leisure, household, and occupational activity (McAuley, Jerome, Elavsky, Marquez, & Ramsey, 2003). Respondents were asked to indicate the number of days of activity per week and hours per day for sitting activities; walking; light, moderate, or strenuous sport activities; and specific strength activity they had completed during the past 7 days (Washburn, Smith, Jette, & Janney, 1993). To complete the household-activities section respondents answered yes or no to having completed household tasks over the last week, and the section on occupational activities asked for number of hours completed per week (Washburn et al., 1993). From these answers, a score was calculated based on activity frequency and an activity-weighted score multiplied by frequency (Washburn et al., 1993). The higher the PASE score, the more physically active the person is, with PASE scores ranging from zero to 400. Population norms (M) for the PASE are, for men 70–75 years, 102.4 ($SD = 53.7$); 76–100 years, 101.8 ($SD = 45.7$); for women 70–75 years, 89.1 ($SD = 55.5$); and 76–100 years, 62.3 ($SD = 50.7$; Washburn et al., 1993).

The SF-12v2© Health Survey is the short form of the SF-36, the commonly used measure of physical and mental health (McBride, Adamson, Bunting, & McCann, 2009; Ware, Kosinski, Turner-Bowker, & Gandek, 2002). The survey consists of 12 items across eight health domains. Two component scores are calculated: the physical-component summary and the mental-component summary, which can be compared with United States population norms (Cheak-Zamora, Wyrwich, & McBride, 2009).

The GDS-5 is a short form of the widely used Geriatric Depression Scale and is commonly used as a screening tool for depression in older people (Hoyl et al., 1999; Rinaldi et al., 2003; Weeks, McGann, Michaels, & Penninx, 2003).

In addition to including these three measures, the questionnaire also collected demographic and health data including education level, body-mass index, and mobility status.

Data Collection

Questionnaires were mailed to the study sample together with a letter explaining the study and a replied paid envelope. Consent was assumed by the completion and return of the questionnaire.

Ethics

Ethics approval for the study had been granted by the Silver Chain and Curtin University Human Research ethics committees.

Statistical Analysis

All analyses were performed using SPSS (version 18.0). Data were initially examined for normality of distribution. We then performed *t* tests, chi-square tests, or ANOVAs, depending on the type and distribution of the variable being examined, to determine any differences between home care service groups (HIP vs. HACC).

After completing the one-way analyses of variance and calculating Pearson product-moment correlation coefficients to examine the relationships between the characteristics of individuals and their PASE scores, characteristics that had a significant relationship were entered into a multiple regression to determine which factors best predicted an older person receiving home care services being more physically active. None of the independent variables were found to exhibit multicollinearity (bivariate correlation coefficients were estimated and all found to be less than .05). A *p* value of .05 or less was considered statistically significant.

Because a total PASE score combines physical activity associated with household and occupational activity with that undertaken as exercise, it cannot be used to determine whether an individual is meeting the levels of physical activity recommended by different countries or by the WHO. However, Questions 2–6, which are specifically about exercise, were used to determine whether individuals were exercising at a level that could be considered to match the recommended physical activity levels for older people living in Australia (i.e., at least 30 min of moderate intensity activity each day, where moderate intensity is defined as an increase in heart rate and some shortness of breath but still being able to comfortably talk while doing the activity; Glasgow et al., 2005). Individuals who met or exceeded the minimum amount of activity to reach the recommended government levels were deemed sufficiently active.

Results

Ten questionnaires were returned unopened. Five hundred six of the remaining 1,490 were returned, a response rate of 34.0%. Table 1 shows the basic demographics of the sample according to type of home care service received, HIP or HACC, and for the group as a whole (total). The difference in the proportions of women and men involved in the study was statistically significant ($\chi^2 = 6.79, df = 1, p = .009$), as was the proportion of HACC clients receiving a service in their country town compared with those receiving HIP ($\chi^2 = 24.89, df = 2, p < .001$).

The majority of respondents had never smoked cigarettes on a regular basis (62.3%, $n = 303$), and for those who smoked previously, 33.5% ($n = 163$) no longer did so. Only 4.2% ($n = 20$) of the sample were current cigarette smokers. There was no statistically significant difference between the two groups.

HIP respondents scored significantly higher on the SF-12v2® physical-component summary ($M = 31.25, SD = 11.04$) than their HACC ($M = 29.27, SD = 10.12$) counterparts, $t(460) = 1.99, p < .05$. On the mental-component summary, HIP respondents again scored higher ($M = 50.22, SD = 12.26$) than HACC ($M = 48.13, SD = 12.37$), although in this case it was not statistically significant. Using the GDS-5 item scale it was determined that 70.0% ($n = 312$) of all the respondents

Table 1 Basic Demographics

Variable	HIP, n = 215	HACC, n = 291	Total, N = 506
Age, M (SD)	82.2 (6.05)	82.1 (5.8)	82.2 (5.94)
Sex (%)			
female	84.8	75.3	79.3*
male	15.2	24.7	20.7
Marital status (%)			
married/de facto	29.5	33.4	31.8
widowed	55.7	53.7	54.5
separated/divorced	9.5	11.1	10.5
never married/other	5.3	1.8	3.2
Education (%)			
university degree	10.6	9.1	9.7
TAFE course	11.1	7.9	9.3
completed high school	37.2	41.5	39.6
quit before end of high school	41.1	41.5	41.3
Location (%)			
metro suburb	87.5	71.7	78.3
country town	8.7	26.2**	18.8
other rural	3.8	2.1	2.9
Housing status (%)			
own home, no mortgage	62.0	62.5	62.3
own home with mortgage	4.3	3.2	3.7
rent privately	3.4	7.1	5.5
rent/state housing	6.7	9.9	8.6
live in retirement village	20.2	14.8	17.1
other	3.4	2.5	2.9
Living status (%)			
alone	65.9	61.5	63.4
with spouse/partner	28.4	32.2	30.6
other	5.7	6.3	6.0

Note. HIP = Home Independence Program; HACC = Home and Community Care; TAFE = technical and further education.

* $p < .05$. ** $p < .001$.

were "not depressed" and the other 30.0% ($n = 134$) needed additional screening to determine if they were. Differences between the service groups were negligible.

Survey respondents were asked how many chronic illnesses they had suffered over the last 12 months, and 40.4% ($n = 187$) of respondents reported having had at least one chronic illness, with 33.2% ($n = 90$) HACC respondents and 28.1% ($n = 54$) HIP respondents reporting having been diagnosed with two. As illustrated in Figure 1, musculoskeletal conditions (including arthritis, osteoarthritis, and osteopenia) were by far the most prevalent for both service groups, with heart or circulatory conditions the second most common. Diabetes (including high blood sugar) and asthma were the only other two chronic conditions identified by more than 10% of the respondents. There were no statistically significant differences between the groups in terms of the proportions with different chronic illnesses.

Over a third of respondents, both HIP (36.6%, $n = 68$) and HACC (41.6%, $n = 102$), had a healthy body-mass index between 18.5 and 24.9. However, more than half of both HIP (54.8%, $n = 102$) and HACC (53.8%, $n = 132$) respondents were overweight or obese (25 and over). Less than 10% of the HIP (8.6%, $n = 16$) and 5% of the HACC (4.5%, $n = 11$) sample were underweight.

Eighty-two percent ($n = 400$) of all respondents had trouble walking. When the proportions of HIP and HACC respondents who had trouble walking were compared with the proportion who had no trouble walking, no significant difference between the groups was found ($\chi^2 = .13$, $df = 1$, $p = .722$). However, there was a significant difference in the proportion of each group who had trouble walking but did not use any aid ($\chi^2 = 16.48$, $df = 6$, $p = .011$).

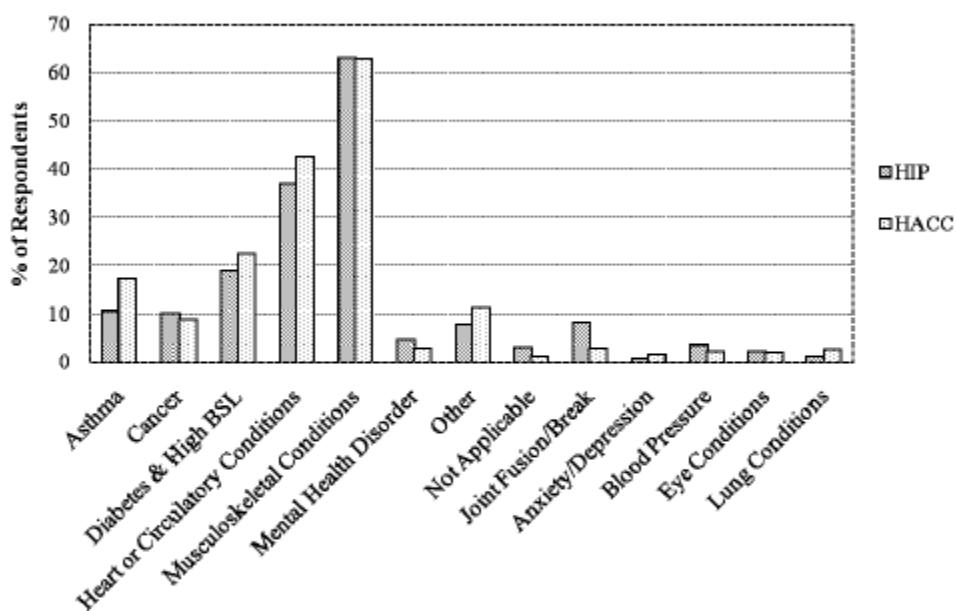


Figure 1 — Chronic illness by home care service. HIP = Home Independence Program; HACC = Home and Community Care; BSL = blood sugar levels.

A third ($n = 63$) of HIP clients, compared with 24.8% ($n = 62$) of HACC clients, reported having been encouraged to be more physically active by their care manager. Thirty percent ($n = 43$) of the HIP clients could recall being given an activity program as part of their home care service, whereas this was true for only 7.7% ($n = 15$) of HACC clients. A significant difference was found between the HIP and HACC groups receiving a physical activity program ($\chi^2 = 28.602$, $df = 2$, $p < .001$)—HIP clients were 4 times more likely to receive a physical activity program than HACC.

The PASE data were found to be not normally distributed, so a square-root transformation was undertaken. All subsequent analyses used the transformed data because they were normally distributed. However, to allow for comparison with other studies, the original (untransformed) PASE scores are presented in Table 2. The mean PASE score for respondents in this study ($n = 312$) was 83.98 ($SD = 64.32$) and ranged from zero to 385. Using an independent t test, we found that HIP respondents were significantly more physically active ($M = 93.4$) than the HACC clients ($M = 77.9$), $t(310) = 1.98$, $p = .049$.

Statistically significant differences were found between respondents' PASE scores at different ages, $F(5, 303) = 5.71$, $\eta_p^2 = .086$, $p < .001$. Tukey post hoc comparisons of the six age groups are illustrated in Table 3, which also shows which of the age groups had statistically significantly higher PASE scores (e.g., the 70- to 74-year-olds illustrated significantly higher PASE scores than the 90–94 and 95+ age groups).

Table 2 Comparison of PASE Scores With Other Studies

Reference	Population	Sample, N	Mean age, years	PASE score, M (SD)
Current study	Home care clients	506	82.2	HIP: 93.4 (70.1); HACC: 77.9 (59.6); total: 83.98 (64.3)
Washburn et al., 1993	65+-year-old Americans living in rural and metro communities	314	73.0	102.9 (64.1)
Martin et al., 1999	65+-year-old people with knee pain and arthritis	471	71.7	131.4 (71.1)
Foldvari et al., 2000	70+-year-old women living independently with functional impairments and had 1+ fall	78	74.8	94.5 (45.5)
Roth, Goode, Clay, & Ball, 2003	65- to 95+-year-old Americans	140	74.5	97.3 (61.9)
Fabre et al., 2010	50+-year-olds attending local community groups for seniors	286	74.2	109.3 (64.4)

Note. PASE = Physical Activity Scale for the Elderly; HIP = Home Independence Program; HACC = Home and Community Care.

Table 3 Comparison of Tukey's Honestly Significant Difference for PASE (THSDP) Across Age Groups

Age group (years)	THSDP
70–74	113.49 _a (88.68, 138.31)
75–79	92.69 _a (77.78, 107.61)
80–84	85.71 _a (74.55, 96.86)
85–89	74.47 _{a,b} (60.67, 88.27)
90–94	54.96 _b (21.63, 88.30)
95+	42.33 _b (1.92, 82.74)

Note. PASE = Physical Activity Scale for the Elderly. Means that share a subscript letter are not significantly different from one another at $p < .05$ in the comparison. Numbers in parentheses are 95% confidence intervals of the means.

Respondents' PASE scores differed significantly according to their mobility status, $F(4, 305) = 28.92$, $\eta_p^2 = .275$, $p = .001$. Table 4 outlines the significant differences found in mobility levels (e.g., respondents who had no trouble walking showed significantly higher PASE scores than all other mobility groups).

Respondents who were not depressed on the GDS-5 had significantly higher PASE scores than those who reported symptoms of depression, $t(289) = 5.97$, $p < .001$. Thus, we are 95% confident that home care clients who are not depressed will have a PASE score 23.95–53.62 points higher than those who are depressed. Using the Pearson product-moment correlation coefficient, a significant positive linear relationship between (transformed) PASE scores and the SF-12v2® physical-component summary score was found ($r = .45$, $p < .001$). Somewhat similar results were found for the SF-12v2® mental-component summary score, where the Pearson product-moment correlation coefficient was calculated as .18 ($p < .001$), showing a weak positive linear relationship between PASE scores and mental capacity.

The multiple-response analysis used transformed PASE data to identify respondents' characteristics most likely to be associated with who is physically active, as shown in Table 5. Service type (HIP vs. HACC), level of education, and chronic illness were initially included in the analysis; however, they were found not to be significant predictors. The results showed that people of younger age, with a higher SF-12v2® physical-component score, and who have little trouble walking and do not present with a diagnosis of depression were most likely to be physically active compared with home care clients who were older, had lower SF-12v2® physical-component scores and difficulty in walking, and suffered from depression.

Using the formula described in the Methods section to determine whether respondents were physically active for the recommended minimum 30 min of moderate exercise each day (Australian Government Department of Health and Ageing, 2009b), we found that 77.7% ($n = 307$) of all respondents met that criterion. Over three quarters of both HIP (76.7%, $n = 135$) and HACC (78.5%, $n = 172$) respondents were sufficiently active as defined by the Australian government's recommendations. The difference between them was insignificant. These results do not include the household activities included in the PASE. When examining the

Table 4 Comparison of Tukey's Honestly Significant Difference for PASE (THSDP) Across Mobility Levels

Level of mobility	THSDP
No trouble	145.09 _a (119.55, 170.63)
Trouble but no aid used	94.38 _b (84.52, 104.23)
Use cane/walking stick or frame outside house	63.84 _c (55.42, 72.26)
Use cane/walking stick or frame inside house	36.49 _d (23.29, 49.69)
Use wheelchair inside house	14.37 _{c,d} (-5.75, 34.50)

Note. PASE = Physical Activity Scale for the Elderly. Level of mobility is about walking. Means that share a subscript letter are not significantly different from one another at $p < .05$ in the comparison. Numbers in brackets are 95% confidence intervals for the means.

Table 5 Respondents Most Likely to Be Physically Active

Variable	B	SE B	p	CI
Age	-1.642	0.557	<.001***	-2.739, -0.545
SF-12v2® Health Survey physical-component summary	1.880	0.360	<.001***	1.171, 2.588
No trouble walking	82.633	28.333	<.001***	26.858, 138.409
Trouble walking but do not use an aid	55.052	27.092	.002**	1.720, 108.384
Need cane/walking stick or frame to walk outside of home	47.240	26.848	.007**	-5.608, 100.097
Need cane/walking stick or frame to walk inside of home	26.746	28.259	.160	-28.884, 82.377
Geriatric Depression Scale-5 item	20.282	6.964	<.001***	6.572, 33.992

Note. The scores presented in the table use original data from the Physical Activity Scale for the Elderly to allow for comparison with other studies. Adjusted $R^2 = .342$ ($p < .001$).

** $p < .01$. *** $p < .001$.

household activities of both home care groups, more HIP respondents (94.1%, $n = 159$) completed household activities than their HACC counterparts (92.2%, $n = 226$); however, this difference was also small and not significant.

Discussion

The total PASE scores indicated that the HIP group was more physically active than individuals in the HACC group. However, HIP and HACC were not found to be predictors of activity level when other variables were adjusted for in the multiple regression.

When comparing this study with others that used the PASE with community-dwelling older people (see Table 2), PASE scores for this study were generally

lower. However, the mean PASE score of the HIP group was comparable to that found by Foldvari et al. (2000) when investigating a group of women, age 70 years and older, who had a minimum of one functional impairment and had experienced at least one fall. Subjects of the other PASE studies identified had lower mean ages, which could explain the higher PASE scores.

The factors found to best predict an older home care client's being physically active were being younger, having a higher physical-component score, having little or no trouble walking, and not being depressed. These findings are consistent with other research: Rhodes et al. (1999) found that older people with perceived physical frailty and poor health were less likely to be physically active, Boyette et al. (2002) also found good health to be important in being physically active, and a recent study by Giuli, Papa, Mocchegiani, and Marcellini (2012) found that older community-dwelling Italians who were younger and had a lower body-mass index, better health status, and an absence of depression were more likely to undertake regular physical activity.

The positive effect of physical activity on depression has been well reported (Craft & Perna, 2004; Harvey, Hotopf, Overland, & Mykletun, 2010; Strawbridge, Deleger, Roberts, & Kaplan, 2002). It is also thought that those who suffer from depression are less likely to be physically active, although the evidence for this is less clear (Roshanaei-Moghaddam, Katon, & Russo, 2009). Our findings are consistent with this latter concept; we found that older home care clients who are not depressed are more likely to be physically active than those who are depressed.

The majority of participants met the recommended levels of physical activity prescribed by the Australian government (Australian Government Department of Health and Ageing, 2009a; Sims et al., 2010). The proportion of HACC clients who met the recommended levels was slightly, but not significantly, higher than the proportion of HIP clients. While this finding appears immediately at odds with the HIP group's having higher PASE scores than the HACC group, it is understandable given that, as explained earlier, household and other activities that form part of the PASE were not included in the determination of whether an individual met the recommended activity level. The HIP program focuses on helping people return to independence by doing as much as they can themselves, whereas the traditional home care model, here represented by HACC, has been to take over tasks with which people are having any difficulty. It is perhaps a direct function of the different service models that fewer HACC clients engaged in activities of daily living despite being more likely to exercise, as the traditional service model reduces older individuals' opportunities to be active and retain functional fitness and promotes further loss of independence.

The Australian and WHO physical activity recommendations do actually include the promotion of everyday activities such as housework, gardening, and walking to the shops for older people, but only in the longer version of the recommendations. Unfortunately, this is not the version used by the media in community campaigns, which tend to focus on increasing the amount of exercise taken rather than doing more housework or walking to the shops. Our research has illustrated the importance of incidental activity in increasing activity levels. If these activities were promoted in the community as being important contributors to aging well and maintaining independence, older individuals and their families may be less inclined to have a home care agency come in and take over household tasks, and

the home care agencies may be motivated to develop models of care that promote independence through helping people maintain or increase their engagement in everyday activities.

While more individuals in the HIP group engaged in everyday activities, as noted, slightly fewer exercised to a level that met the minimum government-recommended level. Yet more of the HIP group had been encouraged to be more physically active and were given an exercise program as part of the service provided. This suggests that exercise programs are not well maintained over time and that activity programs that are based around everyday activities, such as Clemson et al.'s (2010) LiFE program, may have greater impact in the long term. This requires further investigation.

This study had two limitations: the relatively low response rate, which resulted in a smaller than predicted sample size, and the large number of questionnaires returned for which it was not possible to score the PASE. The initial sample-size calculations determined that 335 respondents from each home care service (or 670 in total) were required for the study to have sufficient power to identify a statistically significant difference between the groups, given the effect size expected. Only 506 in total were returned, and of these, fewer were returned by HIP clients than by HACC clients. However, there is no reason to believe that the smaller proportion of HIP clients responding reflects any particular response bias. It was not possible to confirm this, however, as the survey was anonymous and we were therefore unable to determine whether responders were different from nonresponders. As for the smaller number of HIP regional respondents, this is thought to simply reflect the fact that few restorative care services exist in regional areas, rather than a smaller proportion of regional HIP clients having responded.

One hundred ninety-four questionnaires were either not fully completed or completed incorrectly for the PASE questions, which may limit the generalization of these results. It also indicates that there is a need for further research to identify the reasons for incompleteness and whether the tool is useful delivered in this format to this population. A direct measure of activity could potentially provide a more complete data set, but the PASE was chosen because of its demonstrated reliability when administered by mail-out to older people (Washburn et al., 1993). Another advantage of using the PASE in this study was that it included household activity and work-related activity and thus allowed us to see the differences between the groups in terms of their pattern of activity. Because there were similar numbers of incomplete PASEs in each group (HIP $n = 92$, HACC $n = 102$), there is no reason to believe that the number of incomplete surveys introduced bias.

Conclusion

This study found older home care clients who received a restorative home care service (HIP) to be more physically active overall than individuals who received "usual" home care (HACC). However, despite being more likely to have been encouraged to be physically active and to receive a physical activity program as part of the service, they were slightly less likely to be exercising sufficiently to meet the government-recommended activity levels. This, together with the fact that home care group did not predict activity level when other variables were taken into account, suggests that the current exercise component of the restorative program does not

have a sustained impact on activity levels, and investigation of the effectiveness of alternative everyday activity-based programs is warranted.

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CHAPTER 5

Barriers and Motivators to Being Physically Active for Older Home Care

Clients

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Barriers and Motivators to Being Physically Active for Older Home Care Clients

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ABSTRACT. The aim of the study was to identify the motivators and barriers to being physically active for older people receiving either restorative or “usual” home care services. The study used a mixed method descriptive design including questionnaire and interviews. Questionnaires were sent to 1,490 clients who received either service between 2006–2009; 506 (34%) responded, and 190 indicated willingness to participate in a follow-up interview. Of the latter, 20 were purposively selected and interviewed. “Well-being” and “health and fitness” were the top two reasons participants gave for being active. “Ongoing injury/illness” and feeling “too old” were the highest ranked barriers. The qualitative findings confirmed that older home care clients know physical activity is good for health and well-being, however, due to ongoing injury/illness and thinking they are too old, they may not be as active as they could be. This may impact on the number of home care services older people need over the longer term.

KEYWORDS. physical activity, barriers, motivators, home care services, aging

It is well established that being physically active is good for physical and mental health and well-being (Cress et al., 2006; Landi et al., 2007; Newson & Kemps, 2007; Taylor et al., 2004). However, many Australians do not meet the government recommended weekly levels of activity and people's activity levels tend to decline as they get older (Australian Government Department of Health and Ageing, 2009; Landi et al., 2007). In order to stay living independently and not rely on family, friends, and home care services, it is vital that older people remain healthy and try to stay fit and strong, particularly into their latter years.

Researchers (Campbell, MacAuley, McCrum, & Evans, 2001; Cohen-Mansfield, Marx, & Guralnik, 2003) and Western Australia's health promotion agency,

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Healthway (2008), suggest that prior to embarking on physical activity interventions, to encourage or assist any age group or population to become or stay active, it is important to understand a number of issues. These may include why a population would want to be active, what is stopping them from being active, and what would encourage them to become more active.

Much research has considered the reasons why older people are motivated to be active and the barriers stopping them. The most common motivators found are: socialization (someone to go with, meeting people, meeting friends) (Kalavar, Kolt, Giles, & Driver, 2004; Mathews et al., 2010; Sawchuck et al., 2011); improving physical and mental health (Damush, Plue, Bakas, Schmid, & Williams, 2007; Horne, Skelton, Speed, & Todd, 2012; Kolt, Paterson, & Cheung, 2006); recommended by a professional (e.g., doctor or physiotherapist); enjoyment (Buman, Yasova, & Giacobbi, 2010; Rasinaho, Hirvensalo, Leinonen, Lintunen, & Rantanen, 2006); and, living within close proximity to an exercise facility (Schutzer & Graves, 2004).

The reasons older people give for not exercising are wide-ranging and include: poor health, injury, or illness (Fuller, Stewart Williams, & Byles, 2010; Moschny, Platen, Klaassen-Mielke, Trampisch, & Hinrichs, 2011); unsure where to access services and facilities (Brown, Fuller, Lee, Cockburn, & Adamson, 1999; Chen, 2010; Rimmer, Wang, & Smith, 2008; Stathi et al., 2012); lack of motivation or interest (Annear, Cushman, & Gidlow, 2009; Sawchuck et al., 2011); lack of transport (Guerin, Mackintosh, & Fryer, 2008; Mathews et al., 2010); poor weather (Kolt et al., 2006; Stumbo, Pegg, & Lord, 2007); no time (Gyurcsik et al., 2009; Moschny et al., 2011); pain (Guerin et al., 2008; Newson & Kemps, 2007); safety issues (Annear et al., 2009; Stathi et al., 2012); no one to go with (Moschny et al., 2011); not knowing how to be physically active (Mathews et al., 2010); the cost (Fuller et al., 2010); do not enjoy being active (Sawchuck et al., 2011); and feeling too old (Guerin et al., 2008; Stathi et al., 2012).

Specific populations have also been explored including: older people living in residential care (Chen, 2010; Kalinowski et al., 2011) and senior housing (Wagstaff, 2005); older Tongans living in New Zealand (Kolt et al., 2006); American Indian elders (Sawchuck et al., 2011); and people recovering from stroke (Damush et al., 2007). However, to the authors' knowledge no research has specifically considered older people receiving home care services in order to identify whether the motivators and barriers to being active differ from those perceived by community dwelling older people more generally.

There are a number of different options available for older people accessing home care services. In Australia, the majority of home care services are jointly funded by state and federal Governments, through their Home and Community Care (HACC) program. Many HACC services are long-term and on-going and simply involve assisting older people with activities they are having difficulty with, such as cleaning or personal care. These services have not been designed to examine the reasons people are experiencing difficulty or include strategies to assist people to regain or improve function such as a physical activity program. However, over the last decade there has been a shift in emphasis toward helping people to maximize what they can do for themselves, rather than doing things for them.

This change has seen the development of restorative (or reablement) home care services. These services aim to ... "create independence, improve self-image and

self-esteem, and reduce the level of care required" through the delivery of an individualized program (Atchison, 1992, p. 8). Restorative home care services are usually delivered by allied health professionals, or as in the UK, by specifically trained home care staff, and they generally run between 6–12 weeks in length. They are multidimensional, and have a number of components, including physical activity or strength and balance programs, education programs (health and medication), environmental modification, and social aspects (Productivity Commission, 2011).

Silver Chain, one of Western Australia's largest community care organizations, developed the Home Independence Program (HIP), a restorative care service, over a decade ago. Since then they have built a body of increasingly robust evidence on the effectiveness of HIP. A nonrandomized controlled trial found older people who received a HIP service improved more than recipients of "usual" HACC services in terms of their everyday functioning, functional mobility and confidence and that these improvements translated into a reduced need for ongoing services (Lewin & Vandermeulen, 2010). The latter finding was further confirmed in a larger randomized controlled trial (De San Miguel & Lewin, 2008).

Although the body of knowledge for restorative home care services is currently relatively small, advantages have been shown when compared to more traditional approaches (Ryburn, Wells, & Foreman, 2009). The recent Productivity Commission Inquiry Report: Caring for Older Australians suggested that there was a need for greater focus on reablement and they recommended the introduction of an intensive reablement service to promote independence and restorative care (Productivity Commission, 2011). This study will build on the current knowledge base for restorative home care services and aims to identify the motivators and barriers to physical activity for older people receiving a "usual" (HACC) home care service compared to those receiving HIP, a restorative home care service.

METHODS

Study Design

The study design was cross-sectional and descriptive using mixed methods: postal questionnaire (stage 1) and interviews (stage 2). A mixed method design was used to better understand the research problem by combining the quantitative and qualitative data to provide fuller detail of this study population (Cresswell, 2009). Ethics approval was granted by the Curtin University and Silver Chain Human Research Ethics Committees.

Study Population and Sample

The stage 1 study population included 9,199 individuals who were referred to Silver Chain for home care services between 2006 and 2009, who received HIP (4844) or HACC (4355) services and met the inclusion criteria (sampling frame).

Fifteen hundred (750 HIP, 750 HACC) clients were randomly selected from this population to be surveyed. However, only 1,490 received surveys because 10 clients were no longer at the assigned address. The inclusion criteria were: aged 70+ years; received a minimum of 4 weeks/four visits of HIP/HACC between 2006–2009; and

living in the community at the time of the study. The exclusion criteria were: could not communicate adequately in English or had been diagnosed with dementia.

Questionnaires were mailed to the study sample in April 2010, with a letter of explanation about the study plus a replied paid envelope. Consent was assumed by the return of a completed questionnaire. Of the 506 people who completed the postal questionnaire, 190 expressed an interest in being interviewed (37.6%).

Stage 2 consisted of 20 semistructured interviews with a subsample of individuals who responded to the postal survey. Names of willing participants were entered into a database together with their status in terms of the following variables: home care service (HIP or HACC); age cohort; and physical activity status (active, not active) based on their PASE results. A sample of 20 was anticipated to provide sufficient information related to the areas of interest, also taking into account various practical considerations (e.g. traveling time). Selection of interviewees was based on a purposive sampling approach aimed at "range" and "variety", using the variables listed above.

Five clients from each of the four groups: HIP active; HIP not-active; HACC active; and HACC not-active were interviewed. Levels of activity were determined using their Physical Activity Scale for the Elderly (PASE) score. The PASE was used as one criterion for selecting the interviewees for this study, the complete PASE results are part of a larger study published elsewhere (Burton, E., Lewin, G., Boldy, D., 2012).

Prospective interviewees were sent a letter in July 2010, reminding them of their initial intent to participate, with a consent form and information sheet. The letter explained that they would be contacted by phone in the coming days to confirm their interest and to set a time, date, and place for the interview. From the initial list of 20 people, four replacements were necessary. The reasons for this were: not interested anymore (2); did not speak or understand English well (1); and had died (1). Written consent for audio recording was also obtained prior to the commencement of the interview.

Data Collection Tools

For stage 1, a questionnaire was developed requesting participants' views regarding what stopped them from being active (the barriers) and what would encourage them to become more active (motivators). Participants were provided with options and asked to tick as many as were appropriate. The options were developed from other research exploring barriers and motivators to physical activity for older people (Australian Bureau of Statistics, 2007; Booth, Bauman, & Owen, 2002; Brown et al., 1999; Kolt, Driver, & Giles, 2004). Space was also provided to add any additional options. Eight motivating options and 12 barrier options were listed in the questionnaire. The questionnaire was pilot tested using 10 older people living in the community, however, they were not receiving home care services at the time. Suggestions of change in language were discussed for and changes made where there was group consensus.

Other data collected via the questionnaire included: demographics; education levels; details about chronic illness (the list included the most common chronic conditions such as asthma, cancer, diabetes, heart or circulatory conditions, musculoskeletal conditions [e.g., arthritis] and mental health disorders); mobility levels

and physical activity levels using the PASE (Washburn, McAuley, Katula, Mihalko, & Boileau, 1999).

The interviews in stage 2 were semistructured and aimed to explore in more detail the respondents' survey answers as to why they chose particular barriers and motivators to being physically active. All interviews were undertaken in the respondents' homes, except one which was conducted over the phone. Each respondent's survey was used as a start to explore their specific barriers and motivators to being more physically active. They were also given the opportunity to discuss other barriers or motivators that they may have thought about since completing the survey. The interviews ranged from 20 to 90 min.

Data Analysis

Questionnaire analyses were performed using SPSS (version 18.0). Descriptive statistics were generated for all demographic data for the whole sample and for comparison between service groups (HIP versus HACC). Chi-squared tests were used to determine the differences between the home care groups regarding the barriers and motivators to being physically active. A *p* value of <0.05 indicated statistical significance.

Taped interviews were replayed and interview summaries developed. The majority of the interviews were recorded verbatim, however where participants' answers diverted from the topic these sections were omitted. Interview data related to barriers and motivators were separated from other interview data. The qualitative data analysis was then performed using basic content analysis developed with reference to Pope, Ziebland & Mays (2000) and Bazeley (2009). Interview quotes were transferred to an Excel spreadsheet and sorted into the different types of motivator and barrier that were identified by clients during the interviews to provide a greater depth of understanding of what was stopping or encouraging these older home care clients to be physically active. The types of motivator and barrier were then compared and similar types were clustered together to form categories. These motivators/barriers were then refined until all data were coded into exclusive motivator/barrier categories, for example *well-being, enjoyment, feeling too old, or ongoing injury/illness*. The researchers reviewed the data at each stage of data analysis to reach consensus before moving to the next stage. In order to minimize bias, the motivator and barrier categories for being physically active were also further verified by an experienced researcher not involved in the study.

RESULTS

The findings from the questionnaire are presented as a whole. Then, the top motivators and barriers are illustrated and contextualized by findings from the interviews. Although the selection criteria for interviewees allowed us to identify active and not-active HIP and HACC clients, little difference was found between them and all interviewee findings are therefore presented together.

Five hundred and six of the 1,490 questionnaires were returned, a response rate of 34%. Total participants were aged between 70 and 102 years with a mean age of 82.2 (5.9) years. The difference between the number of male and female participants was statistically significant ($\chi^2 = 6.79$, *d.f.* = 1, *p* = .009) and reflected

TABLE 1. Demographics

Variable	HIP (n = 215)	HACC (n = 291)	Total (n = 506)
Sex (%)			
Female	84.8	75.3	79.3*
Male	15.2	24.7	20.7
Marital status (%)			
Married/De Facto	29.5	33.4	31.8
Widowed	55.7	53.7	54.5
Separated/Divorced	9.5	11.1	10.5
Never married/Other	5.3	1.8	3.2
Education (%)			
University degree	10.6	9.1	9.7
TAFE course	11.1	7.9	9.3
Completed high school	37.2	41.5	39.6
Finished before end of high school	41.1	41.5	41.3
Location (%)			
Metro suburb	87.5	71.7	78.3
Country town	8.7	26.2**	18.8
Other rural	3.8	2.1	2.9
Housing status (%)			
Own home no mortgage	62.0	62.5	62.3
Own home with mortgage	4.3	3.2	3.7
Rent privately	3.4	7.1	5.5
Rent/State housing	6.7	9.9	8.6
Live in retirement village	20.2	14.8	17.1
Other	3.4	2.5	2.9
Living status (%)			
Alone	65.9	61.5	63.4
With spouse/partner	28.4	32.2	30.6
Other	5.7	6.3	6.0

Note. *p < .05, **p < .001.

the general home care population who are predominantly female. Over 91% of respondents reported that they had one or more of the chronic illnesses identified in the questionnaire, other demographic data are shown in Table 1. Table 2 illustrates basic demographics of those who were interviewed and those who were not; there were no statistically significant differences found.

Motivators for Being Physically Active

Questionnaire respondents typically identified between two and three different motivations for being active, with "well-being," "health/fitness," "enjoyment," and "social/family" being the four most frequently identified (see Table 3). Overall,

TABLE 2. Interviewee and Non-Interviewee Demographics

Variable	Interviewees	Non-Interviewees
N	20	486
Female (%)	80.0	79.3
Male (%)	20.0	20.7
Age (mean years)(range years)	84.271–102	82.170–101

TABLE 3. Reasons for Being Physically Active by Home Care Service (Percentage of Participants Mentioning)

Reasons for Being Physically Active	HIP	HACC	Total Sample (%)
Well-being	55.3	49.8	52.2
Health/Fitness*	56.3	43.0	48.6
Enjoyment	48.4	44.0	45.8
Social/Family	44.7	44.0	44.3
Transport	20.0	16.8	18.2
Weight loss	18.6	17.9	18.2
Walking the dog	11.6	9.6	10.5
Competition/Challenge	7.0	6.5	6.7
Other	3.7	4.5	4.2
Total%	265.6	236.1	248.7
Total N	215	291	506

Note. $\chi^2 = 12.90$, d.f. = 10, $p = .230$. * denotes statistical significance at $p < .05$.

there was no statistically significant difference in the proportion of the two groups nominating particular reasons as motivating them. However, when reasons were looked at individually there was a significant difference in the proportions of HIP and HACC respondents motivated to be active for "health/fitness" reasons ($\chi^2 = 8.79$, d.f. = 1, $p = .003$).

Well-being

Sixty-five percent of the interviewees, and 52% of the survey respondents overall, indicated they were active in order to promote their well-being and health and fitness. A 102-year-old female (HIP active) who lived alone stated:

...well I can't imagine not [being physically active], you hear of people that are lonely and miserable, is it because they won't exert themselves, even if you walk and smile at somebody, I grin from ear to ear and whether they smile back it doesn't matter...I feel so much better when I'm active than when I'm sitting around.

Health and fitness

Other active interviewees also talked about not wanting to sit for too long, they liked to keep moving and would often set physical challenges for themselves to improve their health and fitness (75%)

sometimes I get out the walking frame and I go down the drive, across the drive, up to my daughter's place [next door then back] into my front door and out again and down the drive. I do that... 20 or 30 times and then I'll think ooh I've had enough (90-year-old female, HIP active).

Enjoyment

Many simply gained enjoyment or liked the social aspects of being physically active (55%), be it inside or outside their home, "*Oh yes [I enjoy being active] you see so*

much when you walk ... yes walking first, gardening second. That's what I enjoy most" (73-year-old female, HACC active), and as a 77-year-old female suggested, [being physically active] "is also very much a comrade thing."

Social and Family

Many of the interviewees (65%) had been physically active with family and friends for the majority of their lives. They continued to enjoy activities with their family or friends and rely on them, especially the accompanying social interaction, and many enjoyed telling the interviewer in detail about these times

I'm still active with my great granddaughter; she's a two year old. She had us kicking the ball, a little tennis ball, up and down the passage with all the doors closed and we're all having a giggle together you know it was lovely (79-year-old female, HACC active);

oh yes she's wonderful she's my carer [daughter], wherever she goes she asks me if I want to go and I never say no, it's either in the car or walking down the street or to see the family or something, we're lucky that the family live reasonably close by, so we see a lot of them, very lucky (102-year-old female, HIP active).

Barriers to Being Physically Active

Survey respondents were asked if they thought they were active enough. More than a third (35%, $n = 144$) described themselves as sufficiently active, with the remainder (65%, $n = 268$) typically mentioning between one and two different barriers. The proportion of respondents stating they were active enough was similar for both home care groups. "Ongoing injury/illness" and "age/too old" were the two most commonly identified barriers, which were identified by more than 40% of both HIP and HACC groups (Table 4). The next commonly perceived barriers were identified by 10–15% of respondents.

TABLE 4. Reasons Stopping Respondents from Being Physical Active by Home Care Service (Percentage of Participants Mentioning)

Barriers to Being Physically Active	HIP	HACC	Total Sample (%)
Ongoing Injury/illness	45.6	47.8	46.8
Age/Too old	41.4	45.4	43.7
Nobody to be physically active with	12.1	14.4	13.4
Lack of transport	11.6	13.7	12.8
Temporary injury/illness**	17.7	6.5	11.3
Other injury/illness	8.8	8.6	8.7
Cost	7.0	5.2	5.9
Nowhere to be physically active	4.7	6.5	5.7
Not interested	3.7	5.8	4.9
Do not know how to be physically active	1.9	3.8	3.0
Other	2.3	2.4	2.4
Not enough time due to family	2.3	2.4	2.4
Not enough time due to work	1.4	0.3	0.8
Total%	160.5	162.8	161.8
Total N	215	291	506

Note. $\chi^2 = 23.54$, d.f. = 14, $p = .052$. ** denotes statistical significance at $p < .001$.



When examined overall, there was no statistically significant difference in the proportions between the groups nominating particular reasons for not being active ($\chi^2 = 23.54$; *d.f.* = 14; *p* = .052). However, when each reason was analyzed individually, a significant difference was found between the groups in the proportion who identified “temporary injury/illness” as a reason for inactivity ($\chi^2 = 15.25$, *d.f.* = 1, *p* < .001). The reason was more frequently identified by the HIP group.

Four interviewees described themselves as being active enough, therefore not providing any barriers to being active. For the remaining 16 interviewees “ongoing injury or illness,” “age or feeling too old,” and “lack of transport” were all discussed as being important barriers to being more physically active. Some interviewees also mentioned “cost,” “weather,” and “pride and embarrassment” during their interviews, even though they did not mark them on their survey, and they are described in more detail below.

Ongoing Injury or Illness

Having an “ongoing injury or illness” was discussed at length by many of the interviewees (87.5%). Arthritis was noted by a number of interviewees as the reason stopping them from being active and one respondent also mentioned asthma as being a barrier. Interviewees noted that they accepted and often limited their physical output due to their injuries or illness and described their energy levels as being low at these times. When they did attempt to be physically active they would frequently have difficulty—“*the thing that stops me ... is the fact that I get whacked out ... now I sort of do little bits, it's quite frustrating but in a way you have to accept the limitation you know*” (88-year-old female, HIP active). Others noted their frustration in recent years as they found tasks more difficult as they became frail and lost confidence, particularly after having a fall—

it's just gradually come on and I can't stand unless I'm holding onto something, I walk around the house with this [frame] or I grab there and then I grab to there and there, I'm petrified I will fall again (90-year-old female, HIP active).

Age or Feeling Too Old

Over 40% of the interviewees noted “age or feeling too old” were major reasons why they were not physically active, for example

I know my capabilities, we have outings and that here, and different things which I go to, but because of my age and because of my unsteadiness I won't go, as I say I know what I can do and I know what I can't do ... I know my limits ... that's what frustrates me now because I can't do things (87-year-old female, HIP not active).

As suggested above, interviewees would place restrictions on themselves to avoid pain or further injury in the future, and often use old age as an excuse—“*I can't really walk any distance, the minute I do my hip plays up and I just get stuck, I think it [the pain in the hip] is growing old really*” (88-year-old female, HIP not

active); and “since I turned eighty I have [felt too old to be active]” (96-year-old female, HIP not active).

Lack of Transport and Assistance

A number of interviewees (25%) identified no longer being able to drive as problematic, as they found it hard to access public transport and had to rely on friends and family—“I would love to go in the ocean but no one will take me down there to get me in the water, I love to swim in the salt water it’s beautiful” (90-year-old female, HIP active); “losing my ability to drive was like losing my right arm. You lose your independence” (86-year-old male, HIP not active).

The interviewees also suggested they needed someone with them to assist them once they arrived at the place to be active, whether it be assistance into the ocean or support once out of the transport—“I can’t get on the bus but I have got half price taxis, but you can’t go everywhere with a taxi . . . you need somebody with you when you get there” (90-year-old female, HIP active);

it would be nice to go and have some hydrotherapy in the swimming pool, but none of it’s available when the carer is available to take me, . . . and I’ve only got the two ladies those two days a week maybe when my daughter has retired she might be able to take me (90-year-old female, HIP active).

Cost

Only one interviewee indicated “cost” as being a barrier to physical activity and for this participant it was a rise in fees from when they first started playing golf to what it costs to play now—“well when I started playing golf, a day’s golf was five bucks, now it’s anything between 20 and 105 [dollars]” (84-year-old male, HIP active).

Weather

The weather was a factor for a few of the interviewees (19%) and was often linked to other barriers such as could not be bothered, feeling too old, or it was too far away:

it’s like we’ve had very, very cold mornings and . . . the aerobics are 9 o’clock in the morning so it means I’ve got to get up at least 8 o’clock . . . it’s been too bloody cold pardon my French and so I haven’t done it as much as I have been . . . I’ve just sort of been sitting here feeling sore and sorry for myself and I shouldn’t be doing it (80-year-old, female, HACC active);

no I’ve gotten too old [to try Tai Chi] but I’ve gotten too old in this fact that I can’t be bothered making the effort to get to these places. I’d do it if you know just around the corner or something but you have to drive somewhere and park and that, no especially if it’s night, I don’t drive at night very much unless I really have to (85-year-old female, HIP not active).

Others reacted more positively to the cold weather or rain and described setting physical goals inside the house. One 87-year-old female noted “if it’s a bad day [cold] I’ll walk, I’ll do, you might think I’m stupid, but I’ll do two hundred steps around the house and I count them out.”

Pride and Embarrassment

Two interviewees described being embarrassed about going to a gym or riding their bike in public—“*I regret to say that pride would stop me. I'm not that sort of person [to ride in public]*” (82-year-old female, HIP not active), and they suggested if they were to be active they would probably do more at home than elsewhere—“*I wouldn't go to a gym. I'd be too embarrassed that's why I prefer to do it here at the house*” (73-year-old female, HIP active).

DISCUSSION

This study aimed to identify motivating factors and barriers to being physically active for older home care clients. A number of motivating factors were identified for older people receiving home care services, with “health/fitness” being shown to be significantly more important for HIP respondents becoming active than for HACC clients. Part of the HIP service is educating clients on the benefits of physical activity, healthy eating, and living a balanced lifestyle, and although this study cannot determine whether participation in HIP and the ensuing education has contributed to the significant difference in motivational perceptions between the groups, it cannot be discounted either. Further research is needed to determine the effect of HIP and its educational components on motivational factors for being more physically active.

A number of other studies identified motivating factors to being physically active for older people living in the community and they also found health and fitness were important reasons (Horne et al., 2012; Mathews et al., 2010). Well-being, although not acknowledged separately by many studies, could be incorporated within “health-based” motivating factors for being physically active, including physical and psychological health. One study that did suggest well-being was a reason for being active was that by Martin and McCann (2005), who explored the reasons why older women attending a fitness center participated in regular activity. They found the maintenance of general well-being and exercising to maintain well-being were two of the four major themes identified as motivators to being physically active.

The older home care clients in this study also suggested they would be more active if they enjoyed the activity they were participating in. Enjoyment or liking the activity has been identified as important in older populations including older Australians (Kolt et al., 2004; Newson & Kemps, 2007) and older adults with mobility limitations (Rasinaho et al., 2006). Many of these older home care clients had chronic illnesses or mobility issues; the present study confirms earlier findings that enjoyment was an important factor for motivating older people who suffer from mobility issues to be physically active. With enjoying the activity participated in being so important to this group, it is recommended that further research explore the types of activity this population would like to undertake, in order to increase the likelihood of them being as active as possible.

Being social or physically active with family and friends was the fourth ranked reason for motivating older home care clients to be active. People like to be active with others and the respondents in the present study were no different (Buman et al., 2010; Damush et al., 2007; Snodgrass & Mackenzie, 2005). Fuller and others

(2010, p. 298) found in their study of older people with chronic conditions, that “using physical activity as a social opportunity” was very important in continuing to be active and that motivation from family and friends could assist them. It is recommended that home care organizations educate clients and their families and friends on the benefits of being physically active together. This could be incorporated into client care plans by those implementing services for older home care clients, in order to promote being more physically active.

Although there were no significant differences between the groups overall regarding barriers to being active, a significant difference was found between HIP and HACC respondents for “temporary injury or illness.” HIP is a short-term restorative service which is often initiated by a sudden decline in health status usually brought on by an injury or illness. The respondent’s HIP service occurred during the preceding three years; therefore, it may be that they remember the incident and it being a factor in not being physically active. Having a temporary injury or illness also provides an opportunity for care organizations to consider introducing an activity program to assist the client in their recovery from the temporary injury or illness and getting back to living independently in the longer term, as is often the case for restorative care services. In contrast, respondents receiving HACC services are assessed as needing long-term assistance to complete certain tasks, if it is determined their health status has declined to a point that they will not improve and ever take up the daily task again, for example vacuuming or mopping the floors. There may however be a place for a modified activity program for these HACC clients in order to maintain their health at the current status and avoid further deterioration which would require greater assistance by the home care organization.

The two highest ranked barriers to older home care clients being physically active were “ongoing injury or illness” and “age/too old.” These two barriers were ranked considerably higher than any of the other barriers, by a margin of more than 30 percentage points. Many other studies that explored barriers to being active also found that injury, illness or poor health (Chen, 2010; Fuller et al., 2010; Moschny et al., 2011) and pain stop older people from being active. Ninety percent of the survey respondents noted they had at least one chronic illness and as reported in other research (Wilcox et al., 2006) musculoskeletal conditions are a predominant chronic illness for this study population, explaining why ongoing injury or illness was a major barrier to being more active for these home care clients. Some interviewees noted that they were unable to be active due to their arthritis and asthma. However, studies have shown that being physically active can benefit individuals suffering from these chronic illnesses and that moderate exercise should be promoted (Brady & Snizek, 2003; Morton & Fitch, 2011; Wilcox et al., 2006). For example, Callahan et al. (2008) found both pain and function improved for arthritis sufferers after participating in an 8-week activity intervention. Given that both HIP and HACC home care clients often avoid being active due to ongoing injury/illness such as arthritis, it is recommended that health information sessions for staff, clients and their families be introduced to assist clients and their families to better understand that pain levels can be managed and functional status improved with regular physical activity. Informing the client’s general practitioner and asking for their support to promote being more physically active with their patient, should also be considered (Nied & Franklin, 2002; Vogel et al., 2009).



A common misconception among older people and their family and friends is that older people should reduce their activity as they age, to reduce the risk of falls. In contrast to this belief, a decline in activity tends to lead to a reduction in muscle strength and balance which can increase an older person's chances of falling (Hill & Schwarz, 2004). Older home care clients in the present study noted feeling too old or gave their age as a reason for not being physically active. Extolling the many benefits of maintaining strength and physical activity levels throughout one's life should be a routine aspect of home care service provision if these services are to be effective in helping older people maintain their independence. Such messages delivered at the individual provider level need to be reinforced by broad based health promotion campaigns that raise community awareness of the benefits of everyday activity such as housework, gardening and walking the dog, as well as the benefits of engaging in formal exercise programs.

A possible limitation of the study was the use of a checklist questionnaire to identify the motivators and barriers. This may be viewed as a limitation as it may have prompted respondents to identify factors that they would not have thought of spontaneously. However, a checklist was preferred over an open-ended question because such questions rely on respondent memory and awareness of the affecting factors, which may have resulted in under reporting. The list of motivators and barriers were created from past research exploring older community dwelling people and participants in this study were given the option of adding additional factors. The strength of this study is that a relatively large sample was used to represent older home care clients receiving two different services, with minimal burden placed on the participants. This would not have been possible without using a questionnaire format.

A second possible limitation may have been the modest response rate. Only 34% of surveys were returned, and of these, a smaller proportion was returned by HIP clients than HACC clients. However, there is no reason to believe that the smaller proportion of HIP clients responding reflects any particular response bias. It was not however possible to confirm this, or that the sample as whole was reflective of the study population, as the survey was anonymous and we were therefore unable to determine whether responders were different from nonresponders.

People living with dementia and not speaking English were also excluded from the sample and these two populations may be different to the study population in terms of the barriers and motivators for being physically active. The study findings cannot be considered to extend to these two groups.

CONCLUSION

The findings of this study have extended what is already known concerning the factors that encourage or discourage older people from being physically active by looking specifically at home care clients. The results indicate that home care organizations should be encouraged to actively promote physical activity within their services. Research is now needed to identify what client education and service delivery strategies are most effective in increasing physical activity in this population.

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DECLARATION OF INTEREST

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CHAPTER 6

Determining the Feasibility of a Lifestyle Activity Program for Inclusion in a Restorative Home Care Service: A Pilot Study.

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Determining the Feasibility of a Lifestyle Activity Program for Inclusion in a Restorative Home Care Service: A Pilot Study.

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Abstract: The aim of this pilot study was to determine whether a lifestyle and functional exercise program (LiFE) was suitable for delivery in a restorative home care service. Eight restorative home care clients and four Care Managers participated in the study. The LiFE program was successfully delivered to all eight clients, however the paperwork requested of both the client and Care Manager was extensive and we recommended some changes for this setting. Despite this, LiFE was found to be suitable for delivery in the restorative home care service and its effectiveness should be tested in a randomized controlled trial.

Keywords: aging, community health care, physical activity, rehabilitation

Introduction

It is well known that being physically active is good for health and wellbeing at any age (Cress et al., 2006; A. Taylor et al., 2004), yet as people age there is a tendency to decrease the amount of daily activity undertaken. With this reduction in activity comes a decrease in muscle strength and power and a decline in endurance, making it more difficult to complete daily living tasks, such as cleaning, gardening and going shopping (Vogel et al., 2009; Warburton et al., 2006). Traditionally when these difficulties occur, services such as those funded by the Home and Community Care (HACC) program in Australia are initiated by home care organizations to help older people with tasks that are becoming difficult. In the majority of cases, the older person is not encouraged to become more active, regain lost function and reduce or remove their need for on-going home care assistance.

Restorative home care services represent a paradigm shift in home care service delivery around the world, particularly in the United Kingdom and more recently Australia. These short term services are focused on assisting older people to regain independence, often after an illness or injury (Lewin, 2011; Ryburn et al., 2009). Restorative home care services are goal oriented and frequently include a physical activity program based around strength and balance, as these are important for functional mobility and falls prevention (Lewin, 2011; Ryburn et al., 2009).

Silver Chain, one of Western Australia's largest health and community care organizations, developed Australia's first restorative home care service, the Home Independence Program (HIP), over a decade ago. The organization developed a second restorative home care program, the Personal Enablement Program (PEP),

several years later. Both programs have the same service model, however, HIP clients originate from community based referrals, whereas PEP clients are referred from hospital to assist with their transition back into the community. Over the last 10 years Silver Chain has been conducting increasingly more rigorous research on the effectiveness of restorative home care services and has found restorative home care clients to have better individual and service outcomes than clients who received usual HACC services (Lewin et al., 2008; Lewin & Vandermeulen, 2010; Lewin et al., 2006). Although the effectiveness of restorative home care services has been investigated, the applicability and effectiveness of the individual components within these services, such as the physical activity intervention, have not.

The physical activity program currently used in Silver Chain's restorative services is based on Campbell and Robertson's (2003) Otago falls prevention activity program. This program, like most exercise programs delivered to older people receiving home care services is 'traditional' or structured in nature, where a number of exercises, repetitions and sets are determined for the client and they are asked to complete these each day or a number of times per week to improve their function, strength or balance (Johnson et al., 2003). This requires the older person to find time during the day to complete these exercises which may be a barrier to the older person maintaining the exercises over time (Rasinaho et al., 2006; Wilcox et al., 2006).

In a recent study, Burton, Lewin & Boldy (2013b) found that clients who had received a restorative home care service were significantly more physically active than those who received usual HACC services and that this was not because they did more formal exercise but rather that they were more active in terms of daily living

activities, such as cleaning, gardening and walking to the shop. This apparent preference for lifestyle activity rather than the type of exercises learnt currently within their restorative home care service suggests that including a lifestyle exercise program, rather than a more traditional, structured exercise program, in a restorative home care service, may be more effective in improving function in the short term and particularly in the maintenance of function over the long term.

Lifestyle exercise programs incorporate exercises/activities into a person's daily routines and tasks and one of the major benefits is that they do not require the person to find set periods of time in their day to undertake a structured exercise program. Dunn et al (1998) reviewed 14 lifestyle activity programs and found the majority increased the amount of physical activity of the participants to above Government recommended levels. However, at the time, there was limited research on older populations using this type of exercise program. During the last five years, two randomized trials have compared lifestyle exercise programs to structured exercise programs for older community dwelling people, one with a focus on older people who had fallen (Clemson et al., 2012) and the other, with older people who had not exercised consistently during the previous two years (Van Roie et al., 2010). Van Roie et al (2010) found both interventions to be equally effective in improving function compared to the control group, for their older participants. Clemson et al (2012) found their lifestyle exercise program to be effective in reducing falls, improving balance, ankle strength, balance efficacy and functional capacity for older people who had a history of falling.

There is a growing research base on the effectiveness of lifestyle exercise programs for older people living in the community. However, to the authors' knowledge no research has been undertaken to identify whether a lifestyle exercise program would benefit older people receiving a restorative home care service and whether this type of exercise program could be delivered within the current service model. Due to the results found by Clemson et al (2012), it was determined that the effectiveness of their lifestyle and functional exercise program (LiFE), be tested as the exercise intervention in a restorative home care service.

However, prior to undertaking a randomized controlled trial (RCT) to test the effectiveness of LiFE compared to the current exercise program, it was considered essential to conduct a pilot study to ensure: LiFE was a 'good fit' within Silver Chain's restorative service model and was acceptable to both staff and clients; and, that the outcome measures proposed to evaluate its effectiveness were suitable for the target population.

The aims of this pilot study were to determine:

1. Whether LiFE was suitable for incorporation into a restorative home care service, or whether changes were necessary to the way the program was delivered, to the activities within it, or to the LiFE manual
2. Whether the outcome measures proposed for use in the randomized controlled trial, planned to follow the pilot, were suitable for, and acceptable to restorative home care clients.

The research objectives were to:

1. Determine the recruitment rate and identify any potential recruitment issues for a RCT study
2. Determine what the expected dropout rate might be in a RCT study
3. Determine whether LiFE, and its associated documentation, was suitable to be delivered as part of a restorative home care service, as perceived by both Care Managers and clients
4. Determine which data collection tools are appropriate for a RCT study within the context of the restorative home care services.

Method

Participants and Setting

Silver Chain's restorative home care services are delivered throughout the Perth metropolitan area by interdisciplinary teams of allied health professionals and nurses, who are the Care Managers. The inclusion criteria for participants in the pilot were that they were: current restorative home care clients; aged 60 years and over; not diagnosed with dementia; able to speak and understand English; and, had been assessed as requiring an exercise program by their Care Manager.

Sample size

The sample size for the pilot study was set at 15 participants. This was deemed a sufficient number to test the suitability of LiFE within the restorative home care services. Our recruitment target was 1-2 clients per Care Manager per month. This target was agreed to be achievable by the Care Managers involved. This size of

sample was also considered to be large enough to test the suitability and acceptability of the outcome measures we planned to use in the RCT.

Recruitment Process

Care Managers conducted assessments of the client during their initial visit and for those clients evaluated as needing an exercise program to assist with their recovery, the Care Manager asked the client whether would like to participate in the pilot study. Once the Care Manager and client agreed that an exercise program would help the client achieve their service goals and the client was interested in being involved in the pilot study, the client was given a brief explanation of the study, a letter from the researcher, an information sheet and consent form and asked if the researcher could contact them to discuss the project further. If the client agreed, the Care Manager informed the researcher, who called the client within 3 days to answer any questions and set up a time to visit, gain consent and complete the baseline data collection.

Care Manager Training/Process

Participating Care Managers attended a one day training session on the LiFE program and its associated documentation, which was used in the original trial.

Intervention

Silver Chain's restorative home care services assist older people living in the community who require assistance to regain their independence, usually after illness or injury. The restorative home care services include a number of key components including: a comprehensive assessment, goal setting with the client, education about

healthy ageing and chronic disease management, and targeted evidence-based interventions, such as a physical activity program to assist with decreased function or falls prevention (Silver Chain Nursing Association, 2007). Each restorative home care service, and the particular intervention or strategies included, are individualized to assist clients to maximize their functioning and independence both in the short and longer term. The restorative home care services are designed to be short term and the average client episode is 7-8 weeks. Each Care Manager visits the client in their home initially and as the client's function improves and to assist the process of increasing the client's independence, phone calls are made instead of visits in the latter part of the service.

LiFE Exercise Program

The LiFE program was developed to improve balance and increase strength in older community dwelling people by embedding exercise into everyday activities (Clemson et al., 2012). Seven of the exercises in the program are for balance and six are for lower limb strength. Once a client had been assessed as needing an exercise program, and the client agreed to participate in the pilot, the LiFE program was explained to the client and the different exercises described. How these exercises could be incorporated into the client's daily routines, and which exercises the client would start with, was then discussed and agreed with the Care Manager. The older person was also given a manual explaining each of the exercises. Follow up visits were used to monitor how well the client was performing the first exercises agreed and to encourage the client to start doing others. In Clemson et al's (2012) original study, LiFE was delivered over five sessions, with two follow up sessions and two phone calls over a six month period. However, for this pilot study, clients were seen

every ten to fourteen days by their Care Manager (average three visits), and LiFE was just one aspect of their service that was discussed during these visits.

Service Delivery

Once baseline data had been collected the Care Manager was notified. The Care Manager then completed the LiFE Assessment with the client during their next visit. The LiFE Assessment was developed by Clemson et al (2007) to assess the client's strength and balance abilities in order to identify which of the LiFE exercises were most relevant for the client.

Following this assessment the Care Manager explained the LiFE program in detail to their client and, with their agreement, gave the client instruction on the exercises they were to do over the next 7-10 days. The Care Manager's discussed how the exercises might fit into the client's routine daily activities and filled out a record sheet indicating when the client was likely to complete the exercises each day. For example, the client could tandem walk or side step when walking down the hall to the toilet. Each client was also given a LiFE manual during this visit. The 67 page manual explained the principles underpinning the program and provided examples of the strength and balance activities, with photographs. It also provided guidance in how to upgrade activities to increase the load on muscles and challenge balance.

Data Collection

Table 1 outlines the tools used in this study, what they measured and why they were included. Each tool (test) was conducted according to author guidelines and was chosen because it had been established as valid and reliable for use with older

persons. For an older person trying to regain their independence and not requiring ongoing assistance to live in their home, functional mobility (Timed Up and Go (Podsiadlo & Richardson, 1991)), strength (Sit to Stand 1 and 5 times (Jette et al., 1999)), balance (Functional Reach (Duncan et al., 1990)), and the ability to Tandem Walk (Guralnik et al., 2000), and function independently (Late Life Function Instrument (Haley et al., 2002), (Late Life Disability Instrument (Jette et al., 2002)), are required. It is also important to understand how confident they are that they will not fall when completing daily activities (Falls Efficacy Scale (Tinetti et al., 1990)) or more challenging tasks (Activities specific Balance Confidence score (Powell & Myers, 1995)), particularly if they have been injured from a fall recently. A lack of confidence often being the basis for someone feeling they need assistance to stay at home. An increase in physical activity levels (measured using the Physical Activity Scale for the Elderly - PASE) (Washburn et al., 1993) can lead to improved pain levels, better sleep, improved appetite, and feeling physically and mentally better (Vitality Plus Scale (Myers et al., 1999)) which are all deemed important aspects for restorative home care clients.

Basic demographic and medical history (e.g. chronic illness) data were collected at baseline and information about recent falls and home care services received were collected at both baseline and post-intervention. During the post-intervention data collection the clients were also asked whether they thought the activity program assisted them and what they liked and disliked about it.

All data were collected in the client's home, when the researcher interviewed the client.

Table 1. Data Collected

Measure	Measures	Why included in pilot study
Functional Reach	Balance	Good balance assists in preventing falls
Falls Efficacy Scale	Fear of falling when completing daily tasks	Having a fear of falling can limit what a person does in their life (basic)
Sit-to-stand 1 and 5 times	Lower body strength and balance	Important for completing activities of daily living
Timed Up and Go	Functional mobility	Important for completing activities of daily living
10-item Vitality Plus Scale	Potential health-related benefits of exercising	Measures factors important to older people such as sleep, energy levels and pain
Tandem walk	Dynamic balance	Important for completing activities of daily living and preventing falls
ABC Scale – 10 Item	Confidence (falls) in completing more challenging tasks	Having a fear of falling can limit what a person does in their life (more advanced)
LLFDI Disability Component	Levels of disability	Important for completing activities of daily living
LLFDI Function Total	Lower and upper body function	Important for completing activities of daily living
PASE	Habitual physical activity	Compare with accelerometer
Actical Accelerometer (TotalEE)	Energy expended over 7-days	Compare with subjective measure (PASE)
LiFE Assessment tool	Functional balance and strength	Part of LiFE program
Counter Clicker & Activity Sheets	Number of times an activity completed on one day	Part of LiFE program

Note. ABC scale is the Activities Specific Balance Confidence Scale, LLFDI the Late Life Function and Disability Instrument, PASE the physical activity scale for the elderly, TotalEE Total energy expenditure. References in measure column outline procedure and validity and reliability of the tool.

In addition to the client data collected, Care Managers were asked to keep notes during the trial and note down: if they had any difficulty following any of the agreed work processes; whether they found any of LiFE's exercises unsuitable for restorative care clients; any issues with the LiFE manual and recruitment strategies; and, any changes they felt needed to be made with the intervention protocol prior to conducting the RCT. The Care Managers were then interviewed as a group after completion of client data collection to discuss these matters.

Analysis

Recruitment, drop out and tool completion rates were calculated. The Care Manager and client data were used to assess the suitability of the LiFE program (exercises, manual and associated work processes) for restorative home care clients. Notes were taken during the final Care Manager group meeting and analyzed thematically. The outcome measures data were analyzed using SPSS version 18. Where data were found not to be normally distributed non-parametric tests were utilized, with paired *t*-tests and Wilcoxon signed rank tests being used to compare pre and post test results. Statistical significance was considered at $p \leq 0.05$.

Ethics Approval

Approval to conduct this study was given by the Curtin University and Silver Chain Human Research Ethics Committees.

Results

Recruitment

All eligible clients (n=9) were recruited for the pilot study between February and April 2011. When queried with the Care Managers why there were fewer clients than expected the Care Managers reported having felt that some clients would be unable to cope with the paperwork. Unfortunately the Care Managers were unable to give exact numbers as to how many clients this included. The Care Managers also reported that they too found the amount of paperwork associated with recruitment excessively burdensome.

Dropout Rate

Eight clients completed both baseline and post-testing (88.9%). One client was unable to complete LiFE and post-testing due to being readmitted to hospital for further treatment, giving a dropout rate of 11.1%.

Client demographics

Of the eight clients who completed the pilot, six were female and two were male. Their ages ranged from 69-87 years with a mean of 80.8 years ($SD=5.87$). Seven participants lived alone and one with a friend. None of the participants had live-in carers, although one was a carer for their older friend. All the participants were referred from hospital, six with fractures, one after a hernia operation and the other for stoma care. Participants averaged 2.4 ($SD=1.06$) chronic illnesses, with 19 collectively. Over half (62.5%, n=5) of the participants had fallen once during the eight weeks prior to baseline. Four were admitted to hospital as a result of falling.

No participants attended a falls clinic after falling. Six participants (75%) had had surgery during the last year.

Delivery of the LiFE Program

The four Care Managers found the LiFE program to be suitable for restorative home care clients. However, they and the clients did not like the amount of paperwork involved in delivering and participating in LiFE. The Care Managers recommended the removal of the LiFE Assessment and the activity sheets used for recording the number of activities completed as a feedback and follow up mechanism. All of this paperwork was viewed as time consuming and often confusing to the clients (n=6). The Care Managers were all familiar with their clients and had completed their restorative home care service functional assessment during their initial visit with the client. The Care Managers felt this allowed them to assess which level in LiFE to begin, which was the original intent of the LiFE Assessment. As a consequence the Care Managers considered that the LiFE Assessment was not needed in addition to the assessment that already forms a part of this restorative home care service.

The Care Managers also recommended adjustments to the wording and illustrations of two of the activities in the LiFE manual. However, all the Care Managers and the clients said they liked the LiFE manual and thought it extremely beneficial because it was clear and easy to understand. Clients also said they liked going back and reading through the activities if they were unsure what to do. One Care Manager in particular said she had really enjoyed delivering LiFE and felt that the LiFE program was "*the perfect program for the true HIP client*".

There were a number of the exercises that the clients did not like doing such as walking backwards or on their heels, and although the client disliked these activities they were still able to complete them. Overall, feedback from the Care Managers and clients suggested they enjoyed the LiFE program and felt it was appropriate and could be successfully delivered to older people receiving a restorative home care service.

Outcome measures

Complete data were collected for most outcome measures but Care Managers or clients experienced difficulty using the accelerometer, the LiFE Assessment and counter clickers to fill in the daily activity sheets. The participants did not report any difficulties in providing answers for the data collection tools completed with the researcher. Three participants did not wear the accelerometer for the full seven days. One participant had backache from it and removed it immediately; another was confused about when to discontinue wearing it and removed it early; and another took it off before sleeping, whereas it was preferable to keep it on during this time. The LiFE Assessment was not completed consistently by the Care Managers. They said this was due to their heavy workloads ($n=3$) or not having enough time during a single visit to complete it fully ($n=1$). Due to inconsistencies and incompleteness, the LiFE Assessment could not be analyzed. The counter click and daily activity sheet data were similarly incomplete. Four participants found the process very confusing and two were not strong enough to use the clicker. These data were also not analyzed.

During the intervention one client had a fall, they were not admitted to hospital, but did require medical attention. When comparing the number of falls at pre and post-testing, a significant reduction was found, $t(7) = -2.65$, $p=.033$.

Table 2 presents the results of a comparison of each client's functioning, as measured by each of the outcome tools. The Falls Efficacy Scale, Tandem Walk, Late Life Function total score and the PASE all improved significantly for the eight clients. Although significant improvement was not found for Functional Reach, Sit to Stand 1 time, Timed Up and Go, Vitality Plus Scale, Activities Specific Balance Confidence scale and the Late Life Disability component over the eight week intervention, the clients did improve, showing increases in static balance, lower body strength, mobility, confidence and potential health related benefits of exercising. The Sit to Stand 5 times, Tandem Walk errors and difference in total energy expended between weeks one and eight all showed deterioration for the group over the eight week period.

Table 2. Mean comparison of outcome measures collected before the program and at 8 weeks

Measure	Pre-test	Post-test	Z or t score	P-value
Functional Reach	19.80 (6.84)	21.00 (3.33)	Z = -.169	.866
FES	25.37 (11.76)	15.75 (7.50)	Z = -2.524	.0120
Sit-to-stand 1	5.00 (1.67)	4.97 (2.21)	Z = .000	1.000
Sit-to-stand 5	22.14 (9.32)	23.82 (12.95)	Z = -.507	.612
TUG	17.63 (8.19)	15.73 (6.17)	Z = -.676	.499
VPS	30.50 (5.42)	32.00 (7.05)	Z = -.423	.673
Tandem walk	25.76 (14.84)	16.58 (8.89)	Z = -2.023	.043
Tandem walk errors	4.86 (3.39)	6.33 (4.63)	Z = -.405	.686
ABC – 10 Item	34.58 (25.79)	37.81 (22.35)	Z = -1.057	.291
LLFDI Disability Component	47.99 (3.94)	50.47 (3.47)	2.48 (4.48)	.162
LLFDI Function Total	45.20 (4.20)	49.81 (5.11)	Z = -2.521	.012
PASE	133.48 (68.56)	169.83 (74.52)	Z = -1.992	.046
Accelerometer (TotalEE)	2736.59 (4299.15)	2302.06 (3062.24)	Z = -1.153	.249

Note. Pre and Post data displayed as M (SD). Z scores denote non-parametric results and t scores normally distributed data. FES = Falls Efficacy Scale, TUG = Timed up and go, VPS = 10-item vitality plus scale, all LLFDI scores use adjusted scaled scores, TotalEE = total energy expenditure.

Discussion

The aim of this study was to determine whether LiFE was suitable for delivery as an exercise program within a restorative home care service. It was also designed to determine whether any changes to the program, exercises or manuals, as well as changes to the outcome measures were required prior to conducting an RCT.

The expected recruitment rate was not achieved because the Care Managers found the required paperwork to be excessive given their overall workload. The Care Managers were not asked to record the number or any information about any clients that declined to be involved and this process has subsequently been added for the RCT. The Care Managers as a group agreed that it was achievable for each of them to recruit and deliver LiFE to 1-2 clients per month, over six months for an RCT, if the paperwork was reduced significantly.

The Care Managers who delivered LiFE during the pilot study found it to be suitable for restorative home care clients. Although, it was initially suggested that there were activities in the LiFE manual that some of their clients could not undertake, on further investigation, this was found to be due to the client's illness or injury, not the LiFE activity itself. It was therefore agreed that in the subsequent RCT all of the LiFE activities would be retained in the manual and if a particular activity was considered unsuitable for a client the Care Manager would cross it out of their client's manual.

As described, not all of the data collection tools were completed by Care Managers and clients during the pilot. As a result, in discussion with the Care Managers it was

determined that the LiFE Assessment, counter clickers and daily activity sheets would not be used for the RCT. Instead, clients would be given a small A5 calendar to record the exercises they did each day during the RCT. It was suggested that this would be less daunting and more achievable for this population. Additionally it was decided not to use accelerometers in the RCT because of the poor compliance and the apparent potential for causing discomfort to some clients. As clients did not experience any problems with any of the other data collection tools, they will all be used in the RCT.

Participants in Van Roie et al's (2010) lifestyle exercise study averaged 66.8 years of age, which is markedly different from the 80.8 years in this current study. Clemson et al's (2012) study participants averaged 83.4 years for their lifestyle and functional exercise study, allowing for possible comparison, however the post-testing in Clemson et al's study occurred at 6 months, not the eight weeks of this study. Clemson et al's study showed a reduction in LiFE participants' falls over the six months as compared to the control group. Although the studies were not directly comparable, the fact that only one client had a fall during the 8 week intervention period of this study was very encouraging. In their 2012 study Clemson and her colleagues found that the LiFE group significantly improved their dynamic balance (using Tandem Walk), strength, function (using Late Life Function Instrument) and balance confidence (using ABC scale). This study also found improvements in these measures and provided support for the need for further research. In particular, there is a need to conduct a randomized controlled trial to ascertain whether the LiFE program is effective in improving function in older people receiving a restorative home care service.

Conclusion

The LiFE exercise program was found to be suitable for delivery to older people receiving a restorative home care service, with some minor changes to the paperwork. A randomized controlled trial will now be conducted to determine whether LiFE is more effective over both the short term (intervention period) and longer term (maintenance) than the current exercise program used in the restorative home care services.

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CHAPTER 7

Effectiveness of a Lifestyle Exercise Program for Older People Receiving a Restorative Home Care Service: Study Protocol for a Pragmatic Randomised Controlled Trial

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STUDY PROTOCOL

Open Access

Effectiveness of a lifestyle exercise program for older people receiving a restorative home care service: study protocol for a pragmatic randomised controlled trial

Elissa Burton^{1,2*}, Gill Lewin^{1,2}, Lindy Clemson³ and Duncan Boldy⁴

Abstract

Background: Restorative home care services help older people maximise their independence using a multi-dimensional approach. They usually include an exercise program designed to improve the older person's strength, balance and function. The types of programs currently offered require allocation of time during the day to complete specific exercises. This is not how the majority of home care clients prefer to be active and may be one of the reasons that few older people do the exercises regularly and continue the exercises post discharge. This paper describes the study protocol to test whether a Lifestyle Functional Exercise (LiFE) program: 1) is undertaken more often; 2) is more likely to be continued over the longer term; and, 3) will result in greater functional gains compared to a standard exercise program for older people receiving a restorative home care service.

Methods/Design: Design: A pragmatic randomised controlled trial (RCT) design was employed with two study arms: LiFE program (intervention) and the current exercise program (control).

Setting: Silver Chain, a health and community care organisation in Perth, Western Australia.

Participants: One hundred and fifty restorative home care clients, aged 65 years and older.

Measurements: The primary outcome is a composite measure incorporating balance, strength and mobility. Other outcome measures include: physical functioning, falls efficacy, and levels of disability and functioning.

Discussion: If LiFE is more effective than the current exercise program, the evidence will be presented to the service management accompanied by the recommendation that it be adopted as the generic exercise program to be used within the restorative home care service.

Trial registration: Australian and New Zealand Clinical Trials Registry ACTRN12611000788976.

Keywords: Physical activity, Exercise, Restorative home care services, Older people, Randomised controlled trial, Study protocol

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Background

As people age there is a tendency to reduce the amount and intensity of physical activity, which can lead to a loss of strength, endurance and balance [1,2]. Such loss of function can then lead to difficulty with everyday living activities and a need for assistance for the older person to remain living in their home. Home care services usually provide this assistance by performing the activity for the older person rather than working with them to assist them to implement strategies that will maximise their function and regain the ability to undertake tasks independently.

In contrast, restorative home care services work with the older person to help them maximise their independence. They do this by incorporating a number of components such as task analysis and redesign, the use of assistive equipment and physical activity programs to improve function, into a short term goal-oriented service [3-5]. In general, restorative home care services provide a "traditional" exercise program, aimed at improving strength and balance to help prevent falls and improve function for the older person. These programs require the older person to complete a set number of exercises, a number of times per day or a number of times per week. The person often completes them for a short period or sporadically, however when they feel they are "better" or have improved their function they often stop.

Recent research has found older people receiving a home care service describe their preferred physical activity as being incidental, such as cleaning the house, walking to the shops and doing the gardening, rather than attending exercise classes or playing sport, which is often preferred by younger generations [6]. Given this and the success of the Lifestyle Functional Exercise (LiFE) program in improving physical function and reducing falls among older people living in the community [7], it was considered important to conduct an RCT to test whether it might be more effective than a traditional exercise program when incorporated into a restorative home care service.

Prior to embarking on the RCT it was necessary to determine whether LiFE was suitable for older restorative home care clients. A pilot study was therefore conducted and LiFE was found to be appropriate for this population [8].

This paper describes the study protocol of the pragmatic randomised controlled trial which compared the effectiveness of LiFE, in both the short and long term, and the current traditional exercise program used in a restorative home care service. It is hypothesised that the LiFE intervention compared to the current exercise program will: 1) be undertaken more often; 2) be more likely to be continued over the longer term; and, 3) result in greater functional gains.

This trial is pragmatic in several aspects including the implementation of the trial within the current restorative

home care services of a health and community care organisation in Western Australia. Pragmatic trials are of increasing interest to government health bodies including the National Institute of Health (NIH) and Australia's Department of Health and Ageing [9], as they provide "real life" results rather than "ideal setting" results often not transferrable to health services.

Methods

Study design

This study was a pragmatic, non-blinded, parallel arm randomised controlled trial testing the effectiveness of the LiFE program compared to the current traditional exercise program when delivered within a restorative home care service.

Participants and setting

The study participants comprised older persons living in Perth suburbs who were referred for a restorative home care service and who met the RCT inclusion criteria. These criteria were: over 65 years of age; assessed by their Care Manager as needing a physical activity program; not having a diagnosis of dementia or other progressive neurological disorders; and, being able to communicate in English.

Silver Chain is an Australian health and community care organisation that delivers a myriad of services, including restorative home care services. The restorative home care services are delivered by an interdisciplinary team consisting of physiotherapists, occupational therapists and registered nurses acting as Care Managers, assisted by aides to provide any direct care needed. Silver Chain delivers two restorative home care services to their older clients; the Home Independence Program (HIP) and the Personal Enablement Program (PEP). HIP is delivered to older people living in the community who need short term assistance to regain their independence, while PEP is delivered to older people who have been in hospital and need the short term service on discharge to help them return to living independently.

HIP and PEP restorative home care services comprise a number of components, including: the promotion of active engagement in daily living activities through work simplification and assistive technology; an exercise program to improve strength, balance and endurance; chronic disease self-management; falls prevention strategies; improvement and maintenance of skin integrity; and medication, continence and nutrition management [10]. HIP is generally delivered for a maximum of 12 weeks and PEP 8 weeks. It was expected that the majority of older people who would be involved in this RCT would be PEP clients, referred after hospital discharge because their referral numbers are higher than HIP.

Sample size

The sample size was calculated based on 80% power, a 5% significance level and a 'medium' effect size of 0.5 [11] related to the two groups, using as the primary outcome, a composite measure incorporating balance, strength and mobility. This effect size was considered sufficient to recommend a change in practice, given that functional improvement is also expected in the current practice group. Based on Peat [12] a sample size of 64 in each group is indicated. Allowing for a 12% drop out rate as found during the pilot study [8], approximately 75 participants in each group were needed, or 150 in total.

Recruitment, randomisation and allocation concealment

When a client met the eligibility criteria, and agreed that an exercise program would help them achieve their service goals, the Care Manager gave the client: a brief explanation of the study; an introductory letter addressed from the researcher; an information sheet and consent form; and, asked if the researcher could contact them to discuss the project further. If the client agreed, the Care Manager informed the researcher, who called the client within three days to answer any questions and set up a time to visit, gain written consent and complete the baseline data collection. After baseline data were collected, clients were randomised to the intervention or control groups. Notification of group assignment was provided by the researcher to the Care Managers either through email or their computerised phone system and delivery of the allocated exercise program was commenced at the Care Manager's next visit to that client.

The randomisation process was conducted by a Senior Researcher not involved in the study. Study numbers were randomly allocated to group ('LiFE' or 'current') using the (simple) random number generator in STATA version 10. Slips of paper with study number and group allocation were then placed in envelopes of the same colour as the paper slip to avoid any tampering with the randomisation. Before sealing the envelopes the study numbers were written on the outside, they were put in sequential order and given to the researcher conducting the trial. The researcher involved in collecting follow up data was not blinded to group allocation.

Exercise programs

Lifestyle and Functional Exercise (LiFE) Program (Intervention)

The LiFE program was developed to improve balance and increase strength in older community dwelling people by embedding exercise into everyday activities [7]. Seven of the exercises in the program are for balance and six are for lower limb strength. It was initially developed as a falls prevention exercise program [13] however there were other outcomes in terms of increased

participation and functional improvements that indicate it would be appropriate for our population of restorative home care clients.

After a client had been assessed as needing an exercise program and agreed to participate in the RCT and was randomised to LiFE, the LiFE program was explained and the different exercises described during the Care Manager's next visit. How these exercises were incorporated into their daily routines, and which they would start with, were discussed and agreed with the older person. The client was also given a manual explaining each of the exercises. Follow up visits were used to monitor how the client was going with the first agreed exercises and to encourage the client to start doing others. In Clemson et al's original study, LiFE was delivered over five sessions, with two follow up sessions and two phone calls over a six month period [7]. However, in this RCT, clients were expected to be seen every ten to fourteen days by their Care Manager (average three visits), and LiFE was just one aspect of their service that would be discussed during these visits.

Current exercise program (Control)

The current exercise program is based on the Otago exercise program developed by Campbell and Robertson [14] which was also initially developed as a falls prevention exercise program. The Otago program has been modified over time by the team delivering restorative home care services, in response to client preferences, to not include weights and, depending on the client's requirements, sometimes included additional exercises.

After giving written consent and completing baseline data collection, participants allocated to the current exercise program were given a one page instruction sheet (back and front) illustrating the exercises (picture), number of times per day and number of days per week to complete them. The Care Managers explained the exercises they prescribed and during follow up visits they discussed and/or supervised the clients completing new exercises. Based on the Care Managers' description of "usual" practice, it was expected that an average of three visits involving discussions about their exercises would be included.

Depending on group allocation, Care Managers took a LiFE manual or the current exercise program sheet, plus a calendar, to each client at the first visit after randomisation. The clients were asked to tick each day on the calendar they completed the exercises and to keep this until their six month follow up visit. A summary of the study schemata is presented as Figure 1.

Data to be collected

All data were collected in the participants' homes and both activity programs were undertaken either in the

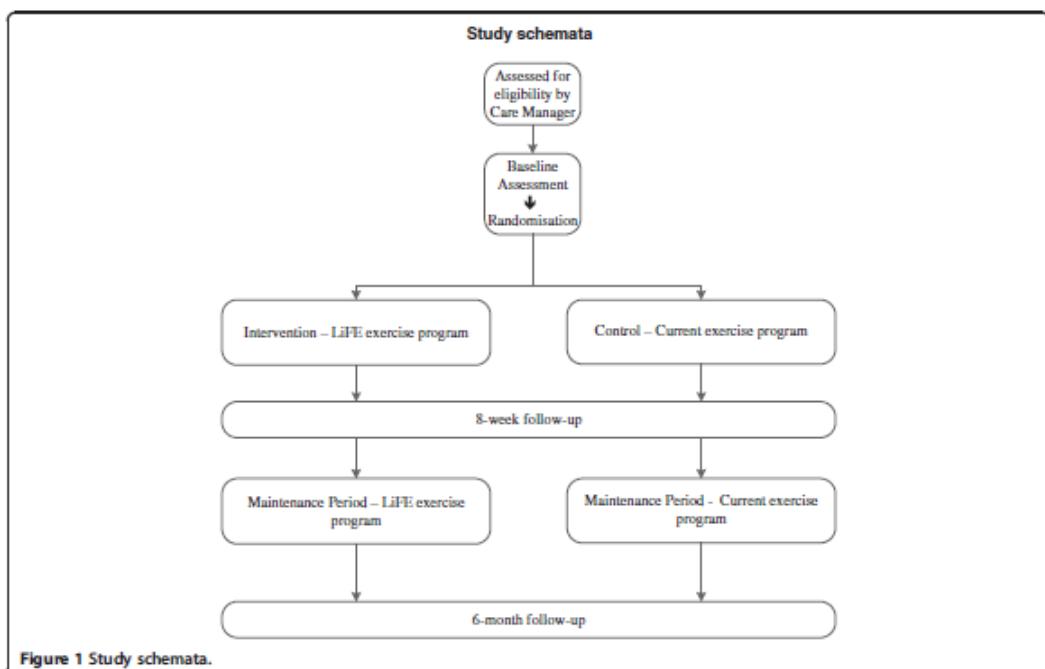


Figure 1 Study schemata.

participant's home or different places they may have visited during their week, such as: a shop, park, or footpaths. No specific equipment was needed for either program.

Demographic, home care service and falls information as well as functional data were collected for participants in both the intervention and control groups at baseline, eight weeks and six month follow-up. The six month follow-up occurred four months after the Care Manager ceased the restorative home service with the client. Table 1 provides a basic description of each of the outcome measures that were used in this study.

Outcome measures

Mobility, strength and balance (static and dynamic) are all equally important physical attributes for an older person to maintain when living independently. We therefore determined it was more appropriate to calculate a cumulative score of the four physical tests, rather than choose just one, as the primary outcome measure (see Data analysis for more detail).

Secondary outcome measures included: functional reach; falls efficacy scale; sit-to-stand 1 and 5 times; activities specific balance scale; timed up and go; vitality plus scale; tandem walk; the Late Life Function and Disability instruments; and, number of home care services received. These measures (see Table 1) were administered at baseline,

Table 1 Outcome measures and instruments

Instrument	Reference	Measures	Validity and reliability reported
Functional Reach	[15]	Balance	Yes
Falls Efficacy Scale	[16]	Fear of falling when completing daily tasks	Yes
Sit-to-stand 1 and 5 times	[17]	Lower body strength and balance	Yes
Timed Up and Go	[18]	Functional mobility	Yes
10-item Vitality Plus Scale	[19]	Potential health-related benefits of exercising	Yes
Tandem walk	[20]	Dynamic balance	Yes
ABC Scale	[21]	Confidence (falls) in completing more challenging tasks	Yes
LLFDI	[22]	Levels of disability	Yes
Disability Component			
LLFDI	[23]	Lower and upper body function	Yes
Function Total			

Note: ABC scale is the Activities Specific Balance Confidence Scale, LLFDI the Late Life Function and Disability Instrument.

eight weeks and six month follow-up. The six month follow-up was important because often exercise programs are not maintained once a service has finished and the Care Manager is no longer there to remind the client of the importance of doing their exercises. This would also show which exercise program, if any, was continued over the longer term.

As described earlier, to determine each client's exercise frequency they were given a calendar and asked to simply tick each day that they performed the exercises during the trial period. Other data collection techniques for determining compliance were tested during the pilot study [8], such as using clickers twice a week to count the number of times an assigned activity was completed (e.g. Tuesday 10 one leg balance exercises were completed and 15 on Thursday). However, none were found to be successful, whereas getting the client to tick a calendar each day was considered to be more achievable. The number of falls was measured by self-report at baseline and six month follow-up by asking how many falls have you had in the past 6 months. For each individual the study lasted six months, recruitment was expected to be completed within six months and data collection completed twelve months from commencement of recruitment.

Data analysis

Data will be analysed using the Statistical Package for the Social Sciences computer statistical software, version 19 [24]. Both *intention-to-treat* (ITT) and *per protocol* (PP) analyses will be performed. For each outcome measure, we will calculate the change that has occurred during the intervention period by subtracting the baseline from the 8-week values. Where the distribution of the change is approximately normal, an independent *t*-test will be used to compare the groups. When the data are not normally distributed a Mann-Witney U test will be used. Categorical data will be analysed using a Chi-square test.

The summary variable to be used as the primary outcome measure will be created using clients' functional reach, chair sit to stand, timed up and go and tandem walk scores. A factor analysis will be carried out to identify the relative importance of these four variables in the dataset, at baseline. This analysis will produce a set of factor loadings or 'weights' that can then be used to construct the new summary variable (as a weighted linear combination of the four separate measures above). The weights will be scaled so that, at baseline, the mean of the summary variable is zero and its standard deviation is 1. The same linear combination will be applied to create the summary variable at 8-weeks. Any change in the summary variable over the 8-week period will be assessed for statistical significance in exactly the same

manner as the other outcome variables (as described above).

Analyses of the post-testing results at 6 months will consist of a regression model for the outcome of interest, adjusting for the correlations due to the multiple measurements on each individual by treating the person ID as a random effect. Multiple linear regressions will be used to identify any differences between the groups at initial data collection, eight weeks and six months, and to examine differences between the groups in terms of change in measures over the follow up period. A p value of <0.05 will be considered statistically significant. Data analysis will be supervised by a statistician who is not involved in conducting the trial.

Ethics approval

Ethics approval was obtained from the Curtin University [approval number HR 145/2010] and Silver Chain Human Research Ethics committees [approval number SC-065] prior to the commencement of the study. The RCT was registered with the Australian and New Zealand Clinical Trials Registry ACTRN12611000788976.

Discussion

Population ageing is one of the major 21st century challenges facing many countries around the world. Substantially increased numbers of older people and decreasing proportions in the workforce, together mean that services to assist older people to maximise their health and wellbeing and remain living independently in the community will become increasingly more essential. Restorative home care services are short-term and have been shown to reduce the need and costs for on-going services in this older population [25]. Ensuring that these services are maximally effective is crucial. Strategies to encourage individuals to increase their activity levels and overall physical fitness are an essential aspect of these restorative home care services. We need to identify which strategies work best with this target population.

In this paper we have described our protocol for testing the effectiveness of a lifestyle exercise program compared to the current exercise program used in a restorative home care service. This protocol may assist other health services researchers wanting to conduct a pragmatic trial to compare the effectiveness of a new/different service component with a current component while continuing to deliver the service to its clients.

Health care services/researchers may also choose similar outcome measures as those used for this study, as they are all validated and reliable tools and have been used by others investigating older people receiving long term home care services [26]. Other researchers or health care organisations may find the summary variable, or principles used to create it, useful because living

independently requires an improvement across many physical domains not just one.

The study is being conducted in an existing restorative home care service operating within a health and community care organisation. The results should be generalisable to other similar services. Engagement with a health care organisation is a continuum and this trial is an example of a research-operational partnership where research is motivated by a desire by all parties to increase both service and cost effectiveness.

Abbreviations

LIFE: Lifestyle and functional exercise program; HIP: Home independence program; PEP: Personal enablement program; ITT: Intention-to-treat; PP: Per protocol.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

EB: participated in the study concept and design, acquisition of data, analysis and interpretation of data and drafting of the manuscript. GL: participated in the study concept and design, interpretation of data and critical revision of the manuscript. LC: was part of the investigation team who developed the LIFE exercise program, trained the Care Managers to deliver LIFE, provided input into the study design and provided critical revision of the manuscript. DB: participated in the study design and provided critical revision of the manuscript. All authors read and approved the final manuscript.

Authors' information

The data used in this article will form part of a doctoral thesis and the first author (EB) would ask permission to present this article as part of her PhD thesis.

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CHAPTER 8

Effectiveness of a Lifestyle Exercise Program for Older People Receiving a Restorative Home Care Service: A Pragmatic Randomized Controlled Trial

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Effectiveness of a lifestyle exercise program for older people receiving a restorative home care service: a pragmatic randomized controlled trial

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Background: Restorative home care services are short-term and aimed at maximizing a person's ability to live independently. They are multidimensional and often include an exercise program to improve strength, mobility, and balance. The aim of this study was to determine whether a lifestyle exercise program would be undertaken more often and result in greater functional gains than the current structured exercise program delivered as part of a restorative home care service for older adults.

Methods: A pragmatic randomized controlled trial was conducted in an organization with an established restorative home care service. Individuals who were to have an exercise program as part of their service were randomized to receive either a lifestyle and functional exercise program called LiFE (as this was a new program, the intervention) or the structured exercise program currently being used in the service (control). Exercise data collected by the individuals throughout and pre and post intervention testing was used to measure balance, strength, mobility, falls efficacy, vitality, function, and disability.

Results: There was no difference between the groups in the amounts of exercise undertaken during the 8-week intervention period. Outcome measurement indicated that the LiFE program was as effective, and on 40% of the measures, more effective, than the structured exercise program.

Conclusion: Organizations delivering restorative home care services that include an exercise component should consider whether LiFE rather than the exercise program they are currently using could help their clients achieve better outcomes.

Keywords: aging, physical activity, reablement, home care services, rehabilitation

Introduction

As in many countries around the world, Australia's population is aging. It is projected that by 2056, Australians aged 65 years and over will constitute almost a quarter of the population compared with only 13% in 2007.¹ As people get older, many will require assistance at some stage to stay living in the community. The Australian Productivity Commission Inquiry report estimated the lifetime risk for an Australian aged 65 years ever requiring an aged care service during their lifetime was 58%.² However, this increased to 80% for females and 62% for males aged 85 years.² Currently, over one million older people receive home care services in Australia each year,² and this number is expected to rise in proportion to the anticipated growth in the aging population over the coming decades.

To combat the current and anticipated future increase in the need for home care, restorative home care services were developed. The aim of a restorative home care service is to "create independence, improve self-image and self-esteem, and reduce

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the level of care required" through the delivery of an individualized program.³ Restorative home care services are available in the UK, US, Australia, and New Zealand.⁴ The services are generally delivered over 6–12 weeks and comprise a number of components, including a physical activity/exercise program to assist the older person to regain function and maintain independence. The exercise programs used in restorative home care services are generally "structured" in nature, where structured exercise programs are defined as those which require the client to complete a set number of exercises a number of times each day and a number of times each week.

There are a vast number of structured exercise programs that have been trialed for older community-dwelling people, particularly for the prevention of falls. One well known structured exercise program is the Otago exercise program, which was developed by Campbell et al⁵ in New Zealand and was designed to prevent falls in community-dwelling older people. Initial research on this home-based strength and balance training program involved 233 women living in the community and aged 80 years and over (Otago exercise group, n=116; control group, n=117).⁵ The program included four visits with a physical therapist and exercises used weight cuffs between 0.5 kg and 1 kg, and increased in weight as the participants progressed.⁵ Participants completed the exercise three times a week, plus they were asked to undertake a walk outside of their house on another 3 days of the week. The rate of falls significantly decreased for those exercising compared with the control group at both one-year and 2-year follow-up. The Otago exercise program has been shown to be effective in reducing the number of falls and injuries resulting from falls, for both men and women, in four randomized controlled trials (RCTs) involving over 1,000 participants.⁶

Recent research found that many older home care clients prefer to incorporate exercise into their daily routines and tasks, such as housework, gardening, and walking to the shops, rather than completing the more structured, sets, repetitions, and volume-based exercise programs usually delivered in restorative home care services.⁷ Lifestyle or incidental exercise programs have been gaining in popularity over the last few decades and have been shown to result in improved function and a reduction in falls in community-dwelling older people with a history of falling.^{8–11} However, no research has as yet been undertaken to identify whether older people receiving a restorative home care service could benefit more from participating in a lifestyle exercise program compared with a more structured exercise program. Before being able to conduct a study to address this question,

it was necessary to conduct a pilot study to ensure that it was feasible to deliver a lifestyle exercise program within a restorative home care service. The pilot found that with some minor changes to the administrative side of the program, the lifestyle and functional exercise program (LiFE) could feasibly be delivered to older people receiving a restorative home care service.¹² This having been established, the present study was designed to compare the effectiveness of LiFE with the more traditional structured exercise program being used in a restorative home care service. The two hypotheses to be tested were that the lifestyle exercise intervention would be undertaken more often (preferred more) than the structured exercise program and that the lifestyle exercise intervention would result in greater functional gains.

Materials and methods

A relatively brief methodology is provided here, given that a detailed trial protocol has recently been published.¹³

Study design

The study was a parallel pragmatic RCT in which the effectiveness of a lifestyle functional exercise program (the intervention) was compared with a structured exercise program (the control) when included in a restorative home care service. Pragmatic trials aim to test an intervention within a "real life" situation and are conducted on people who represent the full spectrum of the population being studied. "If the intervention has a significant effect in a pragmatic trial then it has shown not only that it can work, but that it also works in real life."¹⁴

Setting and participants

Silver Chain is an Australian health and community care organization that delivers a number of health care services, including restorative home care services. The restorative home care services are delivered by an interdisciplinary team consisting of occupational therapists, physiotherapists, and registered nurses acting as care managers, and are assisted by aides where required. Silver Chain delivers two restorative home care services to their older clients, ie, the Home Independence Program (HIP) and the Personal Enablement Program (PEP). HIP is delivered to older people living in the community who need short-term assistance to regain their independence, while PEP is delivered to older people who have been in hospital and need a short-term service on discharge to help them return to living independently.

HIP and PEP restorative home care services comprise a number of components, including: chronic disease

self-management; promotion of active engagement in activities of daily living through work simplification and assistive technology; an exercise program to improve strength, balance, and endurance; falls prevention strategies; improvement and maintenance of skin integrity; and medication, continence, and nutrition management.¹⁵ PEP is generally delivered for a maximum of 8 weeks and HIP for 12 weeks. It was expected that the majority of older people who would be involved in this RCT would be PEP clients, referred after hospital discharge because their referral numbers are higher than for HIP.

The study participants were persons living in Perth suburbs (Western Australia) referred for a restorative home care service between August 2011 and April 2012 and who met the RCT inclusion criteria. These criteria were: over 65 years of age; assessed by their care manager as needing an exercise program; not having a diagnosis of dementia or other progressive neurologic disorder; and able to communicate in English.

Sample size and randomization

The intention was to achieve a total sample size of 150, with baseline and follow-up data for 75 in each group. The sample size was calculated based on the following assumptions: a 12% attrition rate (found in the pilot study);¹² hypothesis tests at the 0.05 level; and an 80% power to detect "medium" effects (0.5 standard deviation)¹⁶ in the primary outcome (composite measure, incorporating balance, strength, and mobility).¹³

The randomization process was conducted by a senior researcher not involved in the study. Cases were randomly allocated using the (simple) random number generator in Stata version 10 into the LiFE (intervention) group or the structured exercise (control) group. The randomized cases were then placed in sequentially numbered envelopes.

Recruitment was slower than anticipated, and when it was clear the 150 sample was not going to be achieved even with an extension of the recruitment period by 3 months, and visiting the care managers a number of times to try to understand what was happening and respond to any study-related issues, a revision of the sample size was undertaken. It was estimated that 85 was the maximum that was likely to be achieved by the end of the extended recruitment period. It was therefore necessary to rerandomize cases from 50 to 85 to ensure balance among the two groups. Once again the allocation was concealed from the researchers.

Recruitment process and data collection

When a care manager identified that a client met the study inclusion criteria they gave the client a brief explanation of

the study, a letter from the researcher, an information sheet and consent form, and asked the client if they were happy for the researcher to contact them to discuss the project further. If the client agreed, the care manager informed the researcher, who called the client within 3 days to answer questions and set up a time to visit, gain consent, and complete baseline data collection.

Baseline data collection involved the use of eight different outcome measures which are commonly used in studies that examine the effectiveness of exercise programs and have been found to be appropriate for use with older people.¹⁷ These measures were: functional reach¹⁸ to measure static balance; chair Sit to Stand 1 and 5 times¹⁹ for measuring strength; Timed Up and Go²⁰ to assess functional mobility; tandem walk²¹ to measure dynamic balance; Falls Efficacy Scale²² for the subject to rate how confident they were that they would not fall when completing daily tasks; the Activities-specific Balance Confidence (ABC) Scale²³ to ascertain their confidence regarding completing more challenging tasks without falling; the Vitality Plus Scale²⁴ to measure any effect on factors such as pain levels, sleep, appetite, and mental and physical well-being; and The Late Life Function²⁵ and Disability²⁶ instruments to assess individuals' level of function and disability in everyday activities. The scores of interest in these latter instruments were: the function total which is based on the overall functional ability of the participant,²⁵ the lower extremity score which is based on tasks such as stair climbing, reaching overhead, standing from a low, soft chair, using a step stool and making a bed,²⁵ and the advanced lower extremity score which was based on physical activities that involve a high level of physical ability and endurance, such as walking a mile briskly and walking up multiple levels of stairs.²⁵

Once baseline data collection was complete, the researcher opened the envelope which contained the information regarding group allocation and notified the care manager which exercise program should be commenced during their next visit. In addition to the outcomes data collected again at the 8-week follow-up visit, using the same tools as baseline, demographic and service data were extracted from the organization's client database.

Tracking specific client exercises and how many times a day they were completed was trialed during the pilot study.¹² However, this was found to be too onerous on the client and as such was replaced by a specifically designed calendar. Study participants were asked by their care manager to record how often they did their exercises for the duration of the study. Due to financial constraints, the same researcher

conducted both the baseline and follow-up home visits and as a consequence was not blinded to group allocation.

Exercise programs

All care managers undertook a training session outlining their requirements for the study and delivering LiFE to their clients. The training session was led by the researchers and three of the care managers who were part of the pilot study. Care managers had delivered the structured exercise program for a number of years within the restorative home care services and were asked to continue this if the client was randomized to the structured exercise group.

In general, care managers saw their clients a minimum of two times prior to the start of an exercise program and during this time they completed a client functional assessment to determine whether an exercise program was needed. Care managers maintained client progress notes throughout the service; however, these were not specific to the project or used in the study. Care managers offered support and encouragement, not only for the client completing their exercises but for other areas of their restorative home care service, such as removing rugs as tripping hazards and reiterating the importance of clear space, at the next service visit.

LiFE program (intervention)

The LiFE program was developed to improve balance and increase strength in older community-dwelling people by embedding exercise into everyday activities.⁸ It was also developed as a falls prevention exercise program.²⁷ Seven of the activities in the program are designed to challenge balance and six are for improving lower limb strength. The care manager explained the program to the client and described the different exercises it included. How these exercises could be incorporated into their daily routines, and which they would start with, was then discussed and agreed, and the older person was given a manual explaining each of the exercises. Follow-up visits were used to monitor how the client was managing the initial exercises and encouraged to begin doing others. Clients were visited every 10–14 days by their care manager (average three visits), and LiFE was just one aspect of their service that was discussed during these visits. This training and support for implementation was much less than in the original LiFE study.^{27,28}

Structured exercise program (control)

The exercise program being delivered within the restorative home care service at the start of this study was “based” on the Otago falls prevention program developed by Campbell and Robertson, and is called the structured exercise program

within this paper.⁶ The program had been modified over time in response to client preferences, to not include weights depending on the client’s requirements and sometimes included additional exercises. Table 1 outlines the features of the LiFE program used in this study, the original Otago falls prevention program, and the structured exercise program to show how they differed.

After giving written consent and completing baseline data collection, participants allocated to the current exercise program were given a sheet illustrating (back and front) the exercises (picture), and number of times per day and number of days per week to complete them. The care managers explained the exercises and during follow-up visits reviewed the exercises with the participants.

Data analysis

Data were analyzed using Statistical Package for the Social Sciences version 19 software (SPSS Inc, Chicago, IL, USA). Both intention-to-treat and per protocol analyses were performed. Intention-to-treat results only are presented except when per protocol results were notably different and then both are presented. Initially paired *t*-tests or Wilcoxon signed-rank tests were employed (depending on normality of data) to determine the functional improvement of clients in their individual exercise group. For each variable, we then measured the change that occurred over the intervention period by subtracting the baseline from the 8-week values. Where the distribution of the change was approximately normal, an independent *t*-test was used to compare the groups. When the data were not normally distributed a Mann–Whitney *U* test was used. Categorical data were analyzed using a chi-square test.

A new summary variable was created using the functional reach, chair Sit to Stand, Timed Up and Go, and tandem walk variables.¹³ Any change in the summary variable over the 8-week period was assessed for statistical significance in the same manner as the other outcome variables (as described above). Data analysis was supervised by a statistician who was not involved in screening, recruitment, or follow-up of study participants. Statistical significance was determined at $P<0.05$.

Ethics approval

Ethics approval was obtained from the Curtin University and Silver Chain human research ethics committees prior to commencement of the study. The RCT was registered with the Australian and New Zealand Clinical Trials Registry.²⁹

Results

Figure 1 shows the participant flow for this RCT. A total of 1,993 clients were referred to a restorative home care service

Table 1 Features of the exercise programs

Features of program	LiFE (for this study)	Otago exercise program	Structured exercise program
Type of exercises	Strength and balance	Strength and balance, plus walking for 30 minutes	Strength and balance
Type and frequency of exercise instructor	Care managers: physiotherapists, occupational therapists, and nurses. Average of three visits (not usual practice for LiFE program)	Physiotherapists and nurses. Four to five home visits on average	Care managers: physiotherapists, occupational therapists, and nurses. Average three visits
Frequency of completing exercises	Incorporated into daily tasks/routines, no set amount to be completed; exercise progressions included, eg, hanging onto bench top to balance, using one finger to balance, not holding onto bench top	Begins with one set of 8–10 repetitions, increasing to two sets of 8–10 repetitions. The stepping exercises are one set of 10 steps increasing to four sets of 10 steps	Three times a day, complete five repetitions. Progress to level 2 exercises on back of sheet, same amount of sets and repetitions
Volume per week and time per session	Every day, no additional time required	Strength and balance three times a week, walking twice a week on different days. Five days in total, 30 minutes each day	Every day, approximately 15–20 minutes
Strength exercises	<ul style="list-style-type: none"> • Knee bends • Standing on toes • Walking on toes • Standing on heels • Walking on heels • Walking up stairs • Sit to stand • Sideways walking • Ankle rotations • Bend and straightening knees • Tightening and relaxing buttocks 	<ul style="list-style-type: none"> • Knee strengthening, sit to stand, knee bends (extensions) • Back knee strengthening (flexors) • Side hip strengthening (hip abductors) • Calf raises (ankle dorsiflexors) • Toe raises (plantar flexors) • Stair walking 	<ul style="list-style-type: none"> • Sit to stand • Side steps • Stand and reach • Toe raises • Backwards walking • Heel drop
Balance exercises	<ul style="list-style-type: none"> • Tandem stand • Tandem walking • One leg stand • Side to side weight shift • Forwards and backwards weight shift • Stepping over objects (including forwards and backwards and side to side) • Turning and changing direction 	<ul style="list-style-type: none"> • Backwards walking • Walking and turning around • Sideways walking • Tandem stance • Tandem walk • One leg stand • Heel walking • Toe walking • Heel and toe walking backwards 	Toe taps Salsa knee (lift one leg off floor)
Equipment and instructions (manual)	No equipment, LiFE manual provided	Ankle cuff weights starting at 1 kg increasing to 8 kg, Otago manual provided	No equipment, a sheet with exercises illustrated on the front and back
Exercise adherence	Calendar, tick when completed exercises on that day (not usual practice for LiFE program)	Calendar, mark date and what exercises completed, eg, Otago exercises 30 minutes	Calendar, tick when completed exercises on that day (not usual practice for structured program)

Abbreviation: LiFE, lifestyle and functional exercise.

at Silver Chain between August 2011 and April 2012. One hundred and seven clients were identified as meeting the eligibility criteria, but 27 who met the eligibility criteria declined to participate, due to already being involved in a physiotherapy program ($n=10$), lack of interest ($n=6$), no time available ($n=2$), being stressed ($n=2$), and a number of other reasons (see Figure 1). Eighty clients randomized to the study were included in the intention-to-treat analysis. Baseline and follow-up data were available for all participants; however, there were two clients at pre-test and five clients at post-test who were unable to complete the physical tests. Four clients were lost to follow-up:

one in the LiFE group (family problems) and three in the structured exercise group (no longer interested, health difficulties, and taking too long to receive the program).

Baseline

The baseline demographics are summarized in Table 2. No significant differences were found between the groups at baseline for any demographic, level of dependency, or outcome measure (see Tables 2 and 3). The average age of the LiFE clients was 80.2 years and that of the structured exercise group was 79.6 years. More women than men were involved

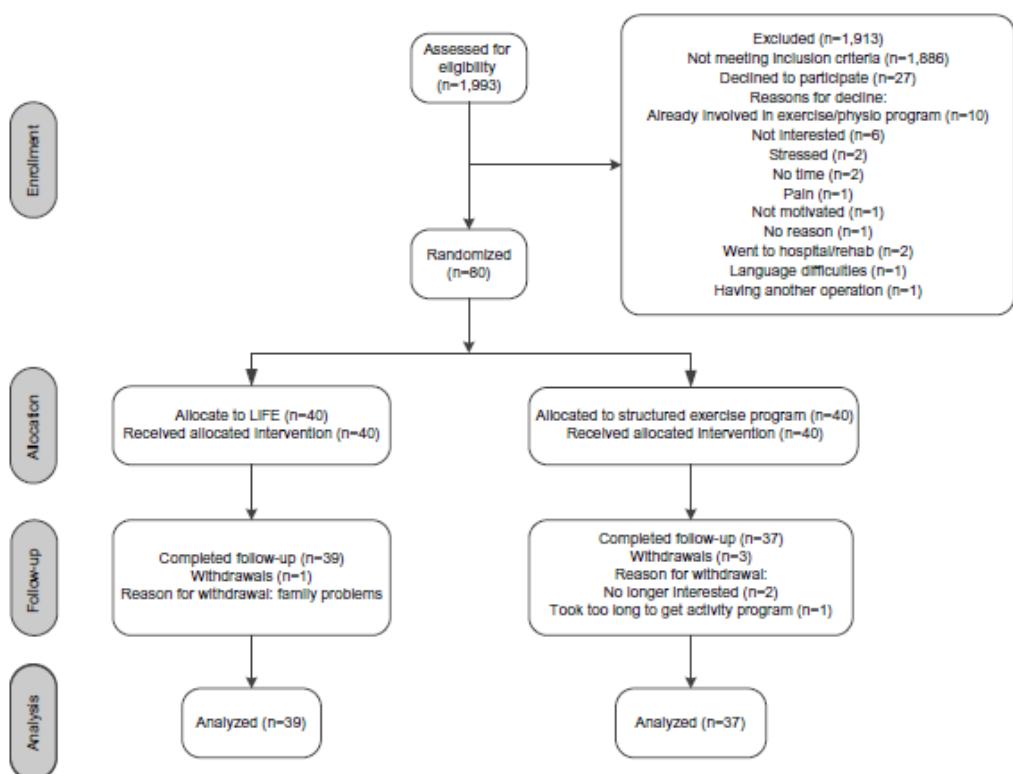


Figure 1 Participant flow through study.
Abbreviation: LiFE, lifestyle and functional exercise.

in the study for both groups and almost two-thirds of each group (LiFE 60%; current 67.5%) lived alone.

Nineteen hundred and ninety-three clients received a restorative home care service during the recruitment period and the demographics and levels of dependency for the population were compared with those of the study sample. No significant differences in demographics (age, sex, language, country of birth, living arrangement, and carer information) were found between clients involved in the RCT and the general restorative home care population for this time. Levels of dependency were also not significantly different.

Exercise program participation

Three quarters (n=31) of the LiFE clients and two thirds (n=27) of the structured exercise group completed their daily calendars. LiFE clients undertook exercises on average 4.91 times a week during the intervention compared with the structured exercise group who averaged 4.42 times per week. No significant difference was found between the

groups in the number of times they exercised during the intervention period.

Outcomes measured

Table 3 shows that the LiFE group significantly improved in 95% (19 of 20) of the outcome measures during the intervention period, compared with the structured exercise group which significantly improved in 70% (14 of 20). All of the physical tests showed a significant improvement for clients who participated in the LiFE program, particularly for the summary score, tandem walk, and tandem walk errors ($P<0.001$), whereas clients in the structured exercise group showed no significant improvement on functional reach and chair Sit to Stand five times or on tandem walk errors.

No difference was seen between the groups at baseline for the summary variable, but the LiFE group was significantly better than the structured exercise group at post-testing ($t[69]=-2.742, P=0.008$). However, no significant difference was found between the groups for the summary variable when looking at change over time ($t[66]=-1.763, P=0.08$). When

Table 2 Demographics

Variables	Intention-to-treat (n=80)			Population	
	LiFE program (intervention, n=40)	Structured program (control, n=40)	P-value	Restorative care population (n=1,993)	P-value
Age (years), mean (SD)	80.2 (6.4)	79.58 (6.2)	0.659	79.05 (7.2)	0.254
Sex			0.077		0.281
Female, n (%)	30 (75.0)	36 (90.0)		1,530 (76.8)	
Male, n (%)	10 (25.0)	4 (10.0)		463 (23.2)	
Country of birth			0.145		0.960
Australia, n (%)	19 (47.5)	27 (67.5)		1,089 (54.6)	
England, n (%)	11 (27.5)	5 (12.5)		359 (18.0)	
Other, n (%)	10 (25)	8 (20)		545 (27.3)	
Language			0.305		0.273
English-speaking, n (%)	37 (92.5)	39 (97.5)		1,828 (91.7)	
Non-English-speaking, n (%)	3 (7.5)	1 (2.5)		116 (5.8)	
Carer availability			0.431		0.874
Has a carer, n (%)	11 (27.5)	8 (20.0)		450 (22.6)	
Has no carer, n (%)	29 (72.5)	32 (80.0)		1,543 (77.4)	
Living arrangements			0.485		0.447
Lives alone, n (%)	24 (60.0)	27 (67.5)		1,106 (55.5)	
Lives with family/others, n (%)	16 (40.0)	13 (32.5)		813 (40.8)	
Levels of dependency (n=37)		(n=37)	0.614	(n=1,934)	0.802
Low, n (%)	6 (16.2)	4 (10.8)		(10.1)	
Medium, n (%)	17 (45.9)	21 (56.8)		(55.0)	
High, n (%)	14 (37.8)	12 (32.4)		(34.9)	

Notes: Restorative Home Care Population not stated; language 2.5%; living arrangement 3.7%.

Abbreviations: LiFE, lifestyle and functional exercise; SD, standard deviation.

Table 3 Results of measurement outcomes per exercise group

Variables	LiFE exercise group				Structured exercise group			
	Baseline	Post-test	Z or t score	P-value	Baseline	Post-test	Z or t score	P-value
Summary score	-0.10 (1.10)	-0.71 (0.78)	-4.45	<0.001***	0.11 (0.82)	-0.18 (0.93)	2.40	0.023*
Functional reach	22.74 (6.29)	24.74 (7.10)	-2.22	0.032*	21.29 (4.50)	23.01 (7.23)	1.72	0.095
Sit to Stand 1	3.70 (1.70)	3.39 (1.99)	2.73	0.006**	4.29 (1.46)	3.80 (1.64)	2.63	0.012*
Sit to Stand 5	18.45 (9.13)	15.68 (6.31)	2.51	0.012*	17.60 (5.28)	17.61 (5.87)	-0.46	0.644
Timed Up and Go	13.77 (4.40)	12.29 (3.66)	3.25	0.002**	17.90 (7.72)	17.88 (14.83)	-2.19	0.028*
Tandem walk	19.62 (13.93)	12.92 (6.18)	-4.34	<0.001***	18.38 (8.10)	16.53 (8.98)	-1.98	0.048*
Tandem walk errors	8.47 (4.14)	4.42 (4.43)	5.31	<0.001***	9.51 (4.12)	8.66 (4.14)	-1.64	0.098
Falls Efficacy Scale	28.48 (14.35)	17.38 (9.33)	-4.94	<0.001***	28.35 (14.60)	22.40 (14.15)	-3.02	0.002**
ABC Scale	56.37 (20.57)	77.52 (19.02)	10.07	<0.001***	52.36 (21.08)	65.27 (23.27)	4.70	<0.001***
Vitality Plus Scale	31.05 (7.81)	35.42 (8.13)	-6.15	<0.001***	29.59 (7.37)	31.76 (7.02)	2.57	0.014*
Late Life Disability Instrument								
Total disability	48.94 (5.71)	50.24 (5.07)	-2.5	0.015*	48.30 (7.02)	49.73 (6.61)	-1.64	0.101
Social role	43.20 (8.49)	44.45 (8.13)	-1.72	0.094	42.82 (10.14)	43.80 (9.73)	-0.945	0.345
Personal role	55.96 (9.39)	60.13 (11.78)	-2.88	0.004**	54.55 (10.85)	58.94 (12.94)	-1.82	0.069
Limitation	60.02 (9.57)	74.18 (11.53)	-8.42	<0.001***	58.09 (10.21)	67.36 (14.58)	-4.24	<0.001***
Instrumental role	58.18 (12.50)	74.97 (14.00)	-5.17	<0.001***	54.89 (11.29)	65.25 (16.03)	-4.29	<0.001***
Management role	77.69 (14.57)	88.88 (11.32)	-4.69	<0.001***	80.59 (17.51)	85.68 (15.53)	2.52	0.016*
Late Life Function Instrument								
Function total	49.38 (6.80)	56.88 (8.41)	-5.23	<0.001***	47.09 (5.27)	51.13 (6.35)	-7.40	<0.001***
Upper extremity	67.37 (15.41)	74.07 (13.38)	-3.46	0.001**	66.39 (13.05)	72.15 (12.69)	3.34	0.002**
Basic lower extremity	59.07 (11.27)	71.14 (13.53)	-8.12	<0.001***	55.46 (9.09)	62.47 (12.39)	5.81	<0.001***
Advanced lower extremity	30.78 (13.43)	42.90 (15.39)	-5.12	<0.001***	22.91 (14.87)	29.74 (14.80)	3.25	0.002**

Notes: *P<0.05; **P<0.01; ***P<0.001.

Abbreviation: LiFE, lifestyle and functional exercise.

the results of the physical tests were analyzed individually, a significant difference between the groups over time was shown for the tandem walk and the number of errors when completing the tandem walk (Table 4).

Significant differences between the groups were also found on the ABC Scale and the Vitality Plus Scale, which are indicators of improved balance confidence when completing challenging daily activities and of potential health-related benefits of exercise, respectively. No difference was found on the Falls Efficacy Scale. The Late Life Function and Disability Instruments measure a number of factors and only one significant difference was found between the groups using the Disability Instrument. The total limitation component, which signifies levels of capability of participating in life tasks, showed that the LiFE group had significantly greater improvement compared with the structured exercise group. There were also significant differences between groups in the instrumental ($Z=-1.98, P=0.048$) and management ($Z=-2.04, P=0.041$) role components of the Disability Instrument in the per protocol analysis. These were the only variables in the per protocol analysis showing a significant difference between the groups, where it was not found in the intention-to-treat analysis.

Three functional components of the Late Life Function Instrument (function total, basic lower extremity, and advanced lower extremity) showed the LiFE group improved significantly more than the structured exercise group.

The LiFE group were also found to have a significant reduction in the number of different home care services (for example, domestic assistance, personal care, and meals on wheels) received between baseline and follow-up ($t[74]=-1.99, P=0.049$) compared with the structured exercise group. This reduction is a crude measure and does not include number of hours received within each service.

Discussion

Participants in the LiFE program were not found to exercise more frequently than individuals who received a structured exercise program. The first hypothesis we tested did not therefore receive any support. In addition to undertaking similar amounts of exercise, clients in both exercise groups showed significant improvement on many of the functional measures. However, the structured exercise participants only improved on 14 of the 20 measures, whereas the LiFE group improved on 19 measures. These results therefore support our second hypothesis that LiFE would result in greater

Table 4 Results of measurement outcomes over time between the groups

Variables	Intention-to-treat				
	LiFE M Diff (SD)	Structured M Diff (SD)	Z or t score	95% CI	P-value
Summary score	-0.55 (0.53)	-0.29 (0.68)	-1.76	-0.56 to -0.03	0.083
Functional reach	1.99 (5.60)	1.73 (5.96)	0.199	-2.41 to 2.94	0.843
Sit to Stand 1	-0.38 (1.01)	-0.49 (1.11)	-0.52	-0.383 to 0.60	0.604
Sit to Stand 5	-2.05 (5.00)	-0.33 (4.72)	-1.49	-4.03 to 0.59	0.142
Timed Up and Go	-1.48 (2.80)	-0.46 (11.54)	-0.022	-4.86 to 2.83	0.983
Tandem walk	-7.07 (11.03)	-1.33 (8.84)	-2.15	-10.47 to -1.00	0.032*
Tandem walk errors	-4.05 (4.70)	-1.12 (3.78)	-2.90	-4.95 to -0.91	0.005**
Falls Efficacy Scale	-11.49 (11.65)	-6.86 (13.75)	-1.57	-10.43 to 1.19	0.116
ABC Scale	21.15 (13.2)	12.90 (16.70)	-2.57	1.40 to 15.09	0.010*
Vitality Plus Scale	4.37 (4.44)	2.16 (5.11)	2.01	0.025 to 4.39	0.047*
Late Life Disability Instrument					
Total disability	1.30 (3.20)	1.12 (3.59)	0.23	-1.37 to 1.74	0.816
Social role	1.25 (4.54)	0.69 (4.44)	0.54	-1.49 to -2.61	0.588
Personal role	4.11 (8.55)	3.80 (11.80)	-0.53	-4.38 to 5.01	0.595
Limitation	14.16 (10.50)	9.56 (10.99)	-1.99	-0.32 to 9.51	0.047*
Instrumental role	16.75 (13.53)	10.74 (12.26)	-1.81	0.10 to 11.92	0.071
Management role	11.19 (14.89)	5.09 (12.30)	1.94	-0.17 to 12.35	0.056
Late Life Function Instrument					
Function total	7.51 (5.98)	4.04 (3.32)	-2.95	1.25 to 5.70	0.003**
Upper extremity	6.70 (12.07)	5.76 (10.48)	0.36	-4.24 to 6.11	0.720
Basic lower extremity	12.07 (9.28)	7.01 (7.33)	2.63	1.22 to 8.90	0.010*
Advanced lower extremity	12.21 (10.85)	6.83 (12.77)	-2.20	-0.023 to 10.79	0.028*

Note: * $P<0.05$; ** $P<0.01$.

Abbreviations: CI, confidence interval; SD, standard deviation; LiFE, lifestyle and functional exercise.

functional gains than the structured exercise program currently in use in the agency's restorative home care services. The level of improvement on eight of the measures was also larger in the LiFE group. These are discussed in more detail below.

Dynamic balance in the LiFE group improved significantly more than in the structured exercise group. Having poor dynamic balance can contribute to a fear of falling, mobility restrictions, and fall injuries.³⁰ Improvements in dynamic balance are important, given that they would be expected to contribute to the older person regaining their independence and improving their confidence, and assist them to remain living in their home.

Improved balance confidence was also found in the LiFE group, because their ABC score was significantly better than in the structured exercise group. The LiFE group's confidence in undertaking more challenging activities, such as riding an escalator, walking through a crowded shopping center, and reaching for items up high within their home was markedly better. Myers et al³¹ suggest that an ABC score of 90%–100% is expected for a well older person, 50%–80% indicates a moderate level of physical functioning, and under 50% suggests a low level of physical functioning. Mean baseline scores for both groups (LiFE 56.37 ± 20.57 , structured 52.74 ± 21.72) show they were in the lower end of the moderate level of physical functioning; however, at 8-week post-testing, the LiFE group (77.52 ± 19.02) was close to the high level of functioning category compared with the structured exercise group (65.22 ± 23.73). Lajoie and Gallagher³² also advise that a score under 67% may show the older person is at risk of falling or be predictive of a fall in the future. The structured exercise group score was below this threshold, indicating that clients in this group may be at greater risk of a future fall than those in the LiFE group.

The Vitality Plus Scale was developed to measure potential health-related benefits of exercising for older people, that are often missing from other measures, such as improved sleep, higher energy levels, fewer aches and pains, and feeling "good".²⁴ Ongoing injury causing pain and feeling too old and tired to exercise have been identified as barriers to older home care clients being active.³³ The LiFE group displayed significantly greater improvement on this measure compared with the structured exercise group. Because pain and low energy are common experiences for older home care clients, participation in the LiFE program could well benefit all home care clients, not only those receiving a short-term restorative service. Further research is required to determine whether this is the case.

The LiFE group also showed better lower body function than the structured exercise group, and given that both exercise programs were lower body-dominant, this provides further support for our recommendation to the manager of the restorative home care services that the LiFE exercise program should be considered as an option for clients receiving their services.

Our recommendation of LiFE to the restorative home care service manager is also based on the similarity of the study sample to the larger restorative client population shown earlier, indicating that the findings are potentially generalizable to the larger population.

This study can be considered to have two limitations. The first is that the same researcher collected both the baseline and follow-up data and therefore was not blinded to group allocation. However, even if it had been possible to reduce the potential for observer bias through blinding, clients often had their exercise manual or exercise sheet with them and referred to how they were incorporating their exercises into their daily activities.

The second limitation was the smaller than desired sample size, which reduced the study's power to detect change in some of the outcome variables, such as the summary variable, which was trending towards change. The size of the sample was a direct consequence of the lower than expected number of clients being judged appropriate for an exercise program by the care managers during the recruitment period. This had also been an issue during the pilot study, when excessive paperwork associated with the trial and a higher than usual workload at the time of the pilot were identified as the main reasons.¹² The first issue was addressed by reducing the paperwork needed in the RCT and the second by discussing with the care managers whether for each of them to have eight new clients over the recruitment period on an exercise program would be achievable. They said it would, but this did not turn out to be the case. One of the risks of undertaking a pragmatic RCT in a service that has been operating for a number of years is that organizational structure and service changes may occur during the recruitment and data collection periods, which are beyond the control of the research team. This unfortunately was the case here, with a new service being introduced during the study period, with care managers being asked to act as mentors for the staff of the new service; a turnover of staff (including maternity leave) with new staff taking longer to be trained and recruit clients; and the reduction in workload expected after the pilot study not occurring. A number of strategies were tried to assist the care managers with these issues, but a proportion found their involvement

in the study too onerous and did not meet their recruitment targets. Although the sample size was smaller than originally calculated, the dropout rate was better than expected (5%, n=4 compared with 12%, n=15 expected), and in several instances the sample was still large enough for differences between the exercise programs to emerge.

Conclusion

Participating in a lifestyle exercise program is at least if not more effective for older restorative home care clients than undertaking a structured exercise program based on sets, repetitions, and volume. The LiFE group performed significantly better on 40% of the outcome measures. Health practitioners and health and community care organizations that work in services focused on functional improvement should consider the LiFE program for their older clients, particularly for those who suggest they have no extra time available in their day or do not like undertaking structured exercise programs.

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Disclosure

The authors report no conflicts of interest in this work.

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CHAPTER 9

Long-term Benefits of a Lifestyle Exercise Program for Older People Receiving a Restorative Home Care Service: A Pragmatic Randomized Controlled Trial

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Long-term Benefits of a Lifestyle Exercise Program for Older People Receiving a Restorative Home Care Service: A Pragmatic Randomized Controlled Trial

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ABSTRACT: Restorative home care services are short term, individualized programs aimed at maximizing an older person's ability to live independently and maintain their function. The services are made up of a number of components, including an exercise program to increase and maintain function of the older person. The aim of this study was to examine over the longer term, the effectiveness and maintenance of a (modified) lifestyle functional exercise program (LiFE) compared to the current, structured exercise program used in a restorative home care service. A pragmatic randomized controlled trial was employed with two study arms: LiFE (intervention) and a structured exercise program (control). Data were collected at baseline, post-intervention (eight weeks) and six months. No difference between the groups for exercise adherence was found. The LiFE group showed significantly better progress for 25% of the outcomes compared to the structured exercise group over the six months. Community and health care organizations delivering restorative home care services should consider this lifestyle exercise program for their clients. It is particularly appropriate for those older people who are not interested in structured types of exercise, those who will not keep using weights to offer resistance, or those who suggest they have limited time.

KEYWORDS: aging, physical activity, restorative home care services, rehabilitation

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Introduction

Population growth throughout the world has increased rapidly over the last few decades, and Australia, like many other Western countries, is looking at how best to address the challenges of population aging. Over one million older Australians receive home care services each year,¹ and that number is expected to rise as people aged 65 years and over are estimated to make up 23% of the Australian population by 2056, compared to 13% in 2007.² A similar circumstance is expected in other Western countries also.

Due to this projected increase in numbers, a new paradigm in home care services has been developed over the last

few decades, namely restorative home care services. These services are designed to "create independence, improve self-image and self-esteem, and reduce the level of care required" through the delivery of a multi-dimensional individualized program.³ Most restorative home care services are 6–12 weeks in length, delivered by allied health care professionals or specially trained home care staff and comprise a number of components to assist in regaining independence. The majority of restorative home care services have an exercise program included, as it is widely accepted that exercise helps improve strength, mobility and balance, which is vital for regaining and retaining independence and function.^{4–6}



Most exercise programs included in restorative home care services are structured in nature, requiring the older person to complete a set of exercises, a number of times per day and/or a number of times per week. However, research has shown that some home care clients prefer to be active through daily activities such as housework, walking to the shops and doing the gardening.⁷ Lifestyle exercise programs promote this type of activity because their aim is to incorporate exercise into the person's daily routine and not require additional specific exercise time in one's day. The intervention period of the randomized controlled trial (RCT), of which the present study is the longer-term follow-up, found the lifestyle functional exercise program to be as effective, and on 40% of the outcome measures, more effective at program end than the structured exercise program in increasing older restorative clients' function.⁸ However, the aim of restorative home care services is to assist the person in regaining and then maintaining their independence over the longer term, not only during the intervention period, in order to avoid needing home care services. Both groups involved in the RCT received support from the allied health professional (care manager) delivering their service, who encouraged and monitored adherence to the exercise programs during the service period. This contact ceased on discharge and the service did not follow up whether the exercises were continued longer term. Many physical activity programs have shown improvement during the supervised intervention phase,⁹ only to have the exercise program discontinued by the person over the longer term.¹⁰ This could result in loss of any previous functional gains made. It is therefore important to determine whether either exercise program (lifestyle or structured) in the RCT was continued over the longer term without additional support and whether there were subsequent functional gains or losses.

The aim of this study was to compare the effectiveness and maintenance of the two exercise programs at six month follow-up. The two hypotheses to be tested were that the lifestyle exercise program would:

1. Be undertaken more often (preferred more) compared to the structured exercise program, and
2. Result in greater functional gains,

at six month follow-up.

Method

Study design. The study presented here is a parallel pragmatic RCT in which the effectiveness of a lifestyle functional exercise program, called LiFE (intervention group) was compared with the current structured exercise program (control group), at six month follow-up. The exercise programs were delivered as components of a restorative home care service. The effectiveness of LiFE was demonstrated in a rigorous trial published by Clemson et al in 2012.¹¹ In this current study, we used a modified LiFE program, reducing the amount of participant training and follow up from the original protocol.

Details of recruitment and the study protocol have been published elsewhere.¹²

Participants & setting. The study participants included persons living in metropolitan Perth (Western Australia) who were referred between August 2011 and April 2012 for a restorative home care service and met the inclusion criteria. These criteria were: over 65 years of age, assessed by their care manager as needing an exercise program, not having a diagnosis of dementia or other progressive neurological disorders, and able to communicate in English.

Data were collected in the participants' homes and the exercise programs were undertaken either at home or different places visited during the week, such as the footpath. No equipment was required for either program.

Study procedures. Eighty clients were randomly assigned to either the lifestyle exercise group or the structured exercise group. Originally a sample of 150 (75 in each group) was calculated based on the assumptions: hypothesis tests at the 0.05 level, 12% attrition rate (found in the pilot study),¹³ and an 80% power to detect "medium" effects (0.5 standard deviation)¹⁴ in the primary outcome (summary score). Recruitment was slower than expected and a number of strategies were tried, including increasing the recruitment period from five to eight months, visiting the care managers regularly and suggesting other strategies (eg, a sport scientist delivering the exercise programs). These were of no avail, because of organizational and staff changes that could not have been predicted and had an irreversible effect. At the end of the recruitment period, 80 clients had been recruited and participated in the six month RCT.

Randomization was conducted by a senior researcher not involved in the study. Cases were randomly allocated using the (simple) random number generator in STATA version 10. The researcher who collected follow-up data was not blinded to group allocation.

After giving consent to be involved in the study, participants completed baseline data collection. This included demographic, falls history over the last six months and home care service data. Functional data collected were: Functional Reach,¹⁵ Chair Sit to Stand,¹⁶ Timed Up and Go¹⁷ and the tandem walk.¹⁸ Other data included: the Falls Efficacy Scale,¹⁹ Activities-specific Balance Confidence scale,²⁰ Vitality Plus scale,²¹ and the Late Life Function and Disability instruments.^{22,23} Measurements were administered at baseline, eight weeks (end of the intervention) and six months (four months post intervention).

Once baseline data collection was complete, the care manager delivering either exercise program was notified of whether their client was allocated to the intervention or control group, and asked to begin that program during their next visit. Care managers gave either a LiFE manual or the structured exercise program sheet and a calendar to each client. The clients were asked to tick each day they did the exercises and to keep this until the completion of the study (six months).



Exercise programs.

Lifestyle and Functional Exercise (LiFE) program (intervention). The LiFE program was developed to improve balance and increase strength in older community-dwelling people by embedding exercise into everyday activities.¹¹ It was also developed as a falls prevention exercise program.²⁴ Seven of the activities in the program are designed to challenge balance and six are for improving lower limb strength. Clients randomized to LiFE had the program and different exercises explained to them before they and the care manager discussed and agreed how they could incorporate the exercises into their personal daily routines. The care manager also gave them a manual explaining each of the exercises. Follow-up visits were used to monitor how the client was managing the initial exercises and to encourage them to begin doing others. Clients were visited three times on average during their restorative home care service and LiFE was just one aspect of the service that was discussed during these visits. As stated, this training and support for the implementation of modified LiFE was much less than in the original research.^{24,25}

Current structured exercise program (control). The current structured exercise program was established to prevent falls and was originally based on the Otago exercise program developed by Campbell and Robertson.²⁶ The restorative home care team, who deliver the program, have modified the Otago program over time, in response to client preferences. It no longer includes weights and, depending on the client's requirements, sometimes additional exercises are included. Participants allocated to the current structured exercise program were given a sheet (back and front) illustrating the exercises and indicating the number of times per day and number of days per week to complete them. Exercises were explained to the participants and reviewed during follow-up visits.

Data analysis. All data were analyzed using SPSS version 19. The summary variable used as the primary outcome measure was created using clients' Functional Reach, Chair Sit to Stand, Timed Up and Go and tandem walk scores.¹² Repeated measures analysis of variance (ANOVA) was performed to compare the within-group changes over time of each of the two groups (LiFE and structured exercise). Post hoc testing using a Bonferroni adjustment was used to identify within-group changes over time and differences between the groups at baseline, post-testing (eight weeks) and follow-up (six months). Results are reported as means and standard deviations, *F* values and *p*-values. Analyses were performed according to intention-to-treat (ITT) principle. A *p* value of < 0.05 was taken to indicate a statistically significant association. Data analysis was supervised by a statistician not involved in the study.

Ethics approval. Prior to the commencement of the study, ethics approval was obtained from the Curtin University and Silver Chain Human Research Ethics committees. The RCT was registered with the Australian and New Zealand Clinical Trials Registry, ACTRN12611000788976.

Results

Figure 1 shows the participant flow for this RCT. A total of 1,993 clients were referred to restorative home care service at Silver Chain between August 2011 and April 2012. Eighty clients randomized to the study were included in the ITT analysis. Baseline, end of the intervention post-testing and follow-up data were available for all participants who completed the study. However, there were two clients at baseline, five at post-intervention and eight clients at follow-up that were unable to complete the physical tests. This includes the seven clients that withdrew from the study during intervention and follow-up (see Fig. 1).

Baseline. The baseline demographics are summarized in Table 1. The average age of the LiFE clients was 80.2 years, compared to 79.6 years for the structured exercise group. More women (*n* = 66) than men (*n* = 14) were involved in the study and almost two-thirds of each group (LiFE: 60%; structured: 67.5%) lived alone. There were no significant differences found between the groups at baseline for any demographic, levels of dependency or outcome measures (see Table 2).

Restorative home care service population. During the recruitment period, 1993 clients received a restorative home care service from Silver Chain, the service provider. The demographics and dependency of the population were compared to the study clients. No significant differences were found between clients involved in the RCT and the general restorative home care population.⁸

Exercise adherence. Three quarters (*n* = 31) of the LiFE clients and 67.5% (*n* = 27) of the structured exercise group completed their daily calendars. LiFE clients undertook exercises on average 4.91 times per week during the intervention and 3.62 times per week during the four month follow-up period. Over the six months, they averaged 4.05 times per week. The structured exercise group exercised on average 4.42 times per week during the intervention period and 3.28 times per week during follow-up, giving an overall average of 3.66 times per week over six months. No significant difference was found between the groups for the number of times they exercised per week during the study.

Outcomes measured. The effects of the intervention on the functional outcome measures are outlined in Tables 2 and 3. A significant main effect of time was found for all measures. The majority of physical tests did not show a significant effect for the time \times group interaction. This was also true for the summary score, which incorporated the balance, strength and mobility scores into one variable. The LiFE group did, however, show significantly greater improvement than the structured exercise group for the tandem walk ($F(2, 132) = 4.491, p = .024$) and the number of errors ($F(2, 132) = 4.045, p = .025$) when completing the tandem walk (see Table 2).

The LiFE group also showed significantly better progress over time for the ABC score ($F(2, 142) = 4.136, p = .026$) and the Vitality Plus scale ($F(2, 142), 4.305, p = .016$) compared to the structured exercise group. Only one measure from the Late

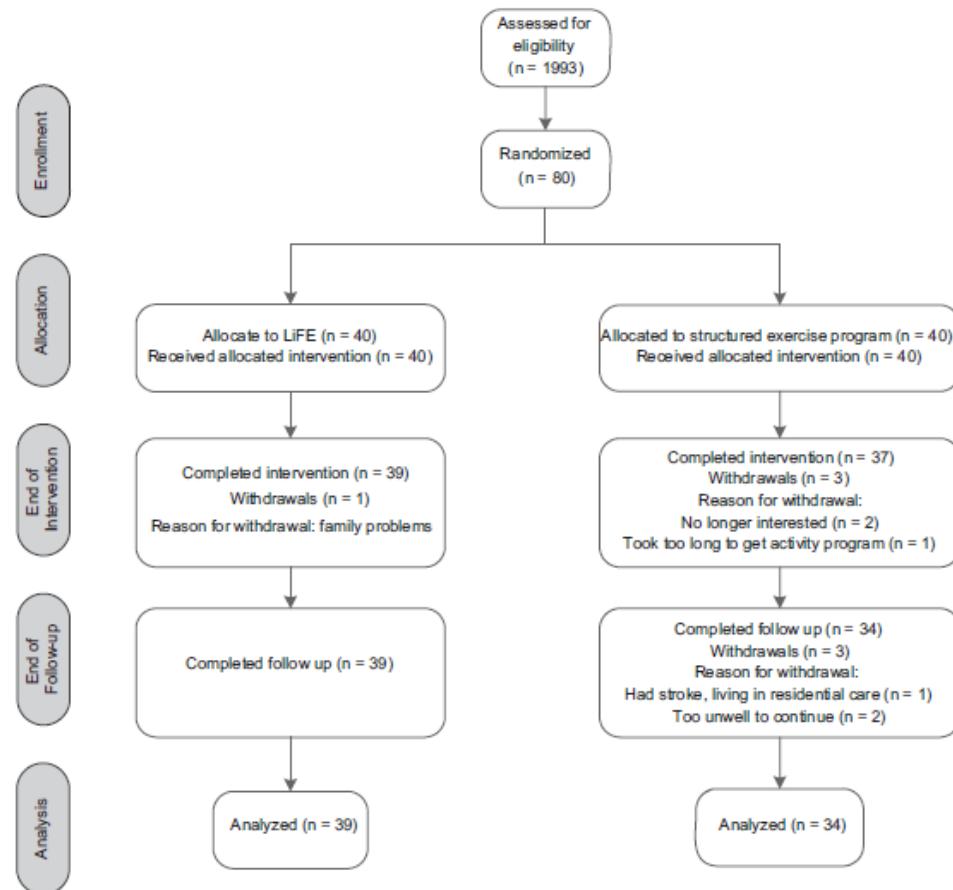


Figure 1. Participant flow through study.

Life Function and Disability instrument demonstrated a significant difference between the exercise groups over time; the LiFE group showed significantly greater improvement during the trial for basic lower extremity ($F(2, 142) = 6.680, p = .003$), which identifies lower limb ability (ie, strength and function). This measurement is based on tasks such as stair climbing, reaching overhead, standing from a low, soft couch and using a step stool.²²

Table 3 outlines the Bonferroni-adjusted pairwise comparisons for the five outcome measures that were significantly different between the groups. The LiFE group showed greater improvement in the tandem walk variables than the structured exercise group, particularly during the intervention period and between baseline and follow-up (see Fig. 2). Similar results were found for the Vitality Plus scale, with improvement by the LiFE group occurring during the intervention period and from baseline to follow-up. No significant improvement was evident

at any time point for the structured exercise group or from post-test to follow-up for the LiFE group. The ABC scale and the basic lower extremity measure showed significant improvement by both groups at the baseline to post-test and the baseline to follow-up time periods. Neither group improved enough between post-test and follow-up to show a significant change.

The number of health care services received at each data collection point was not significantly different between the exercise groups. There was also no difference in the number of falls each group had experienced in the six months before the study or during the six-month study period.

Discussion

This study was designed to compare the maintenance (exercise adherence) and effectiveness (functional gain) of a lifestyle exercise program and a structured exercise program when

Table 1. Demographics of the study.^a

VARIABLES	LIFE (n = 40)	STRUCTURED (n = 40)	P-VALUE
Age (yrs)			.659
Mean (SD)	80.2 (6.4)	79.58 (6.2)	
Gender			.077
Female	30 (75%)	36 (90%)	
Male	10 (25%)	4 (10%)	
Country of birth			.145
Australia (%)	19 (47.5%)	27 (67.5%)	
England (%)	11 (27.5%)	5 (12.5%)	
Other (%)	10 (25%)	8 (20%)	
Language			.305
English Speaking (%)	37 (92.5%)	39 (97.5%)	
Non-English Speaking (%)	3 (7.5%)	1 (2.5%)	
Carer availability			.431
Has a Carer (%)	11 (27.5%)	8 (20%)	
Has no Carer (%)	29 (72.5%)	32 (80%)	
Living arrangements			.485
Lives Alone (%)	24 (60%)	27 (67.5%)	
Lives with Family/Others (%)	16 (40%)	13 (32.5%)	
Levels of dependency	(N = 37)	(N = 37)	.614
Low	6 (16.2%)	4 (10.8%)	
Medium	17 (45.9%)	21 (56.8%)	
High	14 (37.8%)	12 (32.4%)	

Table 2. Outcomes at baseline, post-test (8 weeks), and follow-up (6 months).

MEASUREMENT	LIFE (N = 40)	STRUCTURED (N = 40)	TIME F	GROUP F (BETWEEN EFFECT)	TIME x GROUP F
Exercise undertaken each week					
During intervention period	4.91 ± 2.04	4.42 ± 2.56			
End of intervention to end of follow-up	3.62 ± 2.51	3.28 ± 2.99	22.205***	.190	.002
Total exercise over 6 months	4.05 ± 2.19	3.66 ± 2.71			
Summary score					
Baseline	-.160 ± 1.02	-.014 ± .75			
Post-test	-.712 ± .78	-.311 ± .74	39.276***	2.455	2.183
Follow-up	-.783 ± .82	-.449 ± .60			
Functional reach					
Baseline	22.74 ± 6.29	21.63 ± 4.56			
Post-test	24.74 ± 7.10	23.20 ± 6.52	4.215*	1.414	.398
Follow-up	24.85 ± 7.59	22.57 ± 6.51			
Sit to stand 1					
Baseline	3.74 ± 1.70	3.07 ± 1.15			
Post-test	3.38 ± 2.01	3.37 ± .89	13.458***	.014	.760
Follow-up	3.22 ± 2.30	3.11 ± .92			
Sit to stand 5					
Baseline	17.73 ± 7.16	17.31 ± 4.85			
Post-test	15.68 ± 6.31	16.90 ± 4.79	7.564**	.106	1.334
Follow-up	15.35 ± 6.34	15.83 ± 4.49			
Timed up & go					
Baseline	13.77 ± 4.40	16.57 ± 6.75			
Post-test	12.29 ± 3.66	14.40 ± 4.53	12.350***	4.679*	.807
Follow-up	12.24 ± 4.35	13.88 ± 4.36			

(continued)

**Table 2. (Continued)**

MEASUREMENT	LIFE (N = 40)	STRUCTURED (N = 40)	TIME F	GROUP F (BETWEEN EFFECT)	TIME x GROUP F
Tandem walk					
Baseline	19.98 ± 14.20	17.49 ± 7.91			
Post-test	12.01 ± 6.18	15.91 ± 8.77	17.011***	.659	4.491*
Follow-up	10.67 ± 3.11	14.16 ± 6.01			
Tandem walk errors					
Baseline	8.47 ± 4.14	9.5 ± 4.07			
Post-test	4.42 ± 4.43	8.27 ± 4.35	20.894***	9.727**	4.045*
Follow-up	4.18 ± 4.89	7.47 ± 4.57			
Falls efficacy scale					
Baseline	28.87 ± 14.31	28.82 ± 15.15			
Post-test	17.38 ± 9.33	21.79 ± 13.93	33.449***	1.486	1.995
Follow-up	16.41 ± 7.96	21.29 ± 14.38			
ABC scale					
Baseline	56.37 ± 20.57	52.74 ± 21.72			
Post-test	77.52 ± 19.02	65.22 ± 23.73	67.444***	3.882	4.136*
Follow-up	75.66 ± 19.56	64.77 ± 21.06			
Vitality plus scale					
Baseline	31.05 ± 7.81	30.03 ± 7.46			
Post-test	35.42 ± 8.13	31.91 ± 7.30	19.425***	3.032	4.305*
Follow-up	36.08 ± 8.79	31.66 ± 7.48			
LLFDI total disability					
Baseline	48.94 ± 5.70	49.02 ± 5.03			
Post-test	50.24 ± 5.07	50.79 ± 5.31	16.395 ***	.280	.252
Follow-up	51.89 ± 6.35	52.23 ± 6.24			
LLFDI social role					
Baseline	43.20 ± 8.49	44.96 ± 7.11			
Post-test	44.44 ± 8.12	45.27 ± 7.94	3.907*	.275	.744
Follow-up	45.67 ± 9.40	45.94 ± 8.49			
LLFDI personal role					
Baseline	56.02 ± 9.51	56.71 ± 9.61			
Post-test	60.13 ± 11.78	60.36 ± 12.28	28.415***	.002	.132
Follow-up	66.10 ± 15.09	65.52 ± 13.64			
LLFDI limitation					
Baseline	60.02 ± 9.57	58.19 ± 10.61			
Post-test	74.18 ± 11.53	68.85 ± 14.13	89.354***	2.584	1.156
Follow-up	78.99 ± 14.75	73.86 ± 15.56			
LLFDI instrumental role					
Baseline	58.22 ± 12.66	54.74 ± 11.76			
Post-test	74.97 ± 14.00	66.73 ± 15.78	88.76***	3.767	1.217
Follow-up	78.97 ± 15.96	73.35 ± 17.70			
LLFDI management role					
Baseline	77.69 ± 14.57	82.21 ± 16.75			
Post-test	88.88 ± 11.32	88.06 ± 12.78	28.245***	.073	2.438
Follow-up	91.31 ± 11.70	89.80 ± 14.71			
LLFDI function total					
Baseline	49.37 ± 6.88	47.11 ± 5.46			
Post-test	56.88 ± 8.41	51.20 ± 6.43	49.605***	6.385	3.152
Follow-up	57.00 ± 8.21	52.22 ± 11.15			
LLFDI upper extremity					
Baseline	67.37 ± 15.41	65.90 ± 13.41			
Post-test	74.07 ± 13.38	71.38 ± 11.60	14.681***	1.414	1.180
Follow-up	76.09 ± 13.16	70.54 ± 12.89			
LLFDI basic lower extremity					
Baseline	59.07 ± 11.27	55.73 ± 9.43			
Post-test	71.14 ± 13.53	62.59 ± 12.76	55.245***	7.740**	6.680**
Follow-up	73.64 ± 16.37	62.34 ± 13.37			
LLFDI advanced lower extremity					
Baseline	30.68 ± 13.59	22.75 ± 15.25			
Post-test	42.90 ± 15.39	30.09 ± 15.10	27.581***	8.294**	1.498
Follow-up	40.42 ± 17.91	31.35 ± 20.52			

Notes: P < *.05, **.01, ***.001.

Abbreviation: LLFDI, late life function and disability instrument.



Table 3. Bonferroni adjusted pairwise comparison.

VARIABLES	BASELINE – POST TEST		P VALUE
	P VALUE	BASELINE – FOLLOW-UP	
Tandem walk			
Time	.002**	<.001***	.013*
LiFE group	<.001***	<.001***	.040*
Current exercise group	1.00	.279	.269
Tandem walk errors			
Time	<.001***	<.001***	.681
LiFE group	<.001***	<.001***	1.00
Current exercise group	.388	.078	.638
ABC scale			
Time	<.001***	<.001***	.966
LiFE group	<.001***	<.001***	.729
Current exercise group	<.001***	<.001***	1.00
Vitality plus scale			
Time	<.001***	<.001***	1.00
LiFE group	<.001***	<.001***	1.00
Current exercise group	.068	.269	1.00
LLFDI basic lower extremity			
Time	<.001***	<.001***	.771
LiFE group	<.001***	<.001***	.199
Current exercise group	<.001***	.003**	1.00

Notes: p < .05*, p < .01**, p < .001***.

Abbreviation: LLFDI, late life function and disability instrument.

delivered as part of a restorative home care service. In terms of maintenance, no difference was found between groups in the frequency of exercising during follow-up. The LiFE group completed exercises marginally more frequently (4.05 times per week) than the older people with a history of falling who were involved in the Clemson et al¹¹ LiFE study (3.89 times per week). This was pleasing given our clients had fewer contacts with the care manager (number of visits = 3 over eight weeks) compared to those in the Clemson et al study (number of visits/calls = 9 over six months),¹¹ although Clemson et al's final score was taken at 12 months compared to six months for this study. Those in the structured exercise group maintained their exercises an average of 3.66 times per week over the six months, which was also a positive result given they were asked to complete them three times per day, every day, for the six-month study period. These results show that many restorative home care clients did maintain their exercises over the longer term, even after the service had ceased, and that both exercise programs have been shown to be appropriate and suitable for this population. However, the first hypothesis we tested, that the lifestyle exercise program would be undertaken more often and maintained over the duration of the study period more than the structured exercise program, did not receive any support.

The LiFE group showed significant improvement on a quarter of the outcome measures, whereas the structured exercise group did not show significant improvement on any measure. These results therefore support our second hypothesis that LiFE would result in greater functional gains than the structured exercise program during the maintenance period of the study. Improvement was seen in dynamic balance (tandem walk and errors made while completing tandem walk), increased confidence in completing challenging tasks without falling (ABC scale), improved health benefits from being active (Vitality Plus scale) and improved lower body function (Late Life Function instrument's basic lower body extremity measure) during the intervention period and from baseline to follow-up. Only the tandem walk showed significant improvement for the LiFE group between intervention post-testing and follow-up testing, compared to the structured exercise group.

The LiFE group was again found to show an improvement in the ABC score compared to the structured exercise group, as was the case during the intervention period study.⁸ The structured exercise group had a small decline in their ABC score between intervention and follow-up, subsequently maintaining a score below 67%, which according to LaJoie and Gallagher²⁷ means the older person may be at risk of falling or is predicted to fall in the future. The LiFE exercise group also

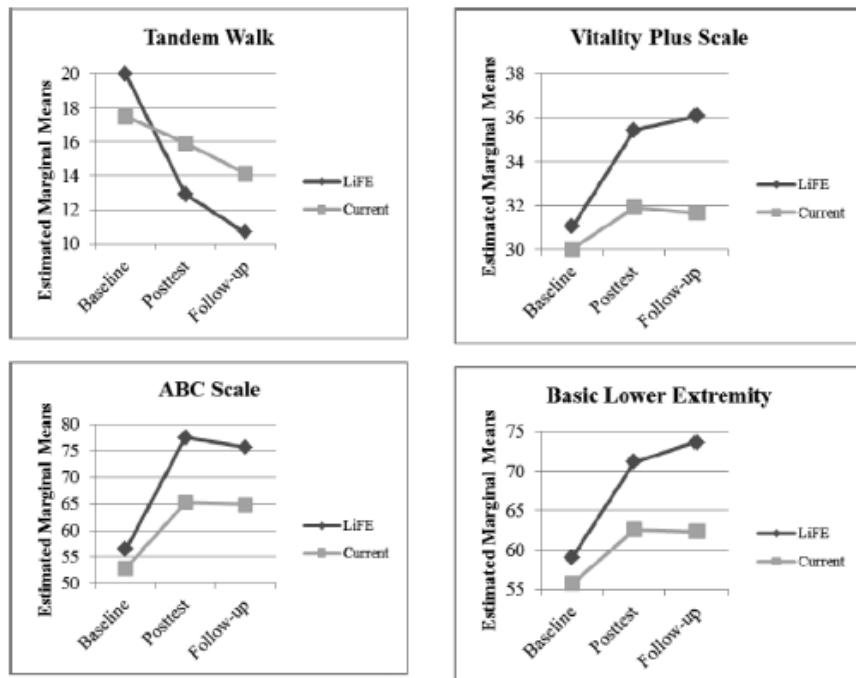


Figure 2. Changes in estimate means over time.

had a reduction in ABC score; however, they remained in the moderate level of physical functioning range.

Although the tandem walk was the only measure to show significant improvement during the maintenance phase (intervention post-testing to follow-up), 85% (17 out of 20) of the outcome measures for the LiFE group and 70% (14 out of 20) for the structured exercise group showed some improvement during this phase. Both exercise programs were therefore effective in assisting older people to maintain function for at least four months post intervention. However, given that the LiFE program showed better results over both the intervention and maintenance periods, it should be considered at the very least as an exercise program option within restorative home care services, if not as the exercise program of choice within that service. As the study sample was representative of the general restorative home care service population, there is support for the conclusion that the functional gains made by the LiFE study sample could be achieved by other restorative home care clients.

A methodological limitation within this study was the lack of blinding of the researcher collecting the follow-up data. An attempt was made to reduce the likelihood of observer bias by asking clients not to discuss their exercise program with the researcher during data collection visits. However, they often had their exercise manual or exercise sheet with them

and were keen to talk about how they were completing the exercises within their day.

The smaller than desired sample size may be considered a further limitation because it reduced the study's power to detect change in some outcome variables. The reduced sample size was a direct consequence of the lower than expected number of clients whose care plan included an exercise program by the care managers, and a number of organizational changes occurring during the recruitment period. Unfortunately, in undertaking a pragmatic RCT in a service that has been operating for a number of years, there is always the risk that organizational changes may occur during the recruitment and data collection periods that are beyond the control of the research team. This was the case, with the care managers being asked to work as mentors for staff of a new service; a turnover of staff (including maternity leave) with new staff taking longer to train and recruit clients; and the reduction in workload expected prior to the commencement of the RCT not occurring. A number of strategies were tried with the care managers, but unfortunately some found their involvement in the study too burdensome and therefore were unable to meet their recruitment targets. Although the sample size was smaller than originally calculated, the dropout rate was better than expected (8.75%, n = 7 compared to 12%, n = 15



expected), and in a number of instances the sample was still large enough for some differences between exercise programs to be found.

Conclusion

Our study is the first trial to examine the maintenance and effectiveness of a lifestyle exercise program compared to a structured exercise program being delivered to older people receiving a restorative home care service. The modified lifestyle exercise program, LiFE, was found to be significantly better on a quarter of the outcome measures even after service delivery had ceased. It is recommended that health and community care organizations delivering restorative home care services consider using LiFE as the exercise intervention, in particular with clients who are not interested in completing specific amounts of exercises each day or week, do not wish to use weights, or who suggest they have no time for exercise or being physically active.

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Author Contributions

Conceived and designed the experiments: EB, GL, LC. Analysed the data: EB. Wrote the first draft of the manuscript: EB. Contributed to the writing of the manuscript: EB, GL, LC, DB. Agree with manuscript results and conclusions: EB, GL, LC, DB. Jointly developed the structure and arguments for the paper: EB, GL. Made critical revisions and approved final version: EB, GL, LC, DB. All authors reviewed and approved of the final manuscript.

DISCLOSURES AND ETHICS

As a requirement of publication the authors have provided signed confirmation of their compliance with ethical and legal obligations including but not limited to compliance with ICMJE authorship and competing interests guidelines, that the article is neither under consideration for publication nor published elsewhere, of their compliance with legal and ethical guidelines concerning human and animal research participants (if applicable), and that permission has been obtained for reproduction of any copyrighted material. This article was subject to blind, independent, expert peer review. The reviewers reported no competing interests.

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CHAPTER 10

Conclusion and Recommendations

10.1 Introduction

Research has contributed to our better understanding the effect physical activity has on function, wellbeing and health of older people living in the community. As many of the world's populations increase in age, the need to stay healthy, to live independently and avoid assistance from family, health and community care organisations or medical care, is becoming increasingly more of a focus. Over a million Australians receive home care services currently, and this is expected to rise as older populations grow in number. Much research has been conducted exploring the effects of physical activity on older community dwelling people, yet physical activity levels continue to decline in this population. Less research is available on physical activity and older people receiving home care services.

This research investigated physical activity through quantitative and qualitative research methods, exploring and identifying factors related to participation, preference of activity, and effectiveness and maintenance of an activity program to promote functional independence for older people receiving a home care service. A number of conclusions and recommendations for future research and practice can be drawn from this research related to older home care clients.

10.2 Conclusions

10.2.1 Physical activity levels of older people receiving a home care service

The quantitative research outlined in Chapter 4 (Burton, Lewin, & Boldy, 2013b) showed: being younger; having better physical health; little or no trouble walking; and, not being depressed; were associated with home care clients being more active. It was found that older people who had received a short-term restorative home care

service were more physically active than those who had received traditional home care services, such as domestic assistance or personal care. It was also found that those older people who had returned to living independently, without the need for long-term assistance, used household chores and daily activities to remain physically active.

10.2.2 Motivations and barriers to being physically active for older home care clients

Chapter 5 (Burton, Lewin, & Boldy, 2013a), reported on the barriers and motivators to being physically active for older home care clients. Health/fitness, wellbeing, enjoyment and being socially involved with family and friends were the most commonly reported reasons why these older home care clients were physically active. Having an ongoing injury or illness and ‘feeling too old’, were the highest ranked barriers for older home care clients.

10.2.3 Suitability of a lifestyle activity program for delivery in a restorative home care service

In the pilot study it was found, and outlined in Chapter 6 (Burton, Lewin, Clemson, & Boldy, 2013a) that, with some modifications, such as reduced paperwork for both the client and care manager, that a lifestyle activity program (LiFE) could be delivered within a restorative home care service.

10.2.4 Effectiveness of a lifestyle exercise program for older people receiving restorative home care services

Chapter 7 (Burton, Lewin, Clemson, et al., 2013c) outlined the study protocol for the RCT which looked at the effectiveness of a lifestyle exercise program compared to

the current structured program included in the restorative home care services. Chapter 8 (Burton, Lewin, Clemson, & Boldy, 2013b) showed that the amount of activity undertaken by each of the groups was not significantly different but, that LiFE clients showed greater functional gains. Chapter 9 (Burton, Lewin, Clemson, & Boldy, 2014) described the results of the four month follow up which found no difference between the groups in terms of the level of activity during the follow up period. The LiFE group did however, show significantly greater gains on 25% of the outcome measures during this time; continuing the improvement from the intervention period of the study.

The results from the RCT confirmed the suitability of incorporating a lifestyle activity program into a short-term restorative home care service. It also demonstrated that clients who participated in this type of program were likely to show greater functional gains and have better balance confidence and efficacy outcomes than if they had participated in a structured exercise program.

10.3 Recommendations for Practice

10.3.1 Promotion of activity of choice for older home care clients

The promotion and delivery of physical activity and exercise programs in home care services in Australia is limited. There is overwhelming evidence that being active as a person ages delivers many benefits. Home care workers need to understand the importance of older people keeping active and to be strongly encouraged to promote exercise and being as physically active as possible, to all of their clients, as part of their role.

Agencies involved in promoting physical activity to older people, and specifically people receiving home care services, should include the promotion of domestic tasks and other everyday incidental activities as ways of maintaining or increasing activity levels. While many physical activity guidelines discuss the importance of undertaking household chores or gardening, this discussion is usually only found within the longer, less commonly read, version of the guidelines. These forms of activity need to be promoted more widely to our ageing population.

Health and community aged care organisations and their direct care staff, need to be aware of many older people's preference for gardening and household chores, rather than specific exercise programs, as a way of keeping active. Traditional home care services often limit a client's activity levels by taking over these chores. Home care organisations should consider providing short-term restorative home care services when clients are referred to provide them with the opportunity to maximise their function and ability to live independently. On-going home care services should only be provided if the individual still requires assistance after the restorative episode. This would be entirely consistent with the Living Longer Living Better aged care reforms which recommend the development of a range of restorative services across the country together with the adoption of a wellness/reablement approach to be utilised across all home care services.

10.3.2 Outcomes of the study

In April 2013, following completion of the RCT and follow up data collection, the findings and recommendations based on them, were presented in a report to management staff at Silver Chain. The report recommended that care managers

deliver the LiFE program, rather than the current exercise program, as part of their restorative home care service. This recommendation has subsequently been taken up and since May 2013, LiFE is the activity program used when increasing activity levels is one of the goals for the restorative home care service agreed between the client and the care manager.

During the period that the research being reported here has been undertaken, Silver Chain has developed and implemented a service model, and associated training, in which coordinators rather than health professionals deliver the HIP service to community referred home care clients. The Allied Health and nurse care managers provide mentoring and support to the HIP-Coordinators as well as continuing to deliver the PEP service to hospital referred clients. The HIP-Coordinators have been trained to deliver LiFE within the HIP restorative home care service and this change in policy occurred in September 2013.

10.4 Recommendations for Future Research

This research has highlighted certain areas that require further investigation.

10.4.1 Subgroups of older home care clients

In order to maximise the potential effectiveness of an exercise program for home care clients it is important to understand the types of barriers and motivators to exercise, as well as the preferences for particular types of activity that are common within the home care client population. My first study, described in Chapter 4, used the PASE survey results to identify the type of exercise the particular cohort of older

home care clients enjoyed. A more in-depth study exploring activity patterns and preferences in different groups and age cohorts of home care clients is needed.

The mixed method study in Chapter 5, designed to identify the barriers and motivators to being more physically active for older home care clients, excluded clients with poor English and those who had been diagnosed with dementia. Given the known benefits of physical activity for older people in general, as well as for those with dementia in particular, it is just as important that we understand what motivates or discourages these groups of home care clients from exercising so that they too are given the opportunity to participate in activity programs that are tailored for maximal impact.

10.4.2 Use of accelerometers with the home care population

Accelerometers are used in many types of research to determine energy expenditure and in some cases step counts for people of all ages. The accelerometer can measure movements through all axial planes and given these measures they can provide more valid data than self-report measures if used correctly. Accelerometers were trialled with this population during the pilot study (Chapter 6) and found not to be suitable, due to poor compliance and causing pain. However, the sample size was small. Further research is needed with a larger sample of home care clients to determine whether the use of accelerometers could in fact be worthwhile and provide valid and reliable data for this population.

10.4.3 Exercise programs for home care clients

Currently, few home care services offer exercise programs to their clients. To slow or reduce the decline in function of older people receiving traditional home care services rather than short term restorative home care services, research is needed to determine:

1. strategies that assist older home care clients receiving traditional home care services to increase their activity levels and improve their strength and balance
2. whether delivering an exercise program can fit within the current funding frameworks of traditional home care services
3. whether exercise programs can be effective in maintaining or improving function for older people receiving traditional home care services to assist them to live in their homes longer and require less care
4. how long an increase in exercise output, or the initiation of activity delivered through traditional home care service use, are maintained by clients, and
5. the role of non-allied health staff in promoting exercise programs to home care clients.

This is the first study to examine the comparative effectiveness of a lifestyle exercise program and a structured exercise program when delivered within a restorative home care service. As a consequence of the study findings it is recommended that organisations delivering short-term restorative home care services consider using LiFE as the exercise intervention, particularly with clients who do not like undertaking structured exercise, do not like using or cannot afford weights, or those who suggest they have no extra time to fit in an exercise program.

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Appendix A: List of Conference Presentations

Conference Presentations

Burton, E., Lewin, G., & Boldy, D. Barriers and motivators to physical activity in older home care clients, for *Emerging Researchers in Ageing Conference*, 21-22 October 2010, Newcastle, New South Wales, Oral Presentation.

Burton, E., Lewin, G., & Boldy, D. Barriers and motivators to physical activity in older home care clients, for *43rd National Conference for the Australian Association of Gerontology*, 17-19 November 2010, Hobart, Tasmania. Published in *Australasian Journal on Ageing*, 2010, Vol. 29 (S2), p. 52. Oral Presentation.

Burton, E., Lewin, G., Boldy, D. Barriers, motivators and life experiences of physical activity for older home care clients, for *Australian Conference of Science and Medicine in Sport*, 19 - 22 October 2011, Fremantle, Western Australia, Oral Presentation.

Burton, E., Lewin, G., Clemson, L. Using a lifestyle exercise program to improve functioning in older people receiving a restorative care service: a pilot study, for *Ninth Asia/Oceania Regional Congress of Gerontology and Geriatrics Conference*, 23-27 October 2011, Melbourne, Victoria, (P127, page 259), Poster Presentation.

Burton, E., Lewin, G., Boldy, D. Using a lifestyle exercise program to improve functioning in older people receiving a restorative care service: a pilot study, for *Curtin Health Innovation Research Institute Inaugural Conference*, 24 November 2011, Perth, Western Australia, Oral Presentation.

Burton, E., Lewin, G., & Boldy, D. Barriers, motivators and life experiences of physical activity for older home care clients, for *World Congress on Active Ageing*, 14-17 August 2012, Glasgow, Scotland, Poster Presentation.

Burton, E., Lewin, G., Clemson, L., & Boldy, D. Lifestyle exercise program to improve functioning in older people receiving a restorative care service: A pilot study, for *World Congress on Active Ageing*, 14-17 August 2012, Glasgow, Scotland, Poster Presentation.

Burton, E., Lewin, G., Clemson, L., & Boldy, D. Physical activity programs for older people receiving a restorative home care service, which is more effective? For the *4th International Congress on Physical Activity and Public Health* ‘Active futures – Evidence informing change’, October 31-November 3, 2012, Sydney, Australia, Poster Presentation.

Burton, E., Lewin, G., Clemson, L., & Boldy, D. Improving function of older people receiving a restorative care service, for *2012 Curtin Health Innovation Research Institute Conference*, 8-9 November 2012, Perth Western Australia, Oral Presentation.

Burton, E., Lewin, G., Clemson, L., & Boldy, D. Improving function of older people receiving a restorative care service, for *45th Australian Association of Gerontology National Conference*, 20-23 November 2012, Brisbane, Queensland, Oral Presentation.

Burton, E., Lewin, G., Clemson, L., & Boldy, D. Effectiveness of a lifestyle exercise program for older restorative home care clients, for *2013 Gerontological Society of America Annual Scientific Meeting*, 20-24th November 2013, New Orleans, United States of America, Poster Presentation.

Appendix B: Stage 1: Exercisers and Non-Exercisers Interview Guide

INTERVIEW GUIDE

Physical Activity in Home Care Clients

Prior to commencement of interview:

- Explain purpose of study overall & of interviews
 - Stress confidentiality, no right/wrong answers etc
 - Permission to tape record
 - Ask if any questions
 - Consent form – sign
-

Explore questions in each section in accordance with respondents' answers; Refer to questionnaire as appropriate

EXERCISERS

1. You noted in the questionnaire that you participate in (name the activities) what are your reasons for being involved?

2. Were you physically active as a child and through your young adult years?
 - a. If yes what activities?
 - b. How often did you do these (per week)?
 - c. Why were you involved?

3. Were your parents physically active as you grew up?
 - a. If yes what activities?
 - b. How often?
 - c. Were you active as a family?

4. You mentioned a number of things helped keep you physically active, can we discuss these in more detail? Ask about each factor from questionnaire question 18

5. You also mentioned a number of reasons that were stopping you becoming active could we discuss these in more detail? Ask about each factor from questionnaire question 19

6. How important do you think being physically active is?
 - a. Why?

INTERVIEW GUIDE

Physical Activity in Home Care Clients

Prior to commencement of interview:

- Explain purpose of study overall & of interviews
 - Stress confidentiality, no right/wrong answers etc
 - Permission to tape record
 - Ask if any questions
 - Consent form – sign
-

Explore questions in each section in accordance with respondents' answers; Refer to questionnaire as appropriate

NON-EXERCISERS

1. You noted in the questionnaire that you don't participate in physical activities what are your reasons for not being involved?

2. Were you physically active as a child and through your young adult years?
 - a. If yes what activities?
 - b. How often did you do these (per week)?
 - c. Why were you involved?
 - d. If no why weren't you involved?

3. Were your parents physically active as you grew up?
 - a. If yes what activities?
 - b. How often
 - c. Were you active as a family?

4. You mentioned a number of things helped keep you physically active, can we discuss these in more detail? Ask about each factor from questionnaire question 18

5. You mentioned a number of reasons that were stopping you becoming active could we discuss these in more detail? Ask about each factor from questionnaire question 19
 - a. How important do you think being physically active is? Why?

Questions may be added or adjusted once quantitative data has been analysed

Appendix C: Stage 1 Questionnaire

Physical activity questionnaire

Physical activity in home care clients

About this survey: It is well known that physical activity can help improve a person's health and well-being. However, we do not know how much physical activity Silver Chain's home care clients undertake each week and if you are not able to exercise we would like to find out the reasons for this. This study will help to develop strategies that will help Silver Chain home care clients begin or remain physically active and improve their health and well-being.

Completing this survey: Please tick the most appropriate responses or write in the space provided.

Returning this survey: Please return your completed survey to Curtin University's Centre for Research on Ageing in the envelope provided by **6 April 2010**.

SECTION 1		Leisure time activities			
1 Over the past 7 days, how often did you participate in sitting activities such as reading, watching TV or doing handicrafts?		Never <input type="checkbox"/> 0 (go to question 2)	Seldom (1–2 days) <input type="checkbox"/> 1	Sometimes (3–4 days) <input type="checkbox"/> 2	Often (5–7 days) <input type="checkbox"/> 3
What were these activities? <input type="text"/>					
On average, how many hours per day did you engage in these sitting activities on these days ? Less than <input type="checkbox"/> 1 hour 1 but less <input type="checkbox"/> than 2 hours 2–4 hours <input type="checkbox"/> 3 More <input type="checkbox"/> 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?		Never <input type="checkbox"/> 0 (go to question 3)	Seldom (1–2 days) <input type="checkbox"/> 1	Sometimes (3–4 days) <input type="checkbox"/> 2	Often (5–7 days) <input type="checkbox"/> 3
On average, how many hours per day did you spend walking on these days ? Less than <input type="checkbox"/> 1 hour 1 but less <input type="checkbox"/> than 2 hours 2–4 hours <input type="checkbox"/> 3 More <input type="checkbox"/> than 4 hours					
3 Over the past 7 days, how often did you engage in light sport or recreational activities such as 'light' cycling on an exercise bike, lawn bowls, bowling, water aerobics, golf in a motorised cart, yoga, tai chi, fishing from a boat or jetty or other similar activities?		Never <input type="checkbox"/> 0 (go to question 4)	Seldom (1–2 days) <input type="checkbox"/> 1	Sometimes (3–4 days) <input type="checkbox"/> 2	Often (5–7 days) <input type="checkbox"/> 3
What were these activities? <input type="text"/>					
On average, how many hours per day did you engage in these light sport or recreational activities on these days ? Less than <input type="checkbox"/> 1 hour 1 but less <input type="checkbox"/> than 2 hours 2–4 hours <input type="checkbox"/> 3 More <input type="checkbox"/> than 4 hours					

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

Never 0 (go to question 5) Seldom 1 (1–2 days) Sometimes 2 (3–4 days) Often 3 (5–7 days)

What were these activities?

On average, how many hours per day did you engage in these moderate sport or recreational activities **on these days**?

Less than 1 hour 1 but less 2 than 2 hours 2–4 hours 3 More than 4 hours 4

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 or other similar activities?

Never 0 (go to question 6) Seldom 1 (1–2 days) Sometimes 2 (3–4 days) Often 3 (5–7 days)

What were these activities?

On average, how many hours per day did you engage in these strenuous sport or recreational activities **on these days**?

Less than 1 hour 1 but less 2 than 2 hours 2–4 hours 3 More than 4 hours 4

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

Never 0 (go to question 7) Seldom 1 (1–2 days) Sometimes 2 (3–4 days) Often 3 (5–7 days)

What were these activities?

On average, how many hours per day did you engage in exercise to increase muscle strength/endurance **on these days**?

Less than 1 hour 1 but less 2 than 2 hours 2–4 hours 3 More than 4 hours 4

SECTION 2

Household activities

7 During the past 7 days:

a Have you done any light housework such as dusting or washing up?

No 1 Yes 2

b Have you done any housework or chores such as vacuuming, scrubbing floors, washing windows or carrying wood?

No 1 Yes 2

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

a Home repairs like painting, wallpapering, electrical etc.

No 0 Yes 1

b Lawn work or garden care incl. leaf removal, wood chopping etc.

No 0 Yes 1

c Outdoor gardening

No 0 Yes 1

d Caring for another person such as a dependent child, dependent spouse or another adult

No 0 Yes 1

Physical activity questionnaire		3																		
SECTION 3																				
9 During the past 7 days did you work for pay or as a volunteer?	<p>No <input type="checkbox"/> Yes <input type="checkbox"/> </p> <p>(go to question 10)</p> <p>How many hours per week did you work for pay and/or as a volunteer? <input type="text"/> hours</p> <p>Which of the following categories best describes the amount of physical activity required on your job and /or volunteer work?</p> <ul style="list-style-type: none"> <input type="checkbox"/> 1 Mainly sitting with light arm movement (e.g. office work, watch maker, seated assembly line worker, bus driver etc.) <input type="checkbox"/> 2 Sitting or standing with some walking (e.g. cashier, general office worker, light tool and machinery worker) <input type="checkbox"/> 3 Walking with some handling of materials generally weighing less than 25 kgs (e.g. mailman, waitress, construction worker, heavy tool and machinery worker) <input type="checkbox"/> 4 Walking and heavy manual work often requiring handling of materials weighing over 25 kgs (e.g. farmer or general labourer) 																			
10 Were the past 7 days similar to a typical week for you?	<p>Yes <input type="checkbox"/> No <input type="checkbox"/> </p> <p>How was it different? <input type="text"/></p>																			
SECTION 4																				
11 In general, would you say your health is:	<p>Excellent <input type="checkbox"/> 1 Very good <input type="checkbox"/> 2 Good <input type="checkbox"/> 3 Fair <input type="checkbox"/> 4 Poor <input type="checkbox"/> 5</p>																			
12 The following items are about activities you might do during a typical day:	<p>Does your health now limit you in these activities, if so how much?</p> <table border="0"> <tr> <td>a Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf</td> <td><input type="checkbox"/> 1</td> <td><input type="checkbox"/> 2</td> <td><input type="checkbox"/> 3</td> </tr> <tr> <td>b Climbing several flights of stairs</td> <td><input type="checkbox"/> 1</td> <td><input type="checkbox"/> 2</td> <td><input type="checkbox"/> 3</td> </tr> </table>		a Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	b Climbing several flights of stairs	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3										
a Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3																	
b Climbing several flights of stairs	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3																	
13 During the past 4 weeks, how much of the time have you had any of the following problems with your work or other regular daily activities as a result of your physical health?	<table border="0"> <tr> <td></td> <td>All of the time</td> <td>Most of the time</td> <td>Some of the time</td> <td>A little of the time</td> <td>None of the time</td> </tr> <tr> <td>a Accomplished less than you would like</td> <td><input type="checkbox"/> 1</td> <td><input type="checkbox"/> 2</td> <td><input type="checkbox"/> 3</td> <td><input type="checkbox"/> 4</td> <td><input type="checkbox"/> 5</td> </tr> <tr> <td>b Were limited in the kind of work or other activities</td> <td><input type="checkbox"/> 1</td> <td><input type="checkbox"/> 2</td> <td><input type="checkbox"/> 3</td> <td><input type="checkbox"/> 4</td> <td><input type="checkbox"/> 5</td> </tr> </table>			All of the time	Most of the time	Some of the time	A little of the time	None of the time	a Accomplished less than you would like	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	b Were limited in the kind of work or other activities	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
	All of the time	Most of the time	Some of the time	A little of the time	None of the time															
a Accomplished less than you would like	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5															
b Were limited in the kind of work or other activities	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5															
14 During the past 4 weeks, how much of the time have you had any of the following problems with your work or other regular daily activities as a result of any emotional problems (such as feeling depressed or anxious)?	<table border="0"> <tr> <td></td> <td>All of the time</td> <td>Most of the time</td> <td>Some of the time</td> <td>A little of the time</td> <td>None of the time</td> </tr> <tr> <td>a Accomplished less than you would like</td> <td><input type="checkbox"/> 1</td> <td><input type="checkbox"/> 2</td> <td><input type="checkbox"/> 3</td> <td><input type="checkbox"/> 4</td> <td><input type="checkbox"/> 5</td> </tr> <tr> <td>b Did work or other activities less carefully than usual</td> <td><input type="checkbox"/> 1</td> <td><input type="checkbox"/> 2</td> <td><input type="checkbox"/> 3</td> <td><input type="checkbox"/> 4</td> <td><input type="checkbox"/> 5</td> </tr> </table>			All of the time	Most of the time	Some of the time	A little of the time	None of the time	a Accomplished less than you would like	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	b Did work or other activities less carefully than usual	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
	All of the time	Most of the time	Some of the time	A little of the time	None of the time															
a Accomplished less than you would like	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5															
b Did work or other activities less carefully than usual	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5															

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

Not at all 1 A little bit 2 Moderately 3 Quite a bit 4 Extremely 5

16 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:

All of the time	Most of the time	Some of the time	A little of the time	None of the time
-----------------	------------------	------------------	----------------------	------------------

a Have you felt calm and peaceful 1 2 3 4 5

b Did you have a lot of energy 1 2 3 4 5

c Have you felt downhearted and blue 1 2 3 4 5

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

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

18 What reasons encourage you to be physically active, or would encourage you to become physically active?

Tick as many as appropriate

Health/fitness 1 Social/family 4 Transport 7

Well-being 2 Weight loss 5 Walking the dog 8

Enjoyment 3 Competition/challenge 6

Other (please specify)

19 Would you say that you are physically active?

Yes 1 No 2 **What do you feel is stopping you from becoming physically active?** Tick as many as appropriate

Age/too old 1 Lack of transport 7

Ongoing injury/illness 2 Not enough time due to work 8

Temporary injury/illness 3 Not enough time due to family 9

Other injury/illness 4 Nobody to be physically active with 10

Not interested 5 Nowhere to be physically active 11

Cost 6 Don't know how to be physically active 12

Other (please specify)

20 In terms of your general well-being:

a Do you often get bored? Yes 1 No 2

b Do you often feel helpless? Yes 1 No 2

c Do you prefer to stay at home rather than going out and doing new things? Yes 1 No 2

d Do you feel pretty worthless the way you are now? Yes 1 No 2

e Are you basically satisfied with your life? Yes 1 No 2

Physical activity questionnaire		5
21	How often do you feel:	Hardly ever Some of the time Often
	a That you lack companionship	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3
	b Left out	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3
	c Isolated	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3
22	Would you say that you	Always <input type="checkbox"/> 1 Often <input type="checkbox"/> 2 Sometimes <input type="checkbox"/> 3 Never <input type="checkbox"/> 4 feel lonely feel lonely feel lonely feel lonely
SECTION 5		A little about you
23	In which year were you born?	19 <input type="checkbox"/> <input type="checkbox"/>
24	Sex	Male <input type="checkbox"/> 1 Female <input type="checkbox"/> 2
25	What is your current marital status?	Never married <input type="checkbox"/> 1 Married/De facto <input type="checkbox"/> 2 Widowed <input type="checkbox"/> 3 Separated/divorced <input type="checkbox"/> 4 Other (please specify) <input type="checkbox"/> 5 <input type="text" value=" "/>
26	What kind of area do you live in?	Metropolitan suburb <input type="checkbox"/> 1 Inner city <input type="checkbox"/> 2 Country town <input type="checkbox"/> 3 Other rural <input type="checkbox"/> 4
27	What was the highest level of education you gained?	University degree(s) <input type="checkbox"/> 1 TAFE course(s) <input type="checkbox"/> 2 Completed high school <input type="checkbox"/> 3 Finished before the end of high school <input type="checkbox"/> 4
28	What best describes your housing situation?	Own your own home without a mortgage <input type="checkbox"/> 1 Own your own home with a mortgage <input type="checkbox"/> 2 Rent privately <input type="checkbox"/> 3 Rent state housing authority <input type="checkbox"/> 4 Live in a retirement village <input type="checkbox"/> 5 Other (please specify) <input type="checkbox"/> 6 <input type="text" value=" "/>

29 Do you live:

- Alone 1
 With spouse /partner 2
 With children 3
 With other family members 4
 With someone else 5
 Other (please specify) 6

30 Are any of the people who live with you dependent on you for daily living activities?

No 1 Yes 2 Not applicable 0

31 What is your employment situation?

Full time 1 Part time 2 Self-funded retiree 3 Retired on a pension 4
 Part-pension/part-self-funded retiree 5
 Other (please specify)

32 Which of the following best describes your use of cigarettes?

- Never smoked cigarettes at all, or never smoked them regularly 1
 Do not smoke now but used to smoke regularly (one or more per day) 2
 Occasionally smoke (on average less than one per day) 3
 Currently smoke cigarettes regularly (more than one per day) 4

33 In the past 12 months have you suffered from any of the following:

- a** Asthma Yes 1 No 2
b Cancer Yes 1 No 2
c Diabetes or high sugar levels Yes 1 No 2
d Heart or circulatory conditions Yes 1 No 2
e Musculoskeletal conditions (arthritis, osteoporosis, osteopenia) Yes 1 No 2
f Mental health disorder Yes 1 No 2
g Other (please specify)

34 Physical statistics

Height:

 ft/in

OR

 m/cm

Weight:

 stone/lbs

OR

 kg

Physical activity questionnaire**7**

35 Which of the following best describes your current mobility?

- | | |
|---|----------------------------|
| No trouble walking | <input type="checkbox"/> 1 |
| Some trouble walking but don't use any kind of aid | <input type="checkbox"/> 2 |
| You need a walking stick or frame to walk outside your home | <input type="checkbox"/> 3 |
| You use a walking stick or frame to walk inside your home | <input type="checkbox"/> 4 |
| You use a wheel chair inside your home | <input type="checkbox"/> 5 |
| Other (please specify) | <input type="text"/> 6 |

36 Please tell us about the home care services you have access to

	Is this service provided where you live?	Do you use it?	How often?
Housekeeping services	No <input type="checkbox"/> 1	Yes <input type="checkbox"/> 2	No <input type="checkbox"/> 1 Yes <input type="checkbox"/> 2 <input type="text"/> times per week
Meals	No <input type="checkbox"/> 1	Yes <input type="checkbox"/> 2	No <input type="checkbox"/> 1 Yes <input type="checkbox"/> 2 <input type="text"/> times per week
Registered nurse available 24hrs a day	No <input type="checkbox"/> 1	Yes <input type="checkbox"/> 2	No <input type="checkbox"/> 1 Yes <input type="checkbox"/> 2 <input type="text"/> times per week
Personal care services (i.e. assistance with dressing or bathing)	No <input type="checkbox"/> 1	Yes <input type="checkbox"/> 2	No <input type="checkbox"/> 1 Yes <input type="checkbox"/> 2 <input type="text"/> times per week
Social activities	No <input type="checkbox"/> 1	Yes <input type="checkbox"/> 2	No <input type="checkbox"/> 1 Yes <input type="checkbox"/> 2 <input type="text"/> times per week
Physical activities or exercise time	No <input type="checkbox"/> 1	Yes <input type="checkbox"/> 2	No <input type="checkbox"/> 1 Yes <input type="checkbox"/> 2 <input type="text"/> times per week

37 When you received services from Silver Chain were you encouraged to be more physically active?

- | | | | |
|-------------------------------|---|--------------------------------|--|
| No <input type="checkbox"/> 1 | Can't remember <input type="checkbox"/> 2 | Yes <input type="checkbox"/> 3 | Were you given an exercise program? |
| | | No <input type="checkbox"/> 1 | Can't remember <input type="checkbox"/> 2 |
| | | | Yes <input type="checkbox"/> 3 |

SECTION 6

We would like to conduct a small number of interviews to discuss further your ideas about being physically active. We are hoping to hear from a range of people, including those who like being physically active and those that don't.

Optional section

38 Please tick as appropriate

- | | |
|----------------------------|---|
| <input type="checkbox"/> 1 | I prefer not to have any further involvement in the study |
| <input type="checkbox"/> 2 | I am interested in participating in an interview |

If you would like to be considered for an interview could you please complete the details below:

First name	<input type="text"/>
Surname	<input type="text"/>
Daytime phone number	<input type="text"/>
Mobile number	<input type="text"/>
Address	<input type="text"/>

References

This survey was developed using the following validated tools.

Questions 1–9: PASE Survey

© Copyright 1991 New England Research Institutes Inc, 9 Galen Street, Watertown, MA 02472. New England Research Institutes. (1991) *PASE Physical Activity Scale for the Elderly Administration and Scoring Instruction Manual*. Watertown, MA: New England Research Institutes, Inc.

Questions 11–17: SF-12 Health Survey

Ware J et al. (2002) How to score version 2 of the SF-12 Health Survey: Quality Metric Inc.

Question 20: Geriatric Depression Scale-5

Rinaldi P, Mecocci P, Benedetti C, Ercolani S, Bregnocci M, Menculini G, Catani M, Senin U, Cherubini A. (2003) *Validation of the five-item geriatric depression scale in elderly subjects in three different settings*, JAGS, 51, p. 694–698.

Question 21: Hughes ME, Waite LJ, Hawkley LC & Cacioppo JT. (2004) 'A short scale for measuring loneliness in larger surveys: Results from two population-based studies', *Research on Aging*, 26, p. 655.

Question 22: Victor CR, Scambler SJ, Shah S, Cook DG, Harris T, Rink E & De Wilde S. (2002) 'Has loneliness amongst older people increased? An investigation into variations between cohorts'. *Ageing & Society*, 22, p. 585–597.

Appendix D: PASE Contract

From: media@neriscience.com
Sent: Monday, 8 February 2010 3:38 PM
To: Elissa Burton
Cc: FTighe@neriscience.com
Subject: Order Payment Confirmation

This e-mail is to confirm payment for using Physical Activity Scale for the Elderly (PASE Instrument). Thank you for your order. You can access a master copy of the instrument and the associated coding manual at our download site. You can access the download site at:

<http://products.neriscience.com/download/downloadStart.html>
Below are your user name and password.

User Name: E.Burton@curtin.edu.au
Password: 8UTJ6HHJT

Your user name and password will be valid for 30 days from the date of payment (Wed Mar 10 02:36:01 EST 2010).

Appendix E: SF-12 version 2® Health Survey License Agreement



NON-COMMERCIAL LICENSE AGREEMENT

Office of Grants and Scholarly Research (OGSR)

License Number: CT127760 / OP009055

Effective Date: September 1, 2010

Licensee Name: Elissa Burton, Curtin University

Licensee Address: 7 Parker Place
Bentley, Western Australia 6062
Australia

Requested Administrations: 1,500

Approved Use: Non-commercial academic research - unfunded – "Physical Activity and Older Home Care Clients Receiving a Restorative Service"

Term: Beginning on September 6, 2010 and ending on September 5, 2011

Licensed Surveys: As indicated in Appendix B attached

Manuals: Licensee must purchase (or have purchased) from QM a copy of the manuals indicated in Appendix B attached

Royalty Fee: None, because this License is granted in support of the non-commercial Approved Use below

Administrative Fee: \$150.00 USD

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Elissa Burton, Curtin University
7 Parker Place
Bentley, Western Australia 6062
Australia

Signature: EJB
Name: ELISSA BURTON
Title: PhD Student

➤ For additional information about QM's OGSR , go to <http://www.qualitymetric.com/advancing/> <

APPENDIX A

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Notices, copies of notices or other communications shall be sent to a party at the address set forth on the first page of this Agreement. All notices shall be effective upon delivery of the notice at such address.

Any waiver of any breach or default under this Agreement must be in writing and shall not be deemed a waiver of any other or subsequent breach or waiver. Failure to delay by either party to enforce compliance with any term or condition of this Agreement shall not constitute a waiver of such term or condition.

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This Agreement may be executed in multiple counterparts, each of which shall be deemed an original and all of which shall be deemed the same agreement

* * *

APPENDIX B

QUALITYMETRIC LICENSE (OGSR) - LICENSED SURVEYS AND MANUALS

Attached to and Incorporated into QM - SLA - OGSR - 09-2008.doc

Licensed Surveys and Approved Languages

SF-12v2® Health Survey – Standard Recall

Australia (English)

NO formatting or editing changes to the survey: (Very Important - Please Read)

In order to obtain licensing from Licensor no changes can be made to the survey forms. Any format and/or language changes have the potential to affect the survey data received. Therefore, to maintain the validation and integrity of the SF Health Surveys, **no language or formatting changes** are allowed. The format of the survey was scientifically engineered to facilitate accurate and unbiased data, as well as keeping the SF Health Survey in a visual format that is comprehensible to the patient/participant, including those who may be impaired and/or elderly. **You should administer the survey in the exact format you will receive it in.** The only item Licensee may add is a header with patient identification and / or administration information. If you do wish to add a header please ask for a sample copy of the survey to edit and then submit this to your Account Representative for review prior to signing this License Agreement. Other than this, Licensor can not guarantee the validity and/or reliability of data obtained from using modified surveys and we will not be able to license any modified survey form. Once the licensing process is completed, you will receive a clean set of Survey Forms in a word and pdf. file. These are the forms you will administer. Please do not use any forms you may already have access to as the ones we send you are the most current versions.

Appendix F: Stage 2: Clients and Care Managers Interview Guide

Interview Probes: Clients

1. Have you found any of the exercises difficult to complete?
2. If Yes which ones?
3. Do you remember to do them?
4. How often do you do the exercises each day?
5. Are there any exercises you prefer more than others?
6. If yes which ones and why?
7. Do you feel any change in your health since starting on HIP/PEP?
8. If yes, how?
9. What part of the program has helped or hindered you the most?

Additional questions may be added during the pilot project, if this occurs the ethics coordinator will be provided with a copy of these

Interview Probes: Care Managers during the Pilot

1. Have you found any of the exercises difficult to explain?
2. Do the clients find any difficult to complete?
3. If Yes which ones?
4. Are there any exercises you think are inappropriate?
5. If yes why? And which ones?
6. Are there any exercises you would remove?
7. If yes which ones?
8. Are there any exercises or muscle groups that you feel are not being catered to by LiFE?
9. If yes, which ones?
10. Are there additional exercises we could add to assist the clients?
11. Do you think the clients remember to do the exercises during each day?
12. Are there any exercises the clients prefer more than others?
13. If yes which ones, and why do you think this is?

Additional questions may be added during the pilot project, if this occurs the ethics coordinator will be provided with a copy of these

Appendix G: LiFE Assessment Tool

Name : _____
ID Number : _____
DOB : _____ Age : _____
<input type="checkbox"/> First visit Date: ___/___/___
<input type="checkbox"/> Last Visit visit Date: ___/___/___
Care Manager: _____



Intervention Assessment Tool

Balance and Strength Assessments

Modified Dec 2009

Musculoskeletal History

Do you have any arthritis in your knees or hips Y / N

If yes, which knee / hip has arthritis?

Do you have any joint replacements in your knees or hips?

If yes, which ones do you have?

Do you get, or have you ever had bursitis or tendonitis in your leg or legs?

Do you get or have you ever had low back pain? Y/N Details:

Functional Balance Questions

Do you sit or stand when dressing? If both, do you mostly sit or mostly stand? Sit Mostly Sit Mostly Stand Stand

Do you sit down or stand up to put on your shoes and socks? Sit Stand

Do you sit down or stand up to put on your pants? Sit Stand

Do you sit down or stand up to put on your bra / singlet? Sit Stand

Do you sit down or stand up to shower? If bath, do you sit in bottom of bath? Sit Stand Sit down in bath

During your shower do you hold onto anything for support? Yes No

How confident are you that you can get dressed without losing your balance? Not at all confident Fairly confident A little confident Very confident

Do you use a walking stick or walking frame? Yes No

If yes, when do you use it? All the time When you go out
Varies – only as needed

Are you able to step down a curb or gutter without assistance? Yes No

BALANCE ACTIVITIES

Decreased base of Support	Instructions	Level 0	Level 1	Level 2	Level 3	Level 4	Level 5
1. Tandem (heel-to-toe) standing	Weight needs to be transferred in a forwards / backwards direction	Tandem stand With constant support OR Cannot perform	Tandem stand With Intermittent support	Tandem stand No support	Tandem stand No support Brushing hair Eyes closed		
2. Single leg stand		Single leg stand Constant support Leg: OR Cannot perform	Single leg stand Intermittent support Leg:	Single leg stand No support Leg:	Single leg stand No support Getting object from cupboard at shoulder height Leg:	Single leg stand No support Eyes shut Getting object from cupboard at shoulder height Leg:	
3. Tandem walking	Distance approximately 1.5 metres Record where activity done: _____	Tandem walk With constant support OR Cannot perform	Tandem walk With intermittent support	Tandem walk No support	Tandem walk No Support Eyes closed		

Notes:

Move to Limits of Sway	Instructions	Level 0	Level 1	Level 2	Level 3	Level 4	Level 5
4. Side to side leaning	<p>Standing on both feet Lean as far as possible to the side, shifting weight onto that leg. Repeat to opposite side Have support available Correct any bending at the waist or neck Aim hold for 10 seconds</p>	<p>Feet shoulder width apart Constant support Hold 10 secs OR Cannot perform</p>	<p>Feet shoulder width apart No support Time =</p>	<p>Feet together No support Hold 10 secs</p>	<p>Feet together No support Hold 10 secs Mental distracter Eyes closed</p>		
5. Forward leaning	<p>Standing on both feet Lean as far as possible forward, shifting the weight onto the toes. Correct bending at the waist or neck Aim to hold for 10 seconds</p>	<p>Feet shoulder width apart Constant support Hold 10 secs OR Cannot perform</p>	<p>Feet shoulder width apart No support Time =</p>	<p>Feet together No support Hold for 10 secs</p>	<p>Feet together No support Hold 10 secs Eyes closed Mental distracter</p>		
6. Backwards leaning	<p>Lean as far backwards as possible shifting weight onto the heels Correct bending at the waist or neck Aim to hold for 10 seconds</p>	<p>Feet shoulder width apart Constant support Hold 10 secs OR Cannot perform</p>	<p>Feet shoulder width apart No support Time =</p>	<p>Feet together No support Hold for 10 secs</p>	<p>Feet together No support Hold 10 secs Eyes closed Mental distracter</p>		

Notes

LIFE Intervention Assessment Tool

Name: _____ ID No: _____

Stepping over Objects	Instructions	Level 0	Level 1	Level 2	Level 3	Level 4	Level 5
7. Forwards and backwards	Place a marker on the floor e.g. coloured mat – the subject should step forward and then backwards over the mat Ensure that support is available e.g. in doorway.	Step in both directions With Support OR Cannot perform	Step in both directions Without support	Step over foam block Without support	Step over foam block Without support With either Eyes closed OR Carrying dinner plate		
8. Side to Side	Place a marker on the floor e.g. coloured mat– the subject should step side to side over the mat	Step both directions With support OR Cannot perform	Step in both directions Without support	Step over foam block Without support	Step over foam block Without support Carrying dinner plate	Step over foam block Without support Eyes closed	

Notes:

STRENGTHENING ACTIVITIES

Bend the Knees	Instructions	Level 0	Level 1	Level 2	Level 3	Level 4	Level 5
9. Squatting		Partial squat with support OR Cannot perform	Partial squat No support Hold 5 secs	Half squat No support Hold 5 secs OR Getting something from below the sink using a squat			
On Your Toes							
10. Standing on toes	Start from standing – feet shoulder width apart Raise up onto toes Hold for 3 seconds Lower heels to ground Have support available	On toes With constant support OR Cannot perform	On toes With intermittent or no Support	On toes No support Putting a cup into a cupboard above shoulder height			
11. Walking on toes	Distance approximately 1.5 metres Heels must be off the ground for entire distance walked Record where activity done:	CAN NOT Perform Level 1	On toes With constant support	On toes With intermittent or no support	On toes No support Carrying a plate with a biscuit on it	On toes No support Eyes closed	

Notes:

LIFE Intervention Assessment Tool

Name: _____ ID No: _____

On Your Heels	Instructions	Level 0	Level 1	Level 2	Level 3	Level 4	Level 5
12. Standing on heels	Start from standing – feet shoulder width apart Lift toes off the ground Hold for 3 seconds Lower toes to the ground Have support READILY available	CAN NOT PERFORM LEVEL 1	On heels With constant support	On heels Intermittent support	On heels No support		
13. Walking on heels	Distance approximately 1.5 metres Toes must be off the ground for entire distance walked Record where activity done _____	CAN NOT PERFORM LEVEL 1	On heels With constant support	On heels With Intermittent support	On heels No support Carrying a plate with a biscuit on it	On heels No support Eyes closed	

Notes:

STRENGTHENING ACTIVITIES

Sit to stand/ Stand to sit	Instructions	Level 0	Level 1	Level 2	Level 3	Level 4	Level 5
14. Standing up from a chair	Rising from chair Therapist to demonstrate correct technique Subjects to avoid rocking use hand support in preference Record assessment chair	Rising from standard chair With hand support. Chair: OR Cannot perform	Rising from standard chair No hand support.	Rising from a low chair With hand support	Rising from low chair slowly No hand support <u>Must take at least 5 seconds</u> Chair:		
15. Sitting down into a chair	From standing to sitting Subjects to avoid 'plonking' into chair Aim is for control Record assessment chair	Sitting into a standard chair With hand support Chair: OR Cannot perform	Sitting into a standard chair No hand support Chair:	Sitting into a low chair No hand support Chair:	Sitting into a low chair slowly No hand support <u>Must take at least 5 seconds</u> Chair:		
On the Stairs							
16. Climbing stairs	Subjects should alternate lead legs if possible	2 stairs with strong support OR Cannot perform	2 stairs With light support only	2 stairs No support	2 steps at once		

Notes:

STRENGTHENING ACTIVITIES

	Instructions	Level 0	Level 1	Level 2	Level 3	Level 4	Level 5
17. Leg abduction	Lift the leg out to the side. Test both sides. Record weaker leg & level.	Lifting the leg out to the side With support Leg: OR Cannot perform	Lifting the leg out to the side Against resistance (telephone book) Leg:				
18. Leg extension	Move the leg behind you. Keep the leg as extended as possible Test both sides. Record weaker leg & level.	Extended one leg backwards With support Leg: OR Cannot perform	Extend one leg backwards Against resistance (telephone book) Leg:	:			
19. Move sideways	Walk by stepping sideways	Sideways walk Steps shoulder width or less apart With support OR Cannot perform	Sideways walk Steps wider than shoulder width With support	Sideways walk Steps wider than shoulder width No support.			

Notes:

Appendix H: Consent

Stages 1: Interview Participants

Stages 2 and 3: Participant and Care Manager

'Physical Activity Study for Silver Chain Home Care Clients'

INTERVIEW CONSENT FORM

- I have read the information statement about this study and any questions I have asked have been answered to my satisfaction.
- I agree to participate in this interview, realising that I may choose to terminate it at any time and should I do so, that any information collected will not be included in the study and will be destroyed.
- I agree for the interview to be audio-taped.
- I agree that the information collected for this study may be published, provided that I am not identifiable.

SIGNED _____
Participant _____ *Interviewer*

NAME _____
(BLOCK LETTERS) _____ *(BLOCK LETTERS)*

DATE _____

'Physical Activity for Home Care Clients'**PARTICIPANT CONSENT FORM**

- I have read the information statement about this study and any questions I have asked have been answered to my satisfaction.
- I agree to participate in this study, realising that I may withdraw at any time, without affecting the Silver Chain services I receive now or in the future.
- I agree for any interviews to be audio-taped.
- I agree that the information collected for this study may be published, provided that I am not identifiable.
- I agree that the researchers may access information regarding my use of other health and aged care services during the course of this study. This use may include hospital services, general practitioners and other home care providers.

SIGNED

Participant

*Researcher***NAME**

(BLOCK LETTERS)

*(BLOCK LETTERS)***DATE**



Curtin Health Innovation
Research Institute

Curtin
University of Technology

'Physical Activity for Home Care Clients'

INDEPENDENCE PROGRAM CARE MANAGER CONSENT FORM

- I have read the information statement about this study and any questions I have asked have been answered to my satisfaction.
- I agree to participate in this study, realising that I may withdraw at any time, without it affecting my employment status with Silver Chain now or in the future.
- I agree for any interviews to be audio-taped.
- I agree that the information collected for this study may be published, provided that I am not identifiable.

SIGNED _____
Participant _____ *Researcher* _____

NAME _____
(BLOCK LETTERS) _____ *(BLOCK LETTERS)* _____

DATE _____

Appendix I: Cover Letters

Stage 1

Stages 2 and 3

ON SILVER CHAIN LETTERHEAD

date

[Click **here** and type Recipient's Address Details]

Dear [insert name]

Re: '**Physical Activity in Home Care Clients**'

Please find enclosed an important questionnaire for a study that is being conducted by Curtin University's Centre for Research on Ageing. The aim is improve understandings of the effects of physical activity on home care clients. It will only take around 20 minutes to complete.

Research shows that physical activity can assist people as they age to remain living independently. Reasons for home care clients being, or not being, physically active has not been widely studied. Your answers to this survey will assist us in better understanding how we may assist older people needing home care services to be physically active.

You have been selected to be part of this research project because you have received, or are still receiving services from Silver Chain. This research project is being conducted by the Centre for Research on Ageing at Curtin University of Technology.

We will be very grateful for your assistance with this project and hope you will complete and return the enclosed questionnaire in the envelope provided. The survey is anonymous, unless you choose to identify yourself so that you may take part in an interview. Whether you choose to complete it or not is entirely up to you and will in no way effect the services you receive from Silver Chain now or in the future.

The Silver Chain Human Research Committee and Curtin University have given ethics approval for the conduct of this project. If you have any concerns or complaints about this project, please contact Dawn Woods, Research Support Co-ordinator, Silver Chain, 6 Sundercombe Street, Osborne Park WA 6017, telephone 9201 6758.

If you have any queries about the questionnaire please contact **Elissa Burton** Research Assistant at Curtin University's Centre for Research on Ageing on **9266 7993**.

If you choose to complete the survey, please return it in the envelope provided by [**insert date here**].

Many thanks for your consideration of this request.

Yours sincerely

Professor Gill Lewin
Research Director



Handed out by the Care Manager

date

Dear [insert name]

Re: 'Physical Activity for Home Care Clients'

Please find enclosed an information sheet for a study that is being conducted by Silver Chain and Curtin University's Centre for Research on Ageing. The aim is to improve understandings of physical activity programs for people receiving a restorative care program.

Research shows that physical activity can assist people as they age to remain living independently. There are different ways people can be physically active, and this research is testing different physical activity programs in order to provide people receiving this Silver Chain service with the most effective program.

A Silver Chain Independence Program Care Manager has identified that a physical activity program would help you regain independence. You have therefore been selected to be part of this research project.

We will be very grateful for your assistance with this project and hope you will read the enclosed information sheet. A Researcher will contact you in the next few days to answer any questions you may have and to determine your interest in the study. Whether you choose to participate or not is entirely up to you and will in no way effect the services you receive from Silver Chain now or in the future.

If you have any queries about the study please contact Researcher **Elissa Burton** on **9266 7993**.

Many thanks for your consideration of this request.

Yours sincerely

Professor Gill Lewin
Research Director

Appendix J: Information Sheets

Stage 1: Interview Participants

Stage 2: Pilot Participants and Care Managers

Stage 3: RCT Participants and Care Managers

'Physical Activity in Home Care Clients'

INFORMATION SHEET FOR INTERVIEW PARTICIPANTS

Thank you for recently completing the Physical Activity in Home Care Clients Questionnaire, could you please take the time to read this information sheet and consent form. This will enable you to identify any questions you need to ask the interviewer who will contact you in a few days to confirm your interest in being interviewed.

What is this study about?

This project aims to explore differences between the levels of physical activity and reasons for being or not being active, between older people who have received different Silver Chain home care services.

Who is conducting this study?

This project is being conducted by the Centre for Research on Ageing, Curtin University of Technology in collaboration with Silver Chain.

Who is being invited to participate in the interviews?

People who have previously or currently receive Silver Chain services, like yourself, who responded to the questionnaire and indicated that they would be happy to be interviewed.

What will the interviews involve?

The interview will take place in your own home (or other place of your choice) and is expected to last about one hour. It will be conducted by one of the researchers working on this project.

It will include questions about your physical activity levels currently and during other stages of your life, and reasons for you being or not being physically active. The interview will be audio-tape recorded, subject to your agreement.

Consent

Before the start of the interview you will be asked to sign a consent form indicating your willingness to be involved in the interview, that you are aware of its purpose, and what it involves.

Voluntary Participation

It is important for you to know that you do not have to take part in this project and if you decide not to be involved, the services provided to you by Silver Chain now, or in the future, will not be affected. If after agreeing, you change your mind about being in the study, you may withdraw your consent at any time by phoning Elissa Burton, Research Assistant 9266 7993. We would then destroy any project records containing your information.

How will your privacy be protected?

You will not be identified by name on the tape or on any other information collected about you. To protect your privacy, your name will not be kept on any study data but will instead only be identified with a study number. The results of this study will be reported at conferences and in journal articles, and be available on the internet but you will not be identified. A copy of the final report will be available to you at the end of the project on your request. In accordance with national research ethics guidelines, all study records will be stored for five years by the Centre for Research on Ageing in a secure location and then destroyed.

Possible Risks and Benefits

It is not anticipated that these discussions will cause discomfort or distress. Nevertheless, should you feel the need to discuss anything further the interviewer can refer you to a counsellor. There are no immediate benefits for you being involved in this research. However, this study will assist us to develop strategies that will help home care clients to begin or remain physically active and improve their health and well-being.

What if you have any concerns or a complaint about how the study is conducted?

The Silver Chain Human Research Committee has given ethics approval for the conduct of this project. If you have any concerns or complaints about this project, please contact Dawn Woods, Research Support Co-ordinator, Silver Chain, 6 Sundercombe Street, Osborne Park WA 6017, telephone 9201 6758.

This study has also been approved by the Curtin University of Technology, Office of Research and Development, Human Research Ethics Committee. Any concerns or complaints about the conduct of the study should be directed to: the Human Research Ethics Committee Secretary on hrec@curtin.edu.au or in writing C/- Office of Research and Development, Curtin University of Technology, GPO Box U1987, Perth WA 6845.

Who to contact if you have any questions about the study?

If you have any questions about this study please discuss them with the interviewer when she visits you, or you may call **Elissa Burton on 9266 7993** (Monday, Wednesday and Friday) or **0409 772 308**.

Thank you for taking the time to read this information sheet.

In pilot study

'Physical Activity for Home Care Clients'**INFORMATION SHEET FOR PARTICIPANTS**

We would appreciate it if you could please take the time to read this information sheet and consent form. This will enable you to identify any questions you need to ask the Researcher who will contact you in a few days to confirm an appointment time to discuss your possible involvement in the research project.

What is this study about?

This study is testing a program for people receiving a restorative care service which incorporates being physically active into daily routines or tasks, to see if it improves your ability to perform these tasks.

Who is conducting this study?

This project is being conducted by Silver Chain in collaboration with the Centre for Research on Ageing, Curtin University of Technology.

Who is being invited to participate in the research project?

Clients and their carers who have been identified by Silver Chain's Independence Program Care Managers as needing a physical activity program to assist you in regaining independence.

What will participants be asked to do?

Participation in this study will involve you being visited eight times over 14 months by a Researcher. Four times to:

- Ask you some questions about your everyday functioning and use of services, and your thoughts about the physical activity program you have been prescribed.
- Take part in some tests measuring endurance, strength and balance; and
- Wear an accelerometer, which is a small device worn during waking hours to measure your movement during the day.

These visits are anticipated to take one and a half hours, and another four times to:

- Collect the accelerometers after seven days use, and
- Complete a physical activity questionnaire

These visits are anticipated to take 10-15 minutes.

The first visit will involve discussing the project and answering any questions you may have. If you agree to be involved, you have a choice to complete the initial questions and tests at that time or re-schedule to a time that suits you better.

Seven days after the first visit the researcher will return to collect the accelerometer and ask you some questions about your physical activity for the week (this will take approx 10-15 minutes). Whilst participating in the physical activity program (first 8 weeks approximately) a researcher will call you twice to ask you questions about the program and how you are enjoying it, anything you would change about it etc

Eight weeks, six months and twelve months after starting the Silver Chain service the Researcher will return to ask you the questions and conduct the tests, and return a week later to pick up the accelerometer and ask you questions about your physical activity for the week.



Page 2

Possible Risks and Benefits

There are no anticipated risks to you taking part in this study. Whilst you may benefit indirectly from this study by enjoying the visit from the researcher, the project should benefit the aged care community as a whole by increasing our understanding of the effectiveness of different physical activity programs in the independence programs.

Consent

Before the start of the first session you will be asked to sign a consent form indicating your willingness to be involved in the project, that you are aware of its purpose, and what it involves.

Voluntary Participation

It is important for you to know that you do not have to take part in this project and if you decide not to be involved, the services provided to you by Silver Chain now, or in the future, will not be affected. If after agreeing, you change your mind about being in the study, you may withdraw your consent at any time by phoning the Researcher, Elissa Burton on 9266 7993. We would then destroy any project records containing your information.

How will your privacy be protected?

If you do decide to take part in the study, all information relating to you is collected for the purposes of the study will be kept strictly confidential. To protect your privacy, your name will not be kept on any information collected and these records will instead only be identified with a project number. The results of this study will be reported at conferences and in journal articles, and available on the internet but you will not be identified. A copy of the final report will be available to you at the end of the project on your request. In accordance with national research ethics guidelines, all records will be stored for five years by the Centre for Research on Ageing in a secure location and then destroyed.

What if you have any concerns or a complaint about how the study is conducted?

The Silver Chain Human Research Committee has given ethics approval for the conduct of this project. If you have any concerns or complaints about this project, please contact Dawn Woods, Research Support Co-ordinator, Silver Chain, 6 Sundercombe Street, Osborne Park WA 6017, telephone 9201 6758.

This study has also been approved by the Curtin University of Technology, Office of Research and Development, Human Research Ethics Committee. Any concerns or complaints about the conduct of the study should be directed to: the Human Research Ethics Committee Secretary on hrec@curtin.edu.au or in writing C/- Office of Research and Development, Curtin University of Technology, GPO Box U1987, Perth WA 6845.

Who to contact if you have any questions about the study?

If you have any questions about this study please discuss them with the researcher when they visit you, or you may call the Researcher, **Elissa Burton on 9266 7993 or 0409 772 308**.

Thank you for taking the time to read this Information Sheet.



Curtin Health Innovation
Research Institute

Curtin
University of Technology

For pilot study & Care Managers initially trained in LiFE

'Physical Activity for Home Care Clients'

INFORMATION SHEET FOR CARE MANAGERS

Thank you for registering an interest to be involved in this research project, could you please take the time to read this information sheet and consent form. This will enable you to identify any questions you need to ask the Researcher who will contact you in a few days to confirm an appointment time to discuss your possible involvement in the research project.

What is this study about?

This study is initially testing (during the pilot) a program called LiFE, for people receiving a restorative care service (HIP or PEP) which incorporates being physically active into daily routines or tasks. At a later date a larger study (randomised controlled trial) will compare the LiFE exercise program with the current HIP/PEP physical activity program to see which program improves their functional mobility more and which program they continue with once the restorative service has been ceased.

Who is conducting this study?

This project is being conducted by Silver Chain in collaboration with the Centre for Research on Ageing, Curtin University of Technology.

Who is being invited to participate in the research project?

Silver Chain's Independence Program Care Managers will be asked to take part in the study. Also involved will be clients and their carers who have been identified by you, Silver Chain's Independence Program Care Manager as needing a physical activity program to assist them in regaining independence.

What will you, the Care Managers be asked to do?

Care Managers will be asked to identify clients aged 70 years and over who have been assessed as needing a physical activity program as part of their restorative care plan. A number of Care Managers will also be trained to assist in the delivery of the new physical activity program called LiFE. This program was developed to incorporate physical activity exercises into daily living routines or tasks, rather than set a specific "workout" session for the client.

Care Managers involved in delivering LiFE will be asked to do the following:

- Attend a one to two day training session on the principles and delivery of LiFE
- During the pilot study you will be contacted weekly (max of eight times) and asked for feedback on the LiFE program, this is to make sure the program is suitable for the clients and to discuss and rectify any issues that may have arisen
- Assist in training other Care Managers in delivering LiFE, in association with the LiFE developer Associate Professor Lindy Clemson, you will also be provided with a LiFE manual
- Deliver the LiFE or current physical activity program during a larger study and be interviewed at the end of the study.



Page 2

Possible Risks and Benefits

There are no anticipated risks to you taking part in this study. Whilst you may benefit indirectly from this study by enjoying the training and delivery of a new program, the project should benefit the aged care community as a whole by increasing our understanding of the effectiveness of different physical activity programs in the independence programs.

Consent

Before the start of the initial training you will be asked to sign a consent form indicating your willingness to be involved in the project, that you are aware of its purpose, and what it involves.

Voluntary Participation

It is important for you to know that you do not have to take part in this project. If after agreeing, you change your mind about being in the study, you may withdraw your consent at any time by phoning Elissa Burton, (Researcher) 9266 7993. Please note, your participation or withdrawal will have no impact on your employment at Silver Chain. We would then destroy any project records containing your information.

How will your privacy be protected?

If you do decide to take part in the study, all information relating to you, the clients and their carers to be collected for the purposes of the study will be kept strictly confidential. To protect your privacy, your name will not be kept on any information collected and these records will instead only be identified with a project number. The results of this study will be reported at conferences and in journal articles, and available on the internet but you will not be identified. A copy of the final report will be available to you at the end of the project on your request. In accordance with national research ethics guidelines, all records will be stored for five years by the Centre for Research on Ageing in a secure location and then destroyed.

What if you have any concerns or a complaint about how the study is conducted?

The Silver Chain Human Research Committee has given ethics approval for the conduct of this project. If you have any concerns or complaints about this project, please contact Dawn Woods, Research Support Co-ordinator, Silver Chain, 6 Sundercombe Street, Osborne Park WA 6017, telephone 9201 6758.

This study has also been approved by the Curtin University of Technology, Office of Research and Development, Human Research Ethics Committee. Any concerns or complaints about the conduct of the study should be directed to: the Human Research Ethics Committee Secretary on hrec@curtin.edu.au or in writing C/- Office of Research and Development, Curtin University of Technology, GPO Box U1987, Perth WA 6845.

Who to contact if you have any questions about the study?

If you have any questions about this study please discuss them with the researcher when they visit you, or you may call the Researcher, **Elissa Burton on 9266 7993 or 0409 772 308.**

Thank you for taking the time to read this information sheet.

**'Physical Activity for Home Care Clients'****INFORMATION SHEET FOR PARTICIPANTS**

Thank you for registering an interest to be involved in this research project, could you please take the time to read this information sheet and consent form. This will enable you to identify any questions you need to ask the Researcher who will contact you in a few days to confirm an appointment time to discuss your possible involvement in the research project.

What is this study about?

This study is comparing two physical activity programs for people receiving a restorative care service to see which program improves the functional mobility of clients more and which program clients continue with once the restorative service has been ceased.

Who is conducting this study?

This project is being conducted by Silver Chain in collaboration with the Centre for Research on Ageing, Curtin University of Technology.

Who is being invited to participate in the research project?

Clients and their carers, who have been identified by Silver Chain's Independence Program Care Managers as needing a physical activity program to assist you in regaining independence.

What will participants be asked to do?

Participation in this study will involve you being visited eight times over 14 months by a Researcher. Four times to:

- Ask you some questions about your everyday functioning and use of services
- And to take part in some tests measuring endurance, strength, balance, and physical activity levels using an accelerometer.

These visits are anticipated to take one and a half hours, and another four times to:

- Collect the accelerometers after seven days use, and
- Complete the physical activity scale for the elderly (PASE survey)

These visits are anticipated to take 10-15 minutes.

The first visit will involve discussing the project and answering any questions you may have. If you agree to be involved, you have a choice to complete the initial questions and tests at that time or re-schedule to a time that suits you better.

Seven days after the initial visit the researcher will return to collect the accelerometer and ask you some questions about your physical activity for the week (this will take approx 10-15 minutes). Eight weeks, six months and twelve months after starting the Silver Chain service the researcher will return to ask you the questions and conduct the tests, and return a week later to pick up the accelerometer and ask the questions about your physical activity for the week.



Page 2

Possible Risks and Benefits

There are no risks anticipated risks to you taking part in this study. Whilst you may benefit indirectly from this study by enjoying the visit from the researcher, the project should benefit the aged care community as a whole by increasing our understanding of the effectiveness of different physical activity programs in the independence programs.

Consent

Before the start of the initial session you will be asked to sign a consent form indicating your willingness to be involved in the project, that you are aware of its purpose, and what it involves.

Voluntary Participation

It is important for you to know that you do not have to take part in this project and if you decide not to be involved, the services provided to you by Silver Chain now, or in the future, will not be affected. If after agreeing, you change your mind about being in the study, you may withdraw your consent at any time by phoning the Researcher, Elissa Burton on 9266 7993. We would then destroy any project records containing your information.

How will your privacy be protected?

If you do decide to take part in the study, all information relating to you is collected for the purposes of the study will be kept strictly confidential. To protect your privacy, your name will not be kept on any information collected and these records will instead only be identified with a project number. The results of this study will be reported at conferences and in journal articles, and available on the internet but you will not be identified. A copy of the final report will be available to you at the end of the project on your request. In accordance with national research ethics guidelines, all records will be stored for five years by the Centre for Research on Ageing in a secure location and then destroyed.

What if you have any concerns or a complaint about how the study is conducted?

The Silver Chain Human Research Committee has given ethics approval for the conduct of this project. If you have any concerns or complaints about this project, please contact Dawn Woods, Research Support Co-ordinator, Silver Chain, 6 Sundercombe Street, Osborne Park WA 6017, telephone 9201 6758.

This study has also been approved by the Curtin University of Technology, Office of Research and Development, Human Research Ethics Committee. Any concerns or complaints about the conduct of the study should be directed to: the Human Research Ethics Committee Secretary on hrec@curtin.edu.au or in writing C/- Office of Research and Development, Curtin University of Technology, GPO Box U1987, Perth WA 6845.

Who to contact if you have any questions about the study?

If you have any questions about this study please discuss them with the researcher when they visit you, or you may call the Researcher, **Elissa Burton on 9266 7993 or 0409 772 308.**

Thank you for taking the time to read this information sheet.

**'Physical Activity for Home Care Clients'****INFORMATION SHEET FOR CARE MANAGERS**

Thank you for registering an interest to be involved in this research project, could you please take the time to read this information sheet and consent form. This will enable you to identify any questions you need to ask the Researcher who will contact you in a few days to confirm an appointment time to discuss your possible involvement in the research project.

What is this study about?

This study is comparing a physical activity program that embeds activity into daily life routines or tasks, called the LiFE program, with the current HIP/PEP physical activity program to see which program improves the functional mobility of clients more and which program clients continue with once the restorative service has been ceased.

Who is conducting this study?

This project is being conducted by Silver Chain in collaboration with the Centre for Research on Ageing, Curtin University of Technology.

Who is being invited to participate in the research project?

Silver Chain's Independence Program Care Managers will be asked to take part in the study. Also involved will be clients and their carers who have been identified by you, Silver Chain's Independence Program Care Manager as needing a physical activity program to assist them in regaining independence.

What will you, the Care Managers be asked to do?

Care Managers will be asked to identify clients aged 70 years and over who have been assessed as needing a physical activity program as part of their restorative care plan. Once consent has been obtained by the researcher and the client has been randomly assigned to either the LiFE or current physical activity program you will be asked to implement the assigned program.

Care Managers involved in the randomised controlled trial will be asked to do the following:

- Attend a training session on the principles and delivery of LiFE
- Deliver the LiFE or current physical activity program during this study
- Be interviewed at the end of the study, for your opinion on each program.

Possible Risks and Benefits

There are no anticipated risks to you taking part in this study. Whilst you may benefit indirectly from this study by enjoying the training and delivery of a new program, the project should benefit the aged care community as a whole by increasing our understanding of the effectiveness of different physical activity programs within the independence programs.



Page 2

Consent

Before the start of the initial training you will be asked to sign a consent form indicating your willingness to be involved in the project, that you are aware of its purpose, and what it involves.

Voluntary Participation

It is important for you to know that you do not have to take part in this project. If after agreeing, you change your mind about being in the study, you may withdraw your consent at any time by phoning Elissa Burton, (Researcher) 9266 7993. Please note, your participation or withdrawal will have no impact on your employment at Silver Chain. We would then destroy any project records containing your information.

How will your privacy be protected?

If you do decide to take part in the study, all information relating to you, the clients and their carers to be collected for the purposes of the study will be kept strictly confidential. To protect your privacy, your name will not be kept on any information collected and these records will instead only be identified with a project number. The results of this study will be reported at conferences and in journal articles, and available on the internet but you will not be identified. A copy of the final report will be available to you at the end of the project on your request. In accordance with national research ethics guidelines, all records will be stored for five years by the Centre for Research on Ageing in a secure location and then destroyed.

What if you have any concerns or a complaint about how the study is conducted?

The Silver Chain Human Research Committee has given ethics approval for the conduct of this project. If you have any concerns or complaints about this project, please contact Dawn Woods, Research Support Co-ordinator, Silver Chain, 6 Sundercombe Street, Osborne Park WA 6017, telephone 9201 6758.

This study has also been approved by the Curtin University of Technology, Office of Research and Development, Human Research Ethics Committee. Any concerns or complaints about the conduct of the study should be directed to: the Human Research Ethics Committee Secretary on hrec@curtin.edu.au or in writing C/- Office of Research and Development, Curtin University of Technology, GPO Box U1987, Perth WA 6845.

Who to contact if you have any questions about the study?

If you have any questions about this study please discuss them with the researcher when they visit you, or you may call the Researcher, **Elissa Burton on 9266 7993 or 0409 772 308**.

Thank you for taking the time to read this information sheet.

Appendix K: Ethics Approval

Stage 1: Curtin University and Silver Chain

Stages 2 and 3: Curtin University and Silver Chain

MINUTE

Curtin
UNIVERSITY OF TECHNOLOGY

To	Dr Gill LEWIN
From	Linda Grenade
Subject	Protocol Approval CRA 10/01
Date	18/01/2010
Copy	

Office of Research and Development

Human Research Ethics Committee

TELEPHONE 9266 3549

FACSIMILE 9266 2508

EMAIL l.e.grenade@curtin.edu.au

Thank you for your "Form C Application for Approval of Research with Minimal Risk (Ethical Requirements)" for the project titled "BARRIERS AND MOTIVATORS TO PHYSICAL ACTIVITY IN OLDER HOME CARE CLIENTS". On behalf of the Human Research Ethics Committee I am authorised to inform you that the project is approved.

Approval of this project is for a period of twelve months from **18th January 2010** to **18th January 2011**.

If at any time during the twelve months changes/amendments occur, or if a serious or unexpected adverse event occurs, please advise me immediately. The approval number for your project is **CRA 10/01**. *Please quote this number in any future correspondence.*

Linda Grenade

Form C Coordinator for Human Research Ethics

Please Note: The following standard statement must be included in the information sheet to participants:

This study has been approved by the Curtin University Human Research Ethics Committee. If needed, verification of approval can be obtained either by writing to the Curtin University Human Research Ethics Committee, c/- Office of Research and Development, Curtin University of Technology, GPO Box U1987, Perth, 6845 or by telephoning 9266 2784.



EVERY MINUTE. EVERY HOUR. EVERY DAY. WE CARE.

8 January 2010

Ms Elissa Burton
7 Parker Place
BENTLEY WA 6102

Dear Elissa

Ethics Application 062 – Barriers and Motivators to Physical Activity in Older Home Care Clients

I refer to your application for ethics approval for the above mentioned study. I am pleased to advise that final approval has been granted, as all the conditions outlined in my letter of 24 December 2009 and those listed in my email of 8 January 2010 have been met.

It would be appreciated if you could email me a copy of the final printed survey, for our records.

Silver Chain ethics approval is valid from 8 January 2010 to 7 January 2013 (3 years).

It is a condition of approval that a report be provided to the Committee at least annually (**reports are due on 8 January each year**) and on completion of the study. Any adverse experiences associated with the study should be reported to the Committee as they occur.

The Silver Chain Human Research Ethics Committee is constituted and functions in accordance with NHMRC National Statement on Ethical Conduct in Human Research (March 2007).

Please quote *EC App 062* on all future correspondence relating to the study.

I wish you every success for the conduct of the study.

Sincerely

Dawn Woods
Executive Officer
Silver Chain Human Research Ethics Committee

DW [EC/L.01]

6 Sundercombe Street, Osborne Park, Western Australia 6017

Tel (08) 9242 0242 Fax (08) 9242 0268
Email info@silverchain.org.au Website www.silverchain.org.au
Silver Chain Nursing Association (Incorporated) ABN 77 119 417 018

Memorandum

To	Professor Gill Lewin, Centre for Research on Ageing
From	A/Professor Stephan Millett, Chair, Human Research Ethics Committee
Subject	Protocol Approval HR 145/2010
Date	16 November 2010
Copy	Miss Elissa Burton, Centre for Research on Ageing Professor Duncan Boldy, Centre for Research on Ageing

Office of Research and Development

Human Research Ethics Committee

TELEPHONE 9266 2784
FACSIMILE 9266 3793
EMAIL hrec@curtin.edu.au

Thank you for your application submitted to the Human Research Ethics Committee (HREC) for the project titled "*Physical Activity for Older Home Care Clients Receiving a Restorative Care Program*". The Committee notes the prior approval by Silver Chain HREC (EC 065) and has reviewed your application consistent with Chapter 5.3 of the *National Statement on Ethical Conduct in Human Research*.

- You have ethics clearance to undertake the research as stated in your proposal.
- The approval number for your project is **HR 145/2010**. *Please quote this number in any future correspondence.*
- Approval of this project is for a period of twelve months **16-11-2010 to 16-11-2011**. To renew this approval a completed Form B (attached) must be submitted before the expiry date **16-11-2011**.
- If you are a Higher Degree by Research student, data collection must not begin before your Application for Candidacy is approved by your Faculty Graduate Studies Committee.
- The following standard statement **must be** included in the information sheet to participants:
This study has been approved by the Curtin University Human Research Ethics Committee (Approval Number HR 145/2010). The Committee is comprised of members of the public, academics, lawyers, doctors and pastoral carers. Its main role is to protect participants. If needed, verification of approval can be obtained either by writing to the Curtin University Human Research Ethics Committee, c/- Office of Research and Development, Curtin University of Technology, GPO Box U1987, Perth, 6845 or by telephoning 9266 2784 or by emailing hrec@curtin.edu.au.

Applicants should note the following:

It is the policy of the HREC to conduct random audits on a percentage of approved projects. These audits may be conducted at any time after the project starts. In cases where the HREC considers that there may be a risk of adverse events, or where participants may be especially vulnerable, the HREC may request the chief investigator to provide an outcomes report, including information on follow-up of participants.

The attached **FORM B** should be completed and returned to the Secretary, HREC, C/- Office of Research & Development:

When the project has finished, or

- If at any time during the twelve months changes/amendments occur, or
- If a serious or unexpected adverse event occurs, or
- 14 days prior to the expiry date if renewal is required.
- An application for renewal may be made with a Form B three years running, after which a new application form (Form A), providing comprehensive details, must be submitted.

Regards,



A/Professor Stephan Millett
Chair Human Research Ethics Committee



26 October 2010

Ms Elissa Burton
Research Assistant
Silver Chain
6 Sundercombe Street
OSBORNE PARK WA 6017

Dear Elissa

Ethics Application 065 – Physical Activity for Older Home Care Clients Receiving a Restorative Care Program

I refer to your application for ethics approval for the above mentioned study. I am pleased to advise that final approval has been granted, as all the conditions outlined in my letter of 19 October 2010 have been met.

Silver Chain ethics approval is valid from 26 October 2010 to 25 October 2013 (3 years).

It is a condition of approval that a report be provided to the Committee at least annually (**reports are due on 26 October each year**) and on completion of the study. Any adverse experiences associated with the study should be reported to the Committee as they occur.

The Silver Chain Human Research Ethics Committee is constituted and functions in accordance with NHMRC National Statement on Ethical Conduct in Human Research (March 2007).

Please quote **EC App 065** on all future correspondence relating to the study.

If you have any queries regarding this matter, please call me on 9201 6758. Thank you.

Sincerely

A handwritten signature in black ink, appearing to read 'Dawn Woods'.

Dawn Woods
Executive Officer
Silver Chain Human Research Ethics Committee

6 Sundercombe Street, Osborne Park, Western Australia 6017

Tel (08) 9242 0242 Fax (08) 9242 0268
Email info@silverchain.org.au Website www.silverchain.org.au
Silver Chain Nursing Association (Incorporated) ABN:77 119 417 018

Appendix L: Statement of Contribution of Others

Your Area

GPO Box U1987
Perth Western Australia 6845

Telephone +61 8 9266 0000
Facsimile +61 8 9266 0000
Email yourname@curtin.edu.au
Web curtin.edu.au

13 January 2014

To whom it may concern

I, Gill Lewin, contributed as Principal Supervisor of the PhD. I had an on-going close involvement with the research across all three stages, including contributing to study design; discussing the structure of papers, critically reviewing drafts and making suggestions for improvements to the following papers:

- Physical activity levels of older adults receiving a home care service. 2013. *Journal of Aging and Physical Activity*, 21(2), 140-154.
- Barriers and Motivators to Being Physically Active for Older Home Care Clients. 2013. *Physical and Occupational Therapy in Geriatrics*, 31(1), 21-36. DOI: 10.3109/02703181.2012.751474.
- Determining the feasibility of a lifestyle activity program for inclusion in a restorative home care service: a pilot study. *Activities, Adaptations and Aging*. Accepted for publication, June 9, 2013.
- Effectiveness of a lifestyle exercise program for older people receiving a restorative home care service: study protocol for a pragmatic randomised controlled trial. 2013. *BMC Health Services Research*, 13:419. DOI:10.1186/1472-6963-13-419.
- Effectiveness of a lifestyle exercise program for older people receiving a restorative home care service: A pragmatic randomized controlled trial. 2013. *Clinical Interventions in Aging*, 8: 1591-1601. DOI: <http://dx.doi.org/10.2147/CIA.S44614>.
- Long term benefits of a lifestyle exercise program for older people receiving a restorative home care service: A pragmatic randomized controlled trial. 2014. *Healthy Aging and Clinical Care in the Elderly*, 6 1–9 DOI:10.4137/HACCE.S13445.



Gill Lewin (Principal Supervisor/co-author)



Elissa Jane Burton (candidate)



THE UNIVERSITY OF
SYDNEY

Professor Lindy Clemson
Faculty of Health Sciences/Ageing, Work & Health Research
University of Sydney
NSW 2141 Australia

6 January 2014

To whom it may concern

I, Lindy Clemson, contributed as an Associate Supervisor of the PhD. My involvement with stages two and three of the study included, training the four care managers to deliver LiFE during the pilot study, provided advice on the study design, and read drafts and made suggestions for improvements to the following papers:

- Physical activity levels of older adults receiving a home care service. 2013. *Journal of Aging and Physical Activity*, 21(2), 140-154.
- Barriers and Motivators to Being Physically Active for Older Home Care Clients. 2013. *Physical and Occupational Therapy in Geriatrics*, 31(1), 21-36. DOI: 10.3109/02703181.2012.751474.
- Determining the feasibility of a lifestyle activity program for inclusion in a restorative home care service: a pilot study. *Activities, Adaptations and Aging*. Accepted for publication, June 9, 2013.
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- Effectiveness of a lifestyle exercise program for older people receiving a restorative home care service: A pragmatic randomized controlled trial. 2013. *Clinical Interventions in Aging*. Accepted for publication, 8: 1591-1601. DOI: http://dx.doi.org/10.2147/CIA.S44614.
- Long term benefits of a lifestyle exercise program for older people receiving a restorative home care service: A pragmatic randomized controlled trial. 2014. *Healthy Aging and Clinical Care in the Elderly*, 6 1-9 DOI:10.4137/HACCE.S13445.

A handwritten signature in black ink, appearing to read "Lindy Clemson".

Lindy Clemson (Associate Supervisor/co-author)

A handwritten signature in black ink, appearing to read "Elissa Jane Burton".

Elissa Jane Burton (candidate)

Faculty of Health Sciences/ Ageing,
Work & Health Research Unit
University of Sydney
NSW 2006 Australia

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F +61 2 9351 9572
LINDY.CLEMSON@sydney.edu.au
sydney.edu.au

ABN 15 211 513 464
CRICOS 00020K

CRICOS Provider Code 00301J (WA), 02637B (NSW)

Your Area

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Perth Western Australia 6845

Telephone +61 8 9266 0000
Facsimile +61 8 9266 0000
Email yourname@curtin.edu.au
Web curtin.edu.au

13 January 2014

To whom it may concern

I, Duncan Boldy, contributed as an Associate Supervisor of the PhD. My involvement with all three stages of the study included: provided advice on the study design; and read drafts and made suggestions for improvements to the following papers:

- Physical activity levels of older adults receiving a home care service. 2013. *Journal of Aging and Physical Activity*, 21(2), 140-154.
- Barriers and Motivators to Being Physically Active for Older Home Care Clients. 2013. *Physical and Occupational Therapy in Geriatrics*, 31(1), 21-36. DOI: 10.3109/02703181.2012.751474.
- Determining the feasibility of a lifestyle activity program for inclusion in a restorative home care service: a pilot study. *Activities, Adaptations and Aging*. Accepted for publication, June 9, 2013.
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- Effectiveness of a lifestyle exercise program for older people receiving a restorative home care service: A pragmatic randomized controlled trial. 2013. *Clinical Interventions in Aging*. Accepted for publication, 8: 1591-1601. DOI: <http://dx.doi.org/10.2147/CIA.S44614>.
- Long term benefits of a lifestyle exercise program for older people receiving a restorative home care service: A pragmatic randomized controlled trial. 2014. *Healthy Aging and Clinical Care in the Elderly*, 6 1-9 doi:10.4137/HACCE.S13445.



Duncan Boldy (Associate Supervisor/co-author)



Elissa Jane Burton (candidate)

