Experiences of physical activity engagement among older adults following discharge from a medically supervised exercise program: facilitators, barriers, and suggestions

by

Melody Burgoyne

B.Sc., University of Victoria, 2001

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Supervisory Committee

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Dr. Sandra Hundza, School of Exercise Science, Physical & Health Education
Co-Supervisor

Dr. Joan Wharf Higgins, School of Exercise Science, Physical & Health Education
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Abstract

Supervisory Committee
Dr. Sandra Hundza, School of Exercise Science, Physical & Health Education
Co-Supervisor
Dr. Joan Wharf Higgins, School of Exercise Science, Physical & Health Education
Co-Supervisor

The purpose of this study was to investigate physical activity (PA) engagement among older adults (OA) following discharge from a medically supervised group exercise program and to explore the facilitators and barriers that influenced maintained PA engagement. While facilitators and barriers to PA among OA in general have been well documented, facilitators and barriers particular to maintaining PA after discharge from a supervised exercise program have not been widely explored with qualitative methods or a mixed method design.

Data for this mixed method, case study approach were collected in two phases. In Phase I, questionnaires were used to investigate PA engagement as well as semi-structured qualitative interviews were completed (n = 12; M_{age} = 80.0 years) to explore facilitators and barriers that influenced PA engagement. In Phase II, reviews of medical charts were conducted retrospectively to gather further information on PA engagement and barriers (n = 12).

All 12 individuals in Phase I remained engaged in PA activity 2 – 48 months post completion of the medically supervised exercise program. This particular group of OA identified facilitators for and barriers to maintaining PA that were personally-, socially-, and program-based, and also provided suggestions to alleviate cited barriers. Four themes identified in regards to PA engagement were: (1) Personal drive: highly aware of the need to keep moving;

(2) Social connections and support: we all need people; (3) Program components matter; and, (4) Convenient, Affordable, Relevant: suggestions to improve program access.

The power of multi-level, multi-sector approaches that consider the broader determinants of health was highlighted in this study. Participants identified the need for health care providers (HCP) and PA instructors to continue to communicate the benefits of PA, the importance of ongoing HCP support, and the necessity of working across sectors to reduce program related barriers to promote PA engagement among OA discharged from a medically supervised exercise program.

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Dedication

This thesis is dedicated to my dear friend Peggy. You are the true definition of strength, resilience, and generousity. Thank you for always being there for me, even when your own plate was more than full. We have gone through so much together and I can't wait for our next set of adventures!

Chapter 1: Introduction

Physical activity (PA) has been shown to be a critical component to healthy aging (Tremblay et al., 2011). PA among older adults (OA) can reduce health and social care costs by postponing the onset of frailty and chronic disease (WHO, 1996). Despite this evidence, 57% of Canadian OA are considered to be physically inactive (Butler-Jones, 2010), failing to meet the required physical activity guidelines of 150 minutes of PA per week (Tremblay et al., 2011). These high rates of inactivity among this population have been referred to as "the great public health burden" (van Stralen, De Vries, Mudde, Bolman, & Lechner, 2009, p. 148). In 2011, OA accounted for 14% of Canada's population (Statistics Canada, 2012). By 2036, it is estimated that the proportion of OA will represent 23 – 25% of the total population (Statistics Canada, 2012). Effective strategies are needed to increase PA engagement among this growing population. Making an effort to assist OA to maintain a high quality of life by initiating and maintaining long term PA should be an important public health mandate, given the high costs of inactivity. (Morey et al., 2003). For example, a lack of PA may contribute to falls which are a major public health problem among OA in British Columbia (Herman, Gallagher, & Scott, 2006). Fall-related injury hospitalizations alone cost the province of British Columbia an estimated $151 million in 2004/2005 (Herman et al., 2006). In an effort to decrease falls and prevent or manage frailty and chronic disease among OA, health care professionals often prescribe PA under the guidance of a physiotherapist or other health care professional. In this chapter, the role of PA for OA is introduced and the subject of OA maintaining PA after discharge from a medically supervised group exercise program is presented.

The Role of Physical Activity

PA can be defined as any bodily movement produced by skeletal muscles that requires energy expenditure (Stathokostas, 2013). Exercise is one type of PA; other forms of PA may include work, activities of daily living, recreation, or sporting activities (WHO, 1996). PA plays an important role in preventing diseases and conditions which are the primary cause of loss of independence in later life (BHFNC for Physical Activity and Health, 2013). PA has been also been recognized as a key component for the management of many of these chronic conditions (Franke, Tong, Ashe, McKay, Sims-Gould, & the Walk the Talk Team, 2013). Recognizing the role that PA plays in both preventing and in helping individuals manage chronic diseases is vital, as the prevalence of chronic health conditions among OA is very high. It has been reported that 89% of today's Canadian OA are living with at least one chronic condition, such as arthritis, osteoporosis, high blood pressure, diabetes, heart disease, cancer, and/or stroke (Butler-Jones, 2010).

In addition to the above mentioned benefits of PA, numerous other immediate and long-term physiological, psychological, and social benefits of physical activity are well-documented (Chodzko-Zajko & Schwingel, 2012). Regular PA may help OA to maintain functional independence, maintain mobility, improve fitness, improve or maintain body weight, maintain bone health, maintain mental health, feel better in general, and reduce their risk of premature death (Tremblay et al., 2007). As stated by Stathi, Fox, Withall, Bentley, and Thompson (2014, p.5) "not only is it clear that regular physical activity adds years to life

through reductions in disease and disability, but it also adds life to years through maintained or improved capacities, and greater social involvement, independence, and mental well-being."

Purpose

Through direct practice as a rehabilitation assistant (RA) working within a local medically supervised exercise program within Western Canada, I have been involved with assisting OA to initiate PA through direction from their primary physician or other health care provider (HCP). There are a variety of medically supervised exercise programs offered within the local health authority that aim to engage OA in PA in an effort to increase mobility, decrease hospitalization rates, decrease falls, and maintain independence. Upon completion of these medically supervised exercise programs, participants are encouraged to maintain physical improvements with ongoing PA engagement.

In my professional role within a medically supervised group exercise program over the past six years, I have been involved in implementing a number of strategies to encourage OA to maintain PA engagement once they are discharged from the medically supervised group exercise program. While participants are still engaged in the medically supervised group exercise program, we have employed the following strategies. First, a one hour session is dedicated to a discussion of individual goals and plans for continued PA once the medically supervised group exercise program has concluded, during which time is spent showing motivational multimedia clips (such as Mike Evans, "23 ½ Hours", https://www.youtube.com/watch?v=aUaInS6HIGo and "What do People Live For", https://www.youtube.com/watch?v=KKXwwEH_ahc). Second, RAs offer to take each

participant to various community classes in order for the participant to view the available community options first hand and provide support to initiating and registering for a new program. Third, a financial incentive has been created, whereby all of the money that the participant has paid towards attending the medically supervised group exercise program will be put towards the first time registration in community balance and strength classes that are offered at the same location. Fourth and most recently, RAs have been attending these community balance and strength classes on a regular basis in order to provide support and familiarity to the OA throughout their transition period.

While these various attempts have been made to facilitate continued PA, it is not known which efforts are effective in assisting OA to maintain PA engagement. In my professional practice, while many participants state they enjoy being physically active and have noticed improvements in their health since becoming more active, it is not clear how many OA maintain PA engagement after completing the medically supervised group exercise program. This "lived experience" evidence (Wharf Higgins, et al., 2011) points to the need for further exploration regarding this topic. There is a need to hear from the OA participants themselves what they require in order to maintain PA engagement upon completion of a medically supervised exercise program.

The purpose of this study was to investigate PA engagement among OA after being discharged from a medically supervised group exercise program and explore the experiences of OA in regards to what they perceive as facilitators and barriers to maintaining PA, after being discharged from medically supervised exercise. The investigation specifically included, but was not limited to, inquiring about the newly implemented strategies mentioned above.

I anticipate that an improved understanding of these experiences of OA will help HCPs, PA programmers and PA instructors to provide programs that address the needs of OA and enhance continued participation in PA when transitioning from a medically supervised group exercise program to self-directed PA.

Research Questions

1. Do community-dwelling older adults maintain physical activity engagement upon discharge from a medically supervised group exercise program?
2. What do community-dwelling older adults perceive as barriers and/or facilitators to maintaining physical activity engagement upon discharge from a medically supervised group exercise program?
3. What do community-dwelling older adults suggest is needed in order to maintain physical activity engagement upon discharge from a medically supervised group exercise program?

Operational Definitions

Medically supervised group exercise program: A group exercise program that participants have been referred to by a doctor, which is led by a physiotherapist or other health care professional

Maintenance phase of PA or maintained PA: In this study, the term maintenance refers to any physical activity that is undertaken by OA once they have been discharged from the medically supervised group exercise program.

Older adults: Adults 65 years of age or older

Physical activity: In this study, activities of daily living, house or yard work, paid work, volunteer work, and exercise are included as forms of physical activity.

Self-directed PA: Any PA that a participant has chosen to engage in by their own volition.

List of Acronyms

Health Care Provider: HCP

Home Exercise Program: HEP

Older Adults: OA

Physical Activity: PA

Rehabilitation Assistant: RA

Delimitations

Cohort was delimited to older adults 65 years of age or older with at least two comorbidities that were discharged from a local medically supervised exercise program after completing at least 12 weeks of the program.

Limitations

A limitation of this study is that the population of OA that were discharged from this medically supervised group exercise program may have been less medically complex or more highly motivated than OA that remained in the medically supervised group exercise program.

Chapter 2: Literature Review

This chapter provides a review of the literature relating to physical activity among older adults. The chapter begins with a look at the facilitators and barriers facing OA in their pursuit of PA, followed by an examination of literature that has specifically focused on PA engagement of OA following completion of a supervised PA intervention. Next, theories that have been utilized to investigate PA and health promotion are examined. Finally, the chapter concludes with a conceptual framework representing the reviewed literature capturing the facilitators and barriers to PA among OA in general and specifically to maintaining PA following completion of a supervised PA intervention.

Facilitators and Barriers to PA among OA

Numerous studies, both qualitative and quantitative, have investigated the barriers and facilitators to participation in PA experienced by OA. Barriers and facilitators are often categorized as intrapersonal (socio-demographic, personal, or psychological), interpersonal/social, environmental, or structural/program-based (Bethancourt, Rosenberg, Beatty, & Arterburn, 2014). Table 1 summarizes the facilitators and barriers to PA experienced by OA that were cited three or more times in the reviewed studies and practical guides. A complete list of facilitators and barriers can be found in Appendix A.

Table 1. *Facilitators and barriers to physical activity experienced by older adults*

Categories (Preceded by number of times cited)	Facilitator (F)	Barrier (B)	Stated as both F & B
Personal			
11 - Physical health or Chronic conditions		De Groot & Fagerstrom, 2011; Grossman & Stewart, 2003; Moschny et al., 2011; Newson & Kemps, 2007; Rasinaho et al., 2006; Stathi et al., 2014; Stathokostas, 2013; Wright & Hyner, 2009	Belza et al, 2004; Bethancourt et al., 2014; Petursdottir et al, 2010
6 – Lack of Time		Costello et al, 2011; Grossman & Stewart, 2003; Moschny et al., 2011; Patel et al., 2013; Stathokostas, 2013; Wright & Hyner, 2009	
Psychological			
11 - Desire to maintain or improve health/ View of PA as beneficial	Belza et al, 2004; Costello et al, 2011; De Groot & Fagerstrom, 2011; Grossman & Stewart, 2003; Newson & Kemps, 2007; Patel et al, 2013; Rasinaho et al., 2006; Stathi et al., 2014.	Lack of: Stathokostas, 2013	Patel et al., 2013; Petursdottir et al., 2010
6 - Motivated to exercise for the sake of exercise		Lack of: Bethancourt et al., 2014; Costello et al., 2011; De Groot & Fagerstrom, 2011; Moschny et al., 2011; Patel et al., 2013; Stathi et al., 2014	
3 – Self-efficacy	High: Franke et al., 2013	Lack of: Costello et al, 2011; Stathokostas, 2013	
3 – Fear of exercise or injury		Costello et al, 2011; Moschny et al., 2011; Rasinaho et al., 2006	

Table 1 (con't). *Facilitators and barriers to physical activity experienced by older adults*

Categories (Preceded by number of times cited)	Facilitator (F)	Barrier (B)	Stated as both F & B
Social			
5 - Peer and family support	Belza et al., 2004	Lack of: Moschny et al., 2011; Rasinaho et al., 2006; Stathokostas, 2013	Petursdottir et al., 2010
3 - Opportunity to Socialize & create friendships	Costello et al., 2011; Franke et al., 2013; Stathi et al., 2014		
Environmental			
7 - Transportation		Lack of: Belza et al., 2004; De Groot & Fagerstrom, 2011; Moschny et al., 2011; Stathokostas, 2013	Franke et al., 2013; Petursdottir et al., 2010; Stathi et al., 2014
6 – Weather Conditions		Poor: Belza et al., 2004; De Groot & Fagerstrom, 2011; Franke et al., 2013; Grossman & Stewart, 2003; Stathi et al., 2014	Petursdottir et al, 2010
3 - Neighbourhood safety		Unsafe: Belza et al., 2004; 2013; Stathi et al., 2014 Stathokostas, 2013	
Program			
5 - Accessible programs (affordable, conveniently located)	Bethancourt et al., 2014; Stathi et al., 2014	Lack of: Belza et al., 2004; Stathokostas, 2013	Petursdottir et al., 2010
4 - Knowledgeable and Engaging Instructors	Bethancourt et al, 2014; Costello et al, 2011; Horne et al, 2010; Wright & Hyner, 2009		
3 - Suitable content Programs		Lack of: Moschny et al., 2011; Stathokostas, 2013	Petursdottir et al., 2010;

Intrapersonal Factors

Intrapersonal factors were the most commonly cited factors for influencing PA engagement among OA across all categories. Poor physical health and/or the presence of chronic conditions were the most often cited barriers to PA (Belza, Walwick, Shiu-Thornton, Schwartz, Taylor, & LoGerfo, 2004; Bethancourt et al., 2014; De Groot & Fagerstrom, 2011; Grossman & Stewart, 2003; Moschny, Platen, Klaassen-Mielke, Trampisch, & Hinrichs, 2011; Newson & Kemps, 2007; Petursdottir, Arnadottir, & Halldorsdottir, 2010; Rasinaho, Hirvensalo, Leinonen, Lintunen, & Rantanen, 2006; Stathi et al., 2014; Stathokostas, 2013; Wright & Hyner, 2009). The influence of physical health and chronic disease in relation to PA engagement became a more prominent factor with increasing age. Newson and Kemps (2007) reported participants older than 75 years of age cited medical problems as barriers more often than younger OA and Moschny et al. (2011) found that participants aged 80 years and above cited poor health as a barrier significantly more often than younger participants.

A lack of time to engage in PA was reported as a personal barrier six times (Costello, Kafchinski, Vrazel, & Sullivan, 2011; Grossman & Stewart, 2003; Moschny et al., 2011; Patel, Schofield, Kolt, & Keogh, 2013; Stathokostas, 2013; Wright & Hyner, 2009). Individuals cited busy schedules and a perceived lack of available hours in their day to fit in PA (Costello et al., 2011). Other personal factors that were found to act as barriers to PA among OA in a review by vanStralen et al. (2009) included socio-demographic factors, such as low socioeconomic status, increased age, and being female.

Psychological factors were also found to significantly influence PA engagement among OA. A knowledge or awareness of the benefits of PA and the belief that exercise was the best way to improve or maintain health were the most frequently cited facilitators to being active (Belza et al, 2004; Costello et al., 2011; De Groot & Fagerstrom, 2011; Grossman & Stewart, 2003; Newson & Kemps, 2007; Patel et al., 2013; Petursdottir et al., 2010; Rasinaho et al., 2006; Stathi et al., 2014; Stathokostas, 2013). This echoes previous findings by Newson and Kemps (2007) which found that health concerns were the strongest motivators to exercise among their study participants. The lack of motivation to exercise for the sake of exercise was cited as a barrier seven times (Bethancourt et al., 2014; Costello et al., 2011; De Groot & Fagerstrom, 2011; Moschny et al., 2011; Patel et al., 2013; Stathi et al., 2014). This may be a reflection of OA being unaccustomed to exercise, in addition to simply disliking exercise (Bethancourt et al., 2014). Self-efficacy served as both a facilitator when rated as high (Franke et al., 2014) and as a barrier when absent (Costello et al., 2011; Stathokostas, 2013). Fear of exercise or fear of experiencing an injury was cited as a barrier to engaging in PA in three studies (Costello et al., 2011; Moschny et al., 2011; Rasinaho et al., 2006).

Social Factors

In addition to intrapersonal factors influencing PA engagement among OA, interpersonal or social factors also were identified as facilitators or barriers to PA. Social factors were cited a total of eight times in the reviewed literature. Having peer or family support, such as presence or absence of a training partner, encouragement from other PA group members, or having family assist with transportation, was revealed as an influential factor in five studies (Belza et

al., 2004; Moschny et al., 2011; Petursdottir et al., 2010; Rasinaho et al., 2006; Stathokostas, 2013). Three investigations found that the opportunity to socialize and create new friendships facilitated PA (Costello et al., 2011; Franke et al., 2014; Stathi et al., 2014). Other social factors that were cited as motivators to PA among OA included personal encouragement from exercise staff (Costello et al., 2011), receiving advice and support regarding PA from physicians (Horne, Skelton, Speed, & Todd, 2013), and guidance and support from physical therapists (Petursdottir et al., 2010).

Environmental factors

Following personal factors, environmental factors were the second most influential category of factors to influence PA engagement among OA , identified as facilitators or barriers a total of 16 times. Transportation issues were the most common (Belza et al., 2004; De Groot & Fagerstrom, 2011; Franke et al., 2014; Moschny et al., 2011; Petursdottir et al., 2010; Stathi et al., 2014; Stathokostas, 2013), followed by weather conditions (Belza et al, 2004; De Groot & Fagerstrom, 2011; Franke et al., 2013; Grossman & Stewart, 2003; Petursdottir et al., 2010; Stathi et al., 2014). Concerns about neighbourhood safety were cited as barriers in three studies (Belza et al., 2004; Stathi et al., 2014; Stathokostas, 2013). This importance of addressing the issue of neighbourhood safety was also identified in a review study by van Stralen et al. (2009), which investigated facilitators and barriers to PA among OA at both the point of PA initiation and maintenance.

Program Factors

Program-based factors were revealed as either facilitators or barriers to PA among OA in 12 instances. In some studies these factors, such as program cost or availability of programs were placed under the category of environmental factors (Belza et al., 2004; vanStralen et al., 2009), while others considered these factors a category distinct from environmental factors (Bethancourt et al. 2014). In this review, factors related to PA programming have been categorized as program-based.

The most common program-based factor – either acting as a facilitator or barrier – was accessibility, in terms financial affordability or location (Belza et al., 2004; Bethancourt et al, 2014; Petursdottir et al., 2010; Stathi et al., 2014; Stathokostas, 2013). Having knowledgeable and engaging PA instructors was cited as a facilitator to PA four times (Bethancourt et al., 2014; Costello et al., 2011; Horne et al., 2013; Wright & Hyner, 2009), while suitable PA program content, or the lack of, was cited as an influential factor three times (Moschny et al., 2011; Petursdottir et al., 2010; Stathokostas, 2013).

Overall, barriers were cited more frequently than facilitators in the reviewed literature. Personal factors were the most frequently cited issues to influence PA engagement among OA in general, followed by environmental factors, program-based factors, and lastly, social factors.

Maintaining PA upon completion of a supervised PA intervention

While numerous studies have explored the facilitators and barriers to PA among OA in general, there is a dearth of studies that have investigated barriers and facilitators specific to maintaining PA engagement upon completion of a supervised PA intervention. I was unable to

find any qualitative studies exploring this topic, but I was able to identify eight quantitative intervention studies that focused on the transition from supervised PA to self-directed PA (Beauchamp, Francella, Romano, Goldstein, & Brooks, 2013; Cockram, Cecins, & Jenkins, 2006; Fielding et al., 2007; Forkan et al., 2006; Loprinzi, Cardinal, Si, Bennett, & Winters-Stone, 2012; Morey et al., 2003, Sze et al., 2008, Tak et al., 2012). Three of these studies had a medically supervised PA component (Beauchamp et al., 2013; Cockram et al., 2006; Sze et al., 2008), while the other five studies speak of supervised PA, but do not identify by whom the supervision was provided. Table 2 provides a summary of the major features of the reviewed articles.

Table 2

Summary of reviewed articles that identified transitions from supervised PA to self-directed PA

Author	**Sample**	**Supervised PA Intervention**	**Self-directed PA**
Beauchamp, Francella, Romano, Goldstein, and Brooks (2013) Canada	29 older adults with moderate-severe COPD (mean age = 66.8)	6 week inpatient or 12 week outpatient hospital-based PR program	1 year community-based maintenance exercise program; included case manager
Cockram, Cecins, and Jenkins (2006) Australia	230 older adults with stable respiratory disease (age not stated)	8 week outpatient hospital-based PR program; included HEP and education	Community-based exercise program sessions, 1/week and HEP 3-4/week
Fielding, Katula. Miller, Abbott-Pillola, Jordan, Glynn, Goodpaster, Walkup, King, and Rejeski (2007) USA	424 older adults with functional limitations (age 70-89)	8 week supervised, centre-based sessions, 3/week; included HEP, T/C, group education, and log books	16 week "transition phase" supervised, centre-based sessions, 2/week; included HEP, T/C and group education → "maintenance phase" supervised, centre-based sessions, 1/week; included HEP, T/C
Forkan, Pumper, Smyth, Wirkkala, Ciol, and Shumway-Cook (2006) USA	175 older adults with balance and gait impairments (age 65+)	4-6 week physical therapist-supervised balance training program, 1-3/week; included individualized HEP	Lifelong HEP, included log book
Loprinzi, Cardinal, Si, Bennett, and Winters-Stone (2012) USA	115 women who had been previously diagnosed with breast cancer (age 65+)	12 months of supervised classes 3/week	6 month HEP; included equipment and instructional DVD
Morey et al (2003) USA	112 sedentary adults (age 65-90)	3 months of supervised classes 3/ week	6 month HEP including telephone F/U and diaries
Sze, Cheung, Lam, Lo, Leung, and Chan (2008) China	60 community-dwelling adults identified with a high risk for falling (age 63-88)	3 month supervised classes, 1/week, included individualized HEP, home visits	9 month community step-down program, 1/week; included bimonthly visit from physiotherapist
Tak, van Uffelen, Chin A Paw, van Mechelen, and Hopman-Roc (2012) Amsterdam	179 community-dwelling adults with mild cognitive impairment (age 70-80)	12 month supervised walking or activity program 2/week	Same programs continued to be offered for a small fee.

PR, pulmonary rehabilitation; HEP, home exercise program; T/C: telephone calls; F/U; Follow Up

Type of self-directed PA program

Self-directed programs consisted of either group-based physical activity only, a home exercise program (HEP) only, or some combination of both. Two studies had group-based physical activity as the sole mean of maintaining PA engagement (Beauchamp et al., 2013; Tak et al., 2012). Three studies focused on a HEP as the vehicle for maintaining PA engagement (Forkan et al., 2006; Loprinzi et al., 2012; Morey et al., 2003) and three studies designed the maintenance phase to include both group-based activity and a HEP (Cockram et al., 2006; Fielding et al., 2007; Sze et al., 2008).

Transitioning from the supervised PA intervention to self-directed PA

The reviewed studies varied greatly in terms of the amount of detail and time dedicated to preparing participants to remain active upon completion of the supervised PA intervention. Unique to the study by Beauchamp et al. (2013) was the use of a case manager to facilitate the transition from the hospital-based pulmonary rehabilitation program to a community-based maintenance exercise program. The case manager (who was a registered physiotherapist) approached eligible patients and invited them to join a one year PA program based in the community. The case manager, patient and fitness consultant all attended the first session of the maintenance program. Beauchamp et al. state that the purpose of the case manager attending the first session was to introduce the participant to the fitness consultant, liaise with the fitness consultant, provide support and encouragement to the participant, and problem solve any logistic or equipment issues. The case manager remained available to the patient by phone or email throughout the maintenance program.

One study had a specific phase included in their program design to prepare individuals for self-directed PA. Fielding et al. (2007) provided their participants with a 15-week transition phase, whereby the amount of supervision participants were receiving diminished over time in an effort to prepare them for self-directed PA, where participants would have little to no supervision.

Three studies embedded the transition at the outset of the supervised PA intervention. For example, within the first two weeks of supervised PA sessions, Cockram et al. (2006) began to introduce the HEP that was to be used for the self-directed component of their program. Forkan et al. (2006) and Sze et al. (2008) also introduced the HEP during the supervised PA intervention. This was done in an effort to be able to address any problems that arose from doing the HEP while the participants were still involved in the supervised stage of their exercise. In stark contrast to the above mentioned studies, the study by Tak et al. (2012) did not address the actual transition from the supervised PA intervention to self-directed PA at all.

Outcomes - Adherence to self-directed PA programs

Adherence to self-directed PA after completion of the supervised PA intervention varied greatly among the reviewed studies. It is important to note that the components of these studies differed from one another in several ways including length of supervised PA intervention, length of self-directed PA program, length of transition from supervised to self-directed PA, type of self-directed program being transitioned to, definition of PA adherence, and type of participants. While these studies were all selected because of a similar goal (transitioning OA from supervised to self-directed PA) it is difficult to compare them to

determine which interventions were most successful in maintaining PA after completion of the supervised PA program, due to the variability in the interventions and how the program components were measured.

The lowest reported adherence rate was 9% by Forkan et al. (2006), while the highest adherence rate was reported at 80% (Sze et al., 2008). When categorized by the type of PA program that participants were transitioning to after the supervised PA intervention, the results differed greatly. For example, in the studies that were comprised of group-based activity only, adherence was reported at 28% (Tak et al., 2012) over 12 months, and 70% for a much shorter duration of 6-12 weeks (Beauchamp et al., 2013). This discrepancy in program length may have accounted for the sharp difference in adherence rates between the two studies. Notably, barriers facing participants over the year-long intervention included a lack of sustained interest and progress, while a case manager supported the transition of participants toward the conclusion of the shorter Beauchamp et al. study to self-directed PA.

Within the HEP only transition group, adherence rates were quite similar between the studies by Loprinzi et al. (2012) and Morey et al. (2003) (57% and 54%, respectively), however, the study by Forkan et al. (2006) reported adherence at only 9%. This low number may reflect the diverse measures used to capture adherence to PA. For example, Forkan et al. defined adherence as engaging in the HEP five or more times per week as self-reported by participants, whereas other studies considered adherence as engaging in HEP three times per week (Loprinzi et al.; Morley et al.).

There is much less disparity among reported adherence rates from two studies that transitioned participants to a combination of group-based and home-based activity, at 55%

(Cockram et al.,2006) and 54% respectively (Fielding et al., 2007). In yet another variation, Sze et al. (2008) reported attendance rate of participants once involved in the maintenance program (80%), rather than in the transition from the supervised PA intervention to self-directed PA.

Facilitators and barriers to maintaining PA

Facilitators or barriers cited by participants to maintaining activity engagement after completion of the PA intervention were mentioned in seven of the eight intervention studies and are outlined in Table 3.

Table 3

Facilitators and barriers to transitioning from supervised PA program to self-directed PA

	Facilitator	**Barrier**
Personal	High Self Efficacy (Loprinzi et al., 2012)	Poor health or injury (Cockram et al., 2006; Forkan et al., 2006; Morey et al., 2003; Tak et al., 2012)
	Strong use of behavioural change strategies (Lorprinzi et al., 2012)	Lack of strength (Forkan et al., 2006)
		Lack of interest (Forkan et al., 2006; Tak et al., 2012)
		Lack of time (Tak et al., 2012)
		Fear of falling (Forkan et al., 2006)
		Depression (Forkan et al., 2006)
		Low outcome expectation / Lack of progress (Forkan et al., 2006; Tak et al., 2012)
Social		Lack of Companionship (Sze et al., 2008; Tak et al., 2012)
Environmental		Lack of Transportation (Beauchamp et al., 2013; Sze et al., 2008)
		Weather (Forkan et al., 2006)
Program		Program Cost (Tak et al., 2012)
		Program Location (Tak et al., 2012)
		Program Quality (incorrect intensity) (Tak et al., 2012)

There was only one study (Loprinzi et al., 2012) to find statistically significant facilitators to maintaining PA upon completion of a supervised PA intervention: participants possessing high sense of self-efficacy and reliance on behavioural change strategies demonstrated greater odds of being sufficiently active six months after completion of the 12 month study intervention. Forkan et al. (2006) surveyed participants about motivators and barriers, but none emerged significant.

Barriers dominated the research findings: in six of the eight reviewed studies, a total of 20 obstacles plagued participants in their transition from a supervised PA program. Two of the studies addressed barriers to maintaining PA with fixed question surveys (Forkan et al., 2006; Tak et al., 2012), while the other four studies reported barriers that were cited by participants during follow up conversations (Beauchamp et al., 2013; Cockram et al., 2006; Morey et al., 2003; Sze et al., 2008). Barriers included personal, social, environmental, and program-based factors, with poor health or injury being the most frequently recounted obstacle.

Because facilitators and barriers were not the prime purpose of the studies reviewed here, only fleeting mention is made of them in this literature. A deeper exploration of the facilitators and barriers influencing PA engagement after completion of a PA intervention is needed to understand more fully the factors influencing OA experiences as they shift from supervised initiatives to more self-directed activity. In particular, qualitative contributions to the evidence-base are required to advance interventions in this area (Newson & Kemps, 2007). Effective interventions promoting the maintenance of PA among OA is critical to the health of this growing population.

Theory

Complex matters, such as maintaining PA after discharge from a medically supervised program, are often best investigated using a theoretical framework to guide the investigation of the multifarious and inter-related influences (Glanz, Rimer, & Lewis, 2002). In this section, theories that address primarily individual behaviour change are discussed first, seminal documents that shifted the focus of health from the individual to a broader scope are next identified, followed by theoretical models that embrace a holistic orientation.

Theories with an Individual Focus

In a review of the most commonly used theories or models in the health behaviour field appearing in articles published in 1999 and 2000, the two most dominant theories identified were the Transtheoretical Model, which focuses on the individual level of health and the Social Cognitive Theory, which focuses on the interpersonal level of health behaviour (Glanz, Rimer, & Lewis, 2002). Only two of the eight quantitative intervention studies that focused on the transition from supervised PA to self-directed PA used in this review mentioned theories (Loprinzi et al., 2012; Morey et al., 2003). Loprinzi et al. utilized the Transtheoretical Model developed by Prochaska as a conceptual framework for their study. This framework involves constructs of self-efficacy and decisional balance as key predictors for an individual progressing through the various stages of behaviour change. Morey et al. did not state an overall theoretical framework, but did mention the use of certain psychosocial variables from the Health Belief Model and the Social Cognitive Model in an effort to predict adherence in their study.

Similarly, Li, Cardinal, and Settersten (2009) found that the majority of the theories applied to PA promotion and health behaviour have focused on psychosocial aspects (e.g., beliefs, values, attitudes, expectations, motivation, and goals). In fact, Crosby and Noar (2010) note that current theories used in health promotion are "all too often centered at the individual level" (p. 261), such as the Health Belief Model, the theories of Reasoned Action and Planned Behaviour, and the Transtheoretical Model frequently informing behaviour change interventions.

Behavioural models which focus on the individual tend to ignore the complex social and physical environments in which people live (Prohaska et al., 2006). In an effort not to place blame on an individual and to understand the broader determinants of health, it has been suggested that theories which look beyond the individual level are needed (Primary and Community Health Branch, 2008).

A Shift in Thinking

The Lalonde report led the way for health promotion in the Western world (e.g., the 1986 documents Achieving Health for All and the Ottawa Charter for Health Promotion), and was one of the first reports to recognize the role of communities and environments to people's health (Hancock, 1985). The report emphasized the need to shift from an individual or biomedical focus on health to acknowledging the broader determinants of health (Lalonde, 1974). Lalonde presented four health fields to consider: human biology, environment, lifestyle, and health care organization.

The introduction of the Ottawa Charter for Health Promotion (WHO, 1986) further highlighted the importance of looking at health promotion beyond the level of the individual. This seminal piece of work spoke to the need to not only develop personal skills, but also strengthen public participation, community action, create supportive environments, reorient health services and build healthy public policy.

While initially these documents garnered increased activity and resources to the field of health promotion, and much good work in the field has been done, Hancock (2011) argued that 25 years later there has been failure to fully adopt and implement these core principles of health promotion due to a lack of provincial and federal government support.

The Need for Theories with Multiple Levels of Focus

According to Stokols (1995), a social ecological approach extends beyond behaviour and environment and offers a theoretical framework for understanding the dynamic interplay among the individual, groups, environment and public policies. For, Rimer and Glanz (2005), simply educating individuals about healthy practices is not enough; a range of strategies operating on multiple levels are needed in order to create effective health promotion programs In their study exploring OA perspectives on PA across multiple cultures, Belza et al. (2004) found their qualitative data to fit within an ecological model: PA was affected by a dynamic interaction between biological, psychological, social, and environmental factors that unfold over the life-course of an individual. As such, Prochaska et al. (2006) argue the need to focus on PA assessment, intervention, and evaluation from a social ecological framework. This acknowledgement of a life-course perspective draws on the strengths of both the psychosocial

and ecological perspectives while adding the unique perspective attempting to understand long-ranging developmental trajectories (Li et al., 2009).

Conceptual Framework

While this research study was not framed around any one theory in particular, a social ecological model founded on the facilitators and barriers identified in the reviewed literature was created as a conceptual roadmap (Figure 1). This figure incorporates the data from Table 1, as well as the literature that investigated PA engagement after completion of a supervised PA intervention (Table 2). Each of these personal-, social-, environmental-, and program-based factors were mentioned in the literature a minimum of three or more times.

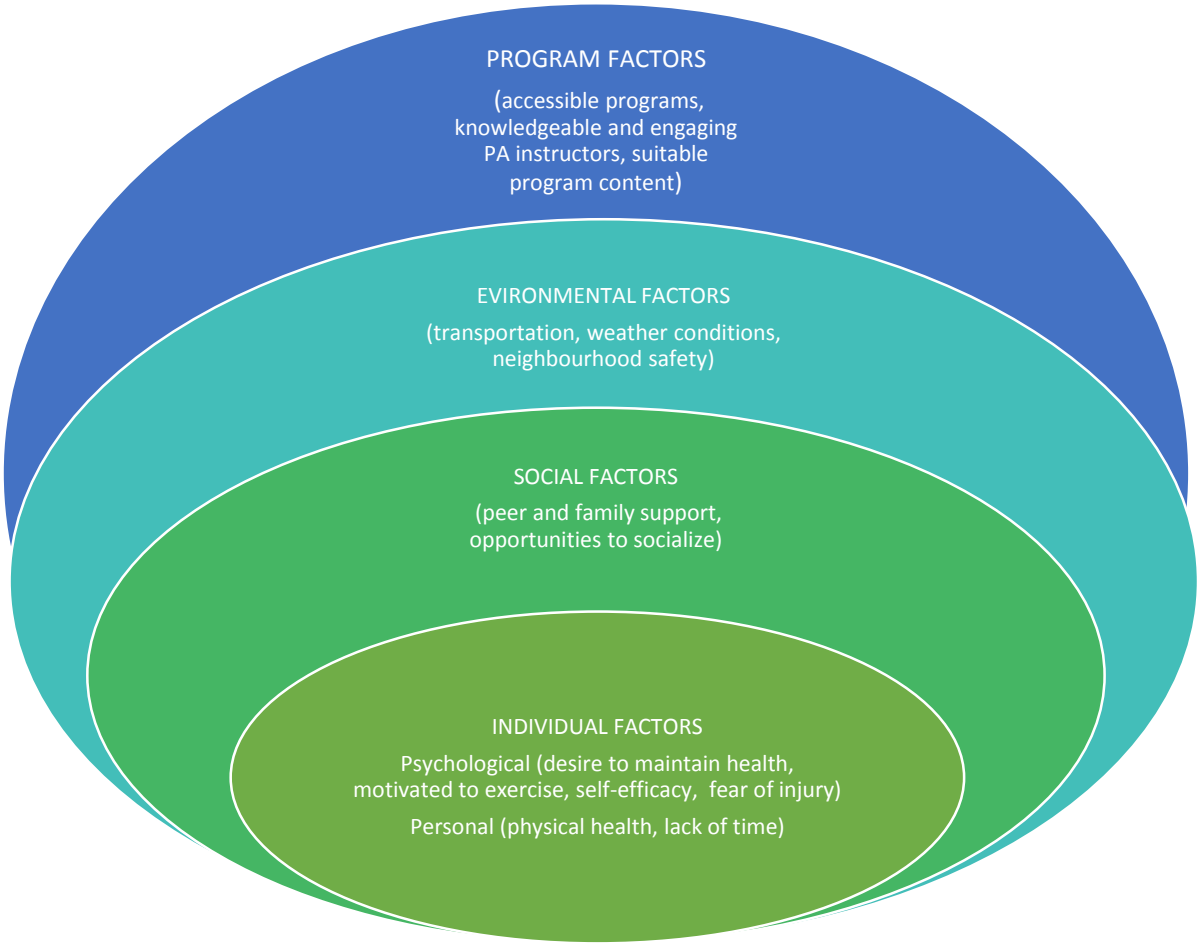

Figure 1. Conceptual framework of factors that may influence physical activity engagement among the older adult population.

This figure reflects a social ecological orientation and acknowledges the dynamic relationship between individual-, social-, environmental-, and program-based factors that influence PA engagement among OA. Individual factors were placed at the centre of the model and were cited most often as facilitators or barriers to PA. Personal factors were cited a total of 54 times, social factors 10 times, environmental factors 19 times, and program-based factors 15 times throughout the reviewed literature. The size of the circles in this model do not signify a weighted importance of each factor, rather they symbolize how factors are nested within

another. The model recognizes that individuals influence and are influenced by various factors, and recognizes the need to understand human behaviour in terms of a systems approach rather than considering each factor separately (Bronfenbrenner, 1992).

While information was readily available regarding facilitators and barriers to PA among OA in general, there was much less information available regarding factors, particularly facilitators, to PA among the literature investigating maintained PA engagement after completion of a supervised PA intervention. Further research in this area is needed, as it has been identified that factors influencing PA at initiation differ from those determinants at the point of maintaining PA engagement (van Stralen et al., 2009). This study bridges a critical gap in the literature as it purposively and qualitatively examines facilitators and barriers to maintaining already established PA and to initiating self-directed PA programs.

Chapter 3: Methods

Research Design

This research explored the experiences of OA in regards to what they perceive as facilitators and barriers to maintaining PA, after being discharged from a local medically supervised group exercise program within Western Canada, with a focus on improving balance, strength and mobility. A case study approach was used to gather data from a variety of sources in order to illuminate the experiences of this clearly defined population that was bound by space and time (Baxter & Jack, 2008). A convergent mixed methods framework (Fetters, Curry, & Cresswell, 2013) allowed me to use qualitative methods to investigate, describe, and interpret the experiences of the participants in a meaningful way (Lichtman, 2013), while quantitative data allowed for measurement of PA engagement and comparison and triangulation of the information (Gillham, 2000). This type of qualitatively-driven mixed methods approach has been suggested as particularly useful when investigating health care questions looking at issues of "care rather than cure" (Shneerson & Gale, 2015, p. 846).

My goal was to engage in this research from a constructivist approach (Haverkamp & Young, 2007) within a relativist ontology. I believe that each OA had their own construction of reality and their experiences were varied. The findings and meaning of this research was constructed between myself and the participants, and I recognize my subjective role in this process (Haverkamp & Young, 2007). My objective was to explore this situation from the view of my participants, as well as my view as a researcher.

Participants

Intense purposive sampling was used to recruit study participants (Patton, 2002) from a local medically supervised group exercise program within Western Canada. Focusing on these information-rich cases allowed for the factors affecting PA engagement after discharge from a medically supervised group exercise program to be illuminated in an in-depth manner (Patton, 2002). To be referred to the medically supervised group exercise program by a doctor, individuals must be over the age of 55 with a diagnosis of at least two long-term health conditions (e.g. diabetes, high blood pressure, heart failure, osteoarthritis). Upon completion of the medically supervised group exercise program, OA were encouraged to maintain PA by engaging in self-directed PA at home or in the community. I chose to explore the experiences of these participants in maintaining PA engagement as they transition from the medically supervised group exercise program to self-directed PA in order to understand factors that influence PA engagement during this time more fully. It has been identified by HCPs working in this program that a better understanding of the experiences of OA is required to better assist clients to stay as active as possible upon discharge from the medically supervised group exercise program to maintain and/or enhance the health benefits gained in the medically supervised program.

Phase I. All program attendees from the April – July 2014 session and August – December 2014 session of the medically supervised group exercise program were given a letter of invitation (Appendix B) by a third party, the program administrative assistant. I was not directly involved in recruitment, as I may have been in a position of power over the prospective

participants in my role as the program RA. Interested participants signed the letter of invitation to express consent to be contacted directly. I then contacted potential participants over the telephone with further information about this study, as outlined in the script provided in Appendix C.

In an effort to recruit participants from earlier sessions of the medically supervised group exercise program, posters (see Appendix D) were placed at the local recreation centre where the medically supervised group exercise program had taken place. Interested participants contacted me directly over the telephone and were provided with further information about this study, as outlined in the script provided in Appendix E.

Participants for this study were deemed as cognitively competent to provide informed consent by a clinical team member. Inclusion criteria were: participants had attended the medically supervised PA program for a minimum of twelve weeks, and participants had been discharged from the medically supervised group exercise program.

Thirteen participants met the inclusion criteria for this study, but one participant withdrew from this study, leaving twelve participants (8 women and 4 men) in total. Participants ranged in age from 72 to 89 years of age (M =80). Table 4 outlines the characteristics of the participants including gender, age, and dates of involvement in the medically supervised group exercise program.

Table 4
Participant Characteristics (N = 12)

Characteristic	n	%
Sex		
Female	8	67%
Male	4	33%
Age (M = 80)		
65 – 74	2	17%
75 – 84	7	58%
85+	3	25%
Completion date of medically supervised group exercise program		
March 2011 – August 2013	4	33%
April – July 2014	6	50%
August – December 2014	2	17%

Phase II. A retrospective chart review of twelve past participants from the same medically supervised group exercise program was also conducted. These participants were involved in previous sessions between January 2013 and April 2014. This retrospective chart review was conducted to gather information from a broader sample regarding previous engagement of PA after discharge from this program, in order to put the experiences of this current sample of OA into context. Retrospective chart information was anonymous, therefore participant characteristics (e.g. age and gender) were not known. It should be noted that participants from these earlier sessions had a slightly different experience than participants that completed the medically supervised exercise program in July 2014 or later. In July 2014, we

had implemented a new strategy of having an RA attend community-based PA programs with clients,

Ethics & Consent

Ethical approval was obtained through the Joint UVIC-VIHA subcommittee, as the participants were from a program within Island Health (formerly VIHA). Written and verbal consent was obtained during the first meeting related to the study and an adapted version of the Senior-friendly Ethics Consent Letter for Joint UVic/VIHA applications developed by the Centre on Aging in consultation with the University of Victoria's Human Research Ethics Office was used (Appendix F and G). The consent forms clearly stated that participation in the research was completely optional and if an individual chose not to participate it would not impact their treatment within the medically supervised group exercise program in any way. To ensure confidentiality, all participants' questionnaire and interview data were matched to a pseudonym of their choosing and no real names were used in any written material or reports pertaining to this study.

In the case of the retrospective chart review, it was impossible to gain consent from the individuals involved in this chart review because, from my role as a researcher, I was not aware of their identity, therefore, was unable to contact them. My intention was not to undermine the trust of the VIHA/Island Health clients, but to more fully understand the issue of engagement of physical activity. I acknowledged that without consent to view these charts I needed to handle these data with care, and was very aware of the importance of privacy and confidentiality. Specific steps were taken to ensure anonymity of the participant information. A

program clinician identified the relevant chart data from past program participants. A second individual then de-identified the data before providing the information to me. If the chart did not contain the information I was seeking (i.e., relative to PA), I did not investigate any further.

Data collection

Quantitative Data

The first point of data collection occurred during the last week of the medically supervised group exercise program, for the eight participants recruited from the April – July 2014 or August – December 2015 cohorts. Self-reports of PA engagement over the past seven days were attained through the use of a the Physical Activity Scale for the Elderly (PASE) questionnaire (Washburn, Smith, Jette, & Janney, 1993) which is included in Appendix H. The PASE questionnaire is comprised of self-reported occupational, household, and leisure activities and was developed to be used with individuals aged 65 and older (Washburn et al., 1993). I administered these questionnaires to each participant in person at the location of their medically supervised group exercise program. I read the PASE questionnaire aloud to the participant and recorded their answers according to the PASE Administration and Scoring Instruction Manual (Appendix I) on a labelled copy of the PASE questionnaire for each participant. I administered the questionnaire a second time over the telephone or in person six to eight weeks later after the participants' were discharged from the medically supervised group exercise program. The questionnaire was administered in the same way over the telephone as it was initially done in person. In the case of the four participants from medically

supervised exercise sessions prior to April 2014, the PASE questionnaire was administered only once, at the time of the interview.

Scoring for specific activities that are not stated in the PASE Administration and Scoring Instruction Manual was done as outlined below:

- Participation in Tai Chi, Qi Gong, or yoga was coded under *light sport and recreation.*
- Participation in a community-based or medically-supervised balance class that consisted of multiple components was coded under multiple suitable categories, as suggested by the PASE Administration and Scoring Instruction Manual. For example, a balance class that consisted of 30 minutes of balance activities (e.g. standing on an unstable surface, standing with an altered base of support) and 30 minutes of resistance work with weights and tubing was coded under both *light sport and recreation* and *muscle strength and endurance* for the amount of time spent doing each specified activity.

Qualitative Data

For the purposes of gathering qualitative data to explore the facilitators and barriers experienced by OA to maintaining PA engagement, I did semi-structured individual interviews eight to ten weeks after the participants had completed the medically supervised program for the eight participants that were involved in the medically supervised group exercise program between April through to December 2014. This time frame allowed the participants to have time to explore options for maintaining PA engagement after completion of their medically supervised group exercise program. The four participants from sessions prior to April 2014 were interviewed 17 – 48 months after completion of the medically supervise group exercise

program. Participants were given the option to participate in an individual interview or group interview. Two sets of two participants requested to do their interviews together, while eight participants completed individual interviews. The interviews were conducted at a local health unit, an environment that was familiar to participants. I conducted two pilot interviews prior to the first interview in order to familiarize myself with the interview process and gain insight into the types of responses my proposed questions would illicit. Interview questions asked of interview participants are located in Appendix J.

Data Analysis

Quantitative Data

Quantitative results from the PASE questionnaire were scored according to the PASE Administration and Scoring Instruction Manual. For the 8 participants for whom the PASE was administered twice the results from the initial administration of the PASE questionnaire were compared with results from the second administration of the questionnaire in order to analyze changes in PA engagement over time. PASE scores were compared and descriptive statistics (mean and range) were used to summarize PA engagement. A dependent t-test was run to test for significant changes regarding levels of PA engagement).

Qualitative Data

All individual interviews were audio recorded and transcribed verbatim by me, one or two days following each interview. Transcripts were read several times and a general inductive approach was used to identify central concepts and themes (Lichtman, 2013). Specific steps

outlined by Braun and Clarke (2006) were used to guide the thematic analysis of the data. These steps involved familiarization with the data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the report (Braun & Clarke, 2006). I began by breaking the data into codes, to represent sentences or paragraphs that I deemed meaningful. Once all of the transcripts were coded, I then reviewed the codes in an iterative manner to identify patterns or themes across the data set. As outlined by Weeks and colleagues (2008, p.39) this type of "thematic analysis lends itself well to understanding meaning in relation to the physical activity behaviors of study participants."

In order to provide graphic images to represent the benefits of PA that were cited by participants and the barriers to PA, NVivo software was utilized to produce word clouds (Figures 3 and 4).

In order to address data trustworthiness, I wanted to check in with participants throughout the process to ensure that, as the researcher, I "led but was not leading" the process of investigation (Horne et al., 2013, p.632). To test my interpretations of the data, I mailed a summary of the themes that were generated from the interviews to each participant. Responses were received from 10 of the 12 participants in Phase I. Feedback was received in written form by four participants (emails and returned theme documents) and verbally from six participants (either in person or over the telephone). Three participants approved of the developed themes and did not request any changes, one participant asked to change a few words in her quotes, five participants wanted to emphasize particular points further (e.g. how important it is for government and health care to take a preventive approach to health, the need to remove barriers

such as cost and transportation, and the importance of encouraging OA to stay active) and one participant suggested a summary of the main points of the findings would be useful. Modifications were made according to the feedback that was received. This verification process was important to show respect to the participants and ensure that the results accurately portrayed their experiences and reflections (Yeh & Inman, 2007).

Integration of quantitative and qualitative data

A merging approach was employed, whereby the two databases were brought together for analysis to understand the experiences of OA in this study more fully (Fetters et al., 2013). Quantitative and qualitative data were used to triangulate OA perceptions of their PA engagement. For example, did PA engagement reported in the interview process corroborate those reported in the questionnaires? The data were also be used to determine if the facilitators and barriers stated by participants were related to PA engagement. For example, did less active OA experience different facilitators or barriers compared to more active OA (Costello et al., 2011)?

My role as the researcher

It was important for me to recognize that I was conducting data collection as a researcher, not as a HCP, and because of this I needed to be aware of my interview style. Hunt, Chan, and Mehta (2011) spoke about the need to be aware of the different styles of interviewing between the clinical method and that of a qualitative researcher. I strove to self-reflect critically on my prior interview experience, prepared for the interviews carefully, tried to

be aware of power dynamics that may have been perceived, and paid attention to language and cues, and constantly evaluated progress (Hunt et al., 2011).

As I also work as a RA with OA within this medically supervised group exercise program, self-reflection was very important in order to maintain awareness throughout the data collection and analysis to ensure that I was consistently interpreting the data in a co-constructed manner (Ponterotto & Greiger, 2007). Wearing two hats (as both a researcher and RA) and keeping these roles separate turned out to be much more difficult than I had anticipated, given the close connections between the two roles. To assist with this, I kept a detailed journal, or audit-trail, of my decisions throughout this process.

Chapter 4: Results

Results for PA engagement among OA discharged from a medically supervised exercise program, as well as facilitators and barriers influencing PA engagement, are presented in this chapter. Phase I includes primary data from 12 participants from the PASE questionnaires (Phase I-A) and semi-structured interviews (Phase I-B). Phase II results are comprised of secondary data gathered from a retrospective medical chart review of 12 individuals.

Phase I-A: PASE questionnaires

PASE questionnaires were administered to 12 individuals to gather quantitative self-reports regarding current PA engagement. All study participants who completed interviews and PASE questionnaires reported being engaged in PA. Table 5 contains a summary of PASE total scores for the 12 participants in this study.

Table 5

Total PASE scores

Participant (age in years)	Upon program completion	8 weeks post program completion	17 – 48 months post program completion	Difference between program completion to 8 weeks post
Avril (81)	136	89	-	-47
Anastasia (85)	66	91	-	+25
Bradley (89)	79	88	-	+8
Cassie (77)	58	61	-	+3
Eugenia (79)	84	116	-	+32
Ronald (80)	82	85	-	+3
Sally (74)	153	155	-	+2
Sharon (77)	45	64	-	+19
Allison (72)	-	-	120	-
Elizabeth (82)	-	-	66	-
Oscar (80)	-	-	121	-
Red (85)	-	-	40	-
Range	45-153	61-155	40-121	-47 - +32
M	87.88	93.63	86.75	+5.63

From April through to December, 2014 eight participants completed the PASE questionnaire at two different time points: upon completion of the medically supervised group exercise program and eight weeks after completion of the program. As outlined in Table 5, the average PASE score upon program completion was 88 (range = 45-153). Eight weeks following program completion, the average PASE score was 94 (range = 61-155). While there was a slight increase between the mean scores, it was not statistically significant ($p = .5$). Further, Cohen's effect size value ($d = .17$) suggested negligible practical significance (Hojat & Xu, 2004). Despite the lack of significance, it may be important for clinicians to note that while it may have been expected OA would experience a decrease in PA levels after discharge from a the medically

supervised exercise program, individual PASE scores indicated 7 of 8 (87.5%) participants were able to maintain the same level or a higher level of PA engagement eight weeks after discharge from the program.

Four participants from earlier sessions of the medically supervised group exercise program offered between March 2011 – August 2013 also completed the PASE questionnaire only once, at the time of the interview which was between 17 – 47 months after completing the program. PASE scores for this group ranged from 40 – 121 with an average score of 87. The mean activity level of these four participants outlined in Table 5 is comparable to the eight participants from the program running April through to December 2014, however this was not tested for statistical significance, due to the low number of participants.

Compared to age and gender based norms provided in the PASE Administration and Scoring Manual (outlined in Table 6), PASE scores obtained following discharge from the medically supervised exercise program for participants in this study fell within the expected range for 9 out of the 12 participants in this study, while PA engagement among the remaining 3 were either above or below this range. Two participants had PASE scores higher than expected for their age and gender: Sally (age 74) and Eugenia (age 79). The only PASE score from this study that fell below the normal range value was reported by Red, an 85 year old male participant. While this participant's PASE score following completion of the medically supervised exercise program was calculated to be 40, his score reflected daily home strengthening exercises, attending a one hour group exercise class that focused on balance and strength twice a week, and doing light housework.

Table 6

PASE scores following completion of the medically supervised exercise program compared to norms

	Age Group	
	70-75 yrs.	76-100 yrs.
Men		
Norms	102.4 +/- 53.7 (48.7 – 156.1)	101.8 +/- 45.7 (56.1-147.5)
		Red (age 85): **40** Bradley (age 89): 88 Ronald (age 80): 85 Oscar (age 80): 121
Women		
Norms	89.1 +/- 55.5 (33.6-144.6)	62.3 +/- 50.7 (11.6-113)
	Allison (age 72): 120 Sally (age 74): **155**	Cassie (age 77): 61 Eugenia (age 79): **116** Sharon (age 77): 64 Anastasia (age 85): 91 Avril (age 81): 89 Elizabeth (age 82): 66

Note. Boldface indicates value outside of normal range

When analyzed by the type of PA participants were engaged in, the most common forms of PA across all points of time included walking, light sport or recreation, muscle strength and endurance work, and light housework. PA engagement across all subcategories are outlined in Table 7. At the time of completion of the medically supervised group exercise program, all eight participants reported being engaged in light sport and muscle strength or endurance activities. This was an expected result, as the medically supervised group exercise program incorporated 30 minutes of light sport and 30 minutes of muscle strengthening.

Table 7

Activity within a PASE Subcategory (N = 12)

PASE Subcategory	Number of participants upon program completion *n* = 8 (%)	Number of participants 8 weeks post program completion *n* = 8 (%)	Number of participants 17 – 48 months post program completion *n* = 4 (%)
Walking	6 (75%)	6 (75%)	3 (75%)
Light sport or recreation*	8 (100%)	6 (75%)	4 (100%)
Moderate sport or recreation	0 (0%)	0 (0%)	0 (0%)
Strenuous sport or recreation*	1 (12.5%)	1 (12.5%)	0 (0%)
Muscle strength & endurance*	8 (100%)	6 (75%)	3 (75%)
Light housework	8 (100%)	8 (100%)	4 (100%)
Heavy housework	4 (50%)	4 (50%)	1 (25%)
Home repairs	1 (12.5%)	0 (0%)	0 (0%)
Lawn or yard work	0 (0%)	1 (12.5%)	1 (25%)
Outdoor gardening	5 (62.5%)	4 (50%)	1 (25%)
Caring for others	3 (37.5%)	4 (50%)	2 (50%)
Volunteer or paid work	1 (12.5%)	1 (12.5%)	0 (0%)

* Group exercise classes (both medically supervised and community-based) were accounted for within light sport or recreation, strenuous sport or recreation, and/or muscle strength and endurance.

Light housework was the only form of PA in which 100% of participants reported across all groups. PASE results show that participants most commonly maintained PA by engaging in self-directed activities such as walking, light sport or recreation, muscle strengthening activities, and light housework after completion of the medically supervised exercise program.

Phase I-B: Interview Data

Participants spoke of factors that facilitated activity (issues that motivated or supported them to be active), barriers hindering activity, and offered suggestions for what OA need in order to live an active lifestyle. Facilitators and barriers were found to be personally-, socially-, and program-based (Figure 2).

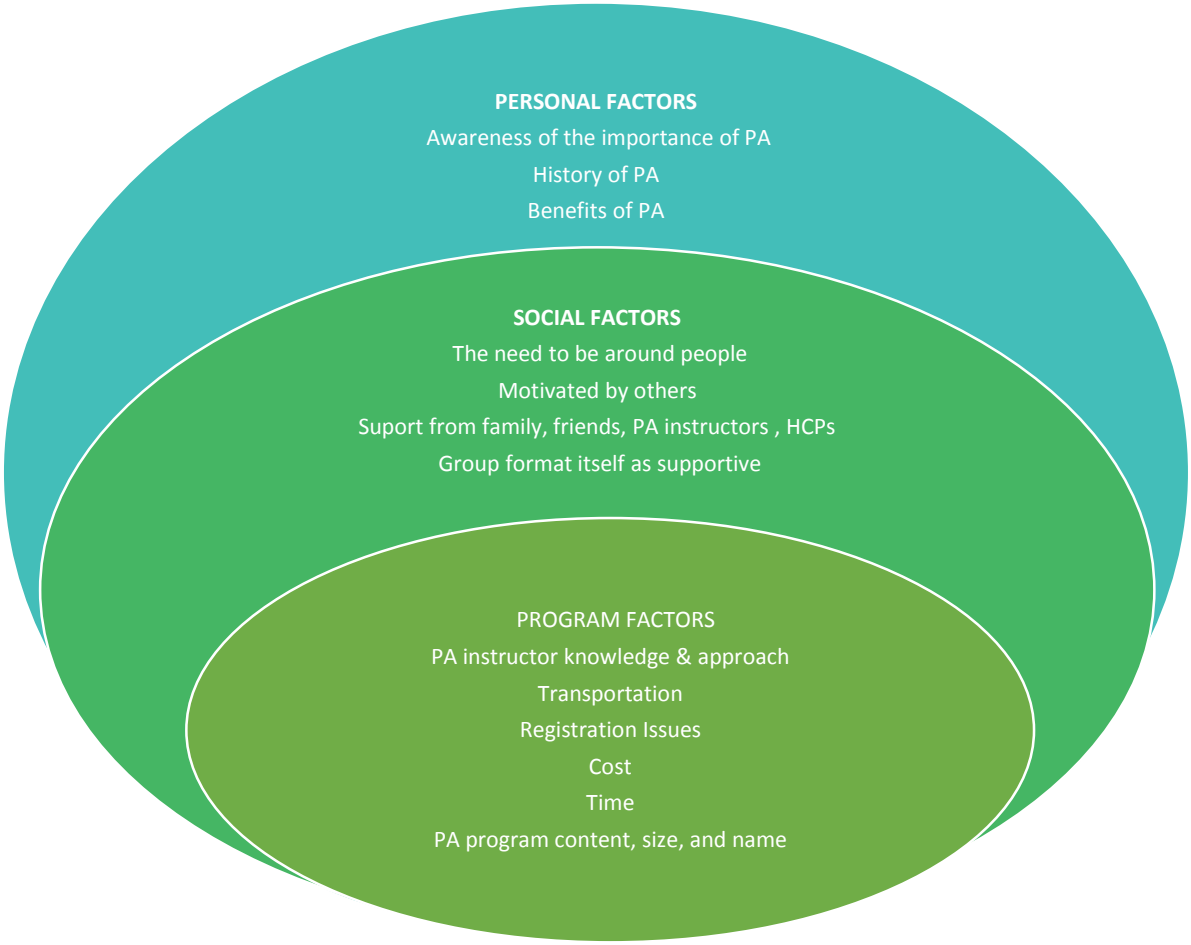

Figure 2. Facilitators and barriers to maintaining PA experienced by OA following completion of a medically supervised exercise program
(based on an upended version of the social ecological model by Golden et al., 2015)

The following four themes were developed through thematic analysis to represent the participants' comments: Personal drive: highly aware of the need to keep moving; Social connections and support: we all need people; Program components matter; and Convenient, Affordable, Relevant: suggestions to improve program access.

Theme 1: Personal drive: "Highly aware of the need to keep moving" (Allison)

All participants recognized the importance of physical activity in maintaining or improving their health. Participants reported that the medically supervised group exercise program served to increase the awareness of the importance of being physically active among three participants. Allison stated,

> You know what (the medically supervised group exercise program) did most of all, was create an attitude. It shifted my attitude toward being so-so aware of it to being highly aware of the need to keep moving.

The medically supervised group exercise program was also reported to encourage people who were not active previously to become active. However, for most participants, being physically active had been a life-long pattern that came from a drive within themselves.

> I am just a very active person. My personality is, I can't sit around doing nothing. I have always been active. (Avril)

> It's in my being; if you want something you go get it. Nobody's going to do it for you. (Anastasia)

Being physically active had been a way of life for many participants. Participants had a strong history of being engaging in PA throughout their lives. Many participants spoke of being athletic in their younger years and throughout their working careers.

> All my life, I have always been active. I used to run. I rode my bike to work and back and ran at noon time and stuff like this. So, I miss this. Right now, I wish I could get back to the good old days! (Red)

> There is always a thought, "I wish I could have been more active, like I used to be. (Bradley)

As exemplified above, participants made reference to the limitations they faced. Despite this, participants remained active, even if activities had to be done in a different way than before. Ronald provided his outlook on this by stating,

> The friends I played tennis with are still playing tennis, and I am a little envious of that, but I can't, so I'll do what I can do.

All participants acknowledged the important connection between being active and their personal health.

> I think (staying active) is a positive thing and it really depends on your own will. You know, your own sense of "is this important or not" and I am convinced that, with all the documentation, that movement is really important. So, I do believe in it. (Ronald)

> It's very important that you keep going, whatever it. You have got to get your blood moving. (Elizabeth)

While some participants spoke of hoping to improve or change their health and physical abilities, others were more focussed on maintaining their health and level of physical ability.

The role of physical activity in relation to one's own health was cited as both a motivator and a benefit.

> So I knew that it was to my advantage to keep going because, "if you don't use it you lose it" sort of attitude. That's why it was important for me to keep on. I don't like fainting, I don't like falling unexpectedly, and I believe that (the community exercise program) helps me to keep mobile. (Anastasia)

> Well it's your wellbeing. That you can do these things. Like I am checking myself all the time, because of this hip, I'm saying, "Oh by golly, I can go up those stairs now?" And I am looking at these progressions all the time. I'm looking for changes that I am improving. Well, this is working. And I say to myself, "You better do more of those." (Red)

Participants also expressed how quickly the benefits of being physically active could be lost, if they were to cease being physically active.

> If I don't walk today, then I probably won't walk tomorrow, and then three days from now I definitely won't walk, and then on the fourth day I won't be able to as easy as it is. And I know that the longer you put it off, the harder it gets. I know that from my experience. I know how my body behaves, so the longer you postpone it, the worse it is. (Sharon)

> I mean once you stop doing things, you don't get back to them as you get older. You have to keep doing them, even if you do them in a more limited way, at least you

> have got to attempt to do them. If you stop and just sit, then you will just be sitting forever. (Avril)

When asked about specific ways that PA maintained or increased their health and abilities, participants cited a wide variety of physical, mental, and social benefits. Sally stated, “I think you just feel good after you have been physically active”. Experiencing improved physical health, improved mental health, maintaining ability to do activities of daily living, weight control, improved balance, fall prevention, and new friendships were all cited by study participants as benefits of engaging in PA. Figure 3 illustrates the benefits of PA cited by participants. The size of the word reflects the frequency count within the transcripts, as analyzed by the word frequency function in NVivo QSR 10.

Figure 3. Benefits of physical activity

Personal barriers to being physically active included being in poor physical health, experiencing low energy engagement, finding difficulty making time for activity, or being busy with travel. Two participants acknowledged experiencing pain when being active and two participants recognized that being active could increase their risk of having a fall or sustaining an injury. Despite these barriers and risks to being active, all participants continued to remain active. As stated by Sharon in regards to foot pain while walking:

> I am ready to bite the bullet on that and keep on walking if it's better for the rest of me because I am not gonna die of sore feet. I'm going to die of a heart condition if I don't get walking.

Whilst personal factors were identified as main motivators to staying active, social influences were also reported to be important in the maintenance of PA.

Theme 2: Social connections and support: "We all need people" (Elizabeth)

Participants clearly articulated the importance of being socially engaged. The need to be around people, the enjoyment from attending group activity, and the role of motivation and support from others were all identified as significant motivators for being active.

> Oh, one more thing, you must be with people. You can't shut yourself off in your own little island. Wherever they are, church or (the recreation centre) or anywhere, people are important. We all need people. No man is an island, I guess. (Elizabeth)

> It's just a need in me that I have to be around people. Since I live alone, it's good for me to be with family or friends and not just be at home on my own. And it has been

> brought to my attention that I am too friendly. I used to be very active in my younger years, but I still exercise trying to keep fit. (Anastasia)

Participants were also motivated by friends, family and PA instructors. In Sharon's case, she was directly encouraged from others to keep going:

> Well definitely the motivation with other people is important to me. And even though I am walking by myself in the hallway, I'm not really by myself because the hallway is an active place. So all of my friends up and down the hall are always giving me the high five or giving me that little extra, "go for it, Sharon!" That kind of thing to make you feel like that what you are doing is what you should be doing. They are all so wonderful. That helps a lot.

Participants also spoke of other ways that friends and family around them had influenced them to keep active. In some cases, a spouse or friend provided transportation to enable the participant to get to their PA program. For one participant witnessing a spouse engage in PA, despite their own personal limitations, served as motivation. A spouse or friend was a source of companionship for PA in some cases. One participant addressed the lack of a training partner and how that had influenced his enjoyment of PA.

> I [went to the gym and did weights] for probably a couple of years. For a while it was very satisfactory, but right now it's not. And I don't go with anyone, see if I had a mate, for example. Like a lot of people come in pairs, and they sort of encourage each other and help each other. You see that a lot up there, a lot of pairs. (Oscar)

Group PA was identified as creating important opportunities for socialization among OA. Meeting new people and creating new friendships were benefits that were identified from being engaged in group PA. The camaraderie of the group served to encourage participants and add to their enjoyment of PA.

> For me, I really enjoyed meeting the people in our class, I really liked that. So, I think you meet a lot of nice people. (Eugenia)

> What made [the medically supervised group exercise program] good was the instructors and the camaraderie of the group. It was a good group. It clicked. People liked each other. People enjoyed each other. There has been some continued contact with those people since. Not extensive, but still there. (Oscar)

The structure of registered group exercise also served to motivate participants to remain active. While some participants were successful in engaging in home exercise on a regular basis, other participants acknowledged that if they did not sign up for registered group class, they may not engage in PA on their own. Oscar articulated that “classes are easier because there is a group and you have to do it”. Another participant recognized the importance of the structure of group OA and how it gave her purpose to her day:

> But I still think that I need to go back to the class at (the recreation centre) because it is structured and it is something that you do and the HandyDart comes to get you and brings you home and there is a good reason to get up in the morning. (Sharon)

In addition to the supportive structure of group PA, participants recounted the importance of receiving encouragement and guidance from both the medically supervised group exercise program and community instructors when asked specifically about the experience of maintaining PA upon discharge from the medically supervised group exercise program.

Over 40% of participants indicated that having the rehabilitation assistant (RA) from the medically prescribed exercise attend a new exercise class with them was helpful. For Cassie, having support from the RA enabled her to try a new form of physical activity:

> Well it certainly made it easier for me to transition to water exercises and I probably would not have continued to do it by myself, because at this time of year it is not exactly fun to go to the pool and not knowing what it was about I was kind of hesitant about actually even trying it. So having that little bit of push to say "I'll give you a hand" definitely made it a lot easier. Very helpful.

Participants that spoke to the influence of having the RA attend new PA programs with them reported increased feelings of comfort, confidence and safety. Anastasia also addressed how having the RA present helped her to feel more at ease trying a new class,

> It is good to see somebody that you have known before, that always helps to adjust to a new class.

Three individuals were able to share very valuable experiences regarding maintaining PA engagement upon discharge from the medically supervised group exercise program, as each

one of these individuals completed the medically prescribed exercise twice. These experiences were very valuable in helping to understand factors involved in successfully maintaining PA engagement upon discharge from a medically supervised exercise program, because in all three cases the participants were not able to successfully engage in group PA after the first discharge from the program. This led to the participants reengaging in the medically supervised group exercise program a second time. Upon discharge from the second time through the medically supervised group exercise program, two of the participants were able successfully engage in group exercise.

When asked about their experiences, a lack of personal guidance and support was cited as the main reason for failing to engage in group PA. Anastasia registered for a group PA program, but due to low registration, the class was cancelled. She tried to register for a different class, but was unable to. She felt that she "fell through the cracks" which resulted in her being referred back to the medically supervised group exercise program by her family physician. When asked about her experience, Anastasia said:

> Nobody told me where I could go. I guess it's the knowing where to go. That's where I hadn't had that much to do with those sort of things and especially the (recreation centre) programs. If I had known earlier, then I could have gone there. I didn't have somebody to guide me to the next step.

Avril was able to recount her experience of attending a community group PA class in detail:

> We got there on the first day, no one was there. Nobody instructed us on where to go. It was a rambling place. There was one group of children there and I found someone, well she had no idea what was going on. And so we just departed because nobody knew what was happening. The second time we went, sure they told us where to go, and there was this young girl and we sat on a chair (and moved our arms). We never got on to our feet. Far as me, with balance, you get onto your feet. The next time we went nobody came. You cannot start a class until you have got it totally organized, and by organized I mean for somebody to meet you and (introduce themselves), tell you this is where we are having the class, and say I will be here every day.

Upon completion of the medically supervised exercise program the second time, Avril was aware of available group exercise class options. She remained engaged in group PA (lawn bowling), and although she stated she would like to participate in a community-based group exercise class that focused on muscle strengthening, she did not, citing cost as a barrier.

These above accounts outline how social factors, as well as program-based factors may influence PA engagement.

Theme 3: Program components matter

Along with personal and social factors, program-based factors also highly influenced PA engagement among participants. Participants that were engaged in PA programs following the completion of their medically supervised group exercise program were able to reflect and address program components that acted as either facilitators or barriers to maintaining PA.

Program factors that were addressed included the instructor's knowledge level and approach, transportation, registration issues, cost, time, program content, program size, and program name.

Figure 4 depicts the program components that were cited by participants. The size of the word reflects the frequency count within the transcripts, as analyzed by the word frequency function in NVivo QSR 10.

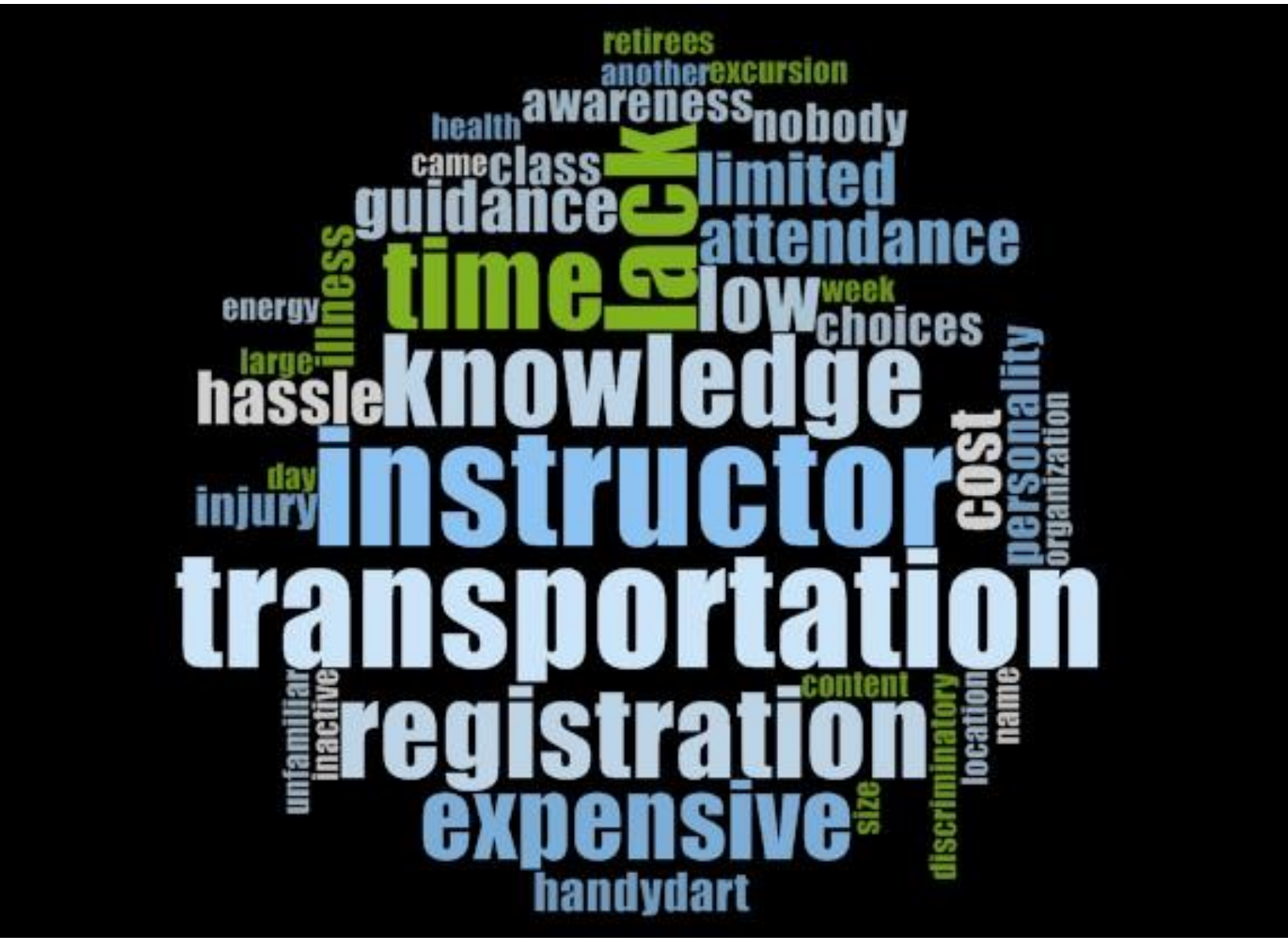

Figure 4. Program-based barriers and facilitators

PA Instructor's knowledge level and approach. A strong knowledge base regarding appropriate exercises for OA was cited to be essential. Some participants reported that they noticed a gap in the knowledge level between various PA instructors or between the medically supervised exercise program instructors compared with community exercise instructors. Allison reported sustaining a serious injury during a community exercise class from engaging in an exercise she was directed to do. She stressed the importance of having instructors that "really understand the aging body." Additionally, Oscar made the following observation:

> I don't think [the community exercise instructors] fully appreciated who they were exercising with. They weren't 30 year olds, 40 year olds, 50 year olds; they were 70 and 80 year olds who had a range of limitations and difficulties. (Oscar)

In addition to knowledge level, a personalized and compassionate approach from instructors was stated as essential to a successful PA program. Participants noted that the use of names in class was important and added to enjoyment of the class. Participants appreciated instructors that were encouraging and that took a personal interest in them. The importance of compassion was also addressed:

> An appreciation of our condition is important. (Bradley)

> One of the most important things for me is that the person who is running the class is congenial to me. Is knowledgeable and cares about me. (Sharon)

> Well it is the personality of the instructors. They have got to show personal interest. The instructor would motivate you more than anything else. (Red)

Transportation. Transportation was reported as a barrier to PA by seven participants. It was personally reported by participants that could not drive or identified as a potential barrier for other OA. Eugenia reported that she would be unable to get to the recreation centre without the help of someone else to drive her there. Other participants that were driving reported that having to share a vehicle with a spouse was a barrier to PA.

Registration Issues. Low registration was cited as a reason community group exercise programs had been cancelled for four participants. Alternately, it was reported that PA programs that were too full presented another barrier. One participant that had regularly attended the same community group exercise program for a number of years was put on a waitlist to register for his program. When asked if he felt upset about that, the participant replied:

> Well, yeah. I feel a little peeved. You know. Because I have so much seniority. You would think, that you know, "Red. He should be on there!" I have got time in. And that is not considered. It is not considered at all. You should be rewarded for loyalty.

Cost. Participants mentioned the cost of PA programs five times, either as a factor that influenced their own choice of PA program or identified program cost as a possible barrier for others. Participants stated that they did not find exercise programs offered at the local recreation centre to be affordable for retirees. Participants reported having to be mindful of how they spend their money. As Ronald reported, "I do find the class rather expensive as a retiree."

Time. Participants reported that the time of day that a PA program was offered was an important factor in program engagement. Participants stated that they preferred a morning time for engaging in PA rather than the afternoon.

Program content. It was reported that the feeling of progression was an important component of PA program satisfaction. When addressing the content difference between the medically supervised group exercise program and the group exercise program that a participant registered in independently afterwards, one participant stated,

> We were given exercises to do which were sort of a step ahead than what we had been doing before. So it was a step up the ladder. (Bradley)

Program Size. Participants identified class size as a program factor that influenced the level of personal attention instructors were able to provide to their participants.

> I would like the class to be a manageable size so that everybody got individual attention. (Sharon)

> I think it is particularly nice when there is a very small group out. You know having that sort of almost one on one and it's very nice during the class. (Ronald)

Program name. Also related to program design was the importance of a suitable program name or clear descriptions of programs. One participant did not think a particular program would address her personal goal of increasing her leg strength because the program was labelled as a balance class. OA need to be aware of the particular focus and components of a program in order to choose suitable classes.

Theme 4: Suggestions to improve program access: Convenient, Affordable, Relevant

Participants emphasized the need to make PA programs aimed at OA easy to attend and identified the need to reduce program barriers. The importance of a system-level focus on health promotion, or illness prevention rather than reaction, was emphasized by three participants. Ideas to improve program accessibility to PA programs in an effort to promote health, included addressing the issues of convenience, affordability, and relevance.

Convenience. Suggestions addressing program awareness, transportation, registration, and time were made by participants in order to increase program convenience. One participant addressed the need increase awareness of available PA programs among OA.

> (Older adults) become inactive and simply do not know that a program exists that will help them meet people and participate in an exercise program. (Elizabeth)

Elizabeth suggested placing advertisements regarding available PA programs in local newspapers, community centres, and seniors establishments.

Participants also suggested that providing suitable means of transportation or improving existing transportation options for OA that cannot drive was important. It was also stated that having assistance for arranging transportation would be helpful. In order to address the possible barrier of program registration, Oscar suggested providing PA on a drop-in basis in order to meet the unique needs of OA:

> What if you set up a “come if you wish” and we will do some activity for whoever shows up? Try it out. What about a “Hey, come on in,” tell us what you would like to

> have help with. What kind of movement activities are you having difficulty with? It is so individual at this age. I mean we have got people that have had serious, serious operations. People have had heart attacks, we have people that have had strokes, and I mean, some of my falls were serious.

Oscar also suggested asking OA what their needs are in order to determine the best time to offer a particular program:

> Like, the time the classes are offered are not always the best. The time of day. Time of week. But one possible way to correct that is to invite, ask people, "What are the best times and days for you to engage in exercise?" And you might see a pattern. I don't know. I noticed that one of the problems that sometimes arises is a very mixed attendance. Sometimes there were very few people in class. And so, what is behind that? It is hard to know. So that is one thing, you can ask people, "When is the best time to meet?" and you can ask people "What's the hindrance?"

Affordability. Participants suggested that PA programs aimed at keeping OA healthy and strong that are either medically supervised or self-directed, should be widely offered and be free of charge in an effort to encourage OA to be physically active. Sally discussed the positive impact that subsidizing programs could have in terms of prevention:

> And especially for seniors, you would think that the health care system would want to keep them active, you know to be proactive, keep us out of hospitals, and from falling, or whatever else we might do. (Sally)

Elizabeth also noted the importance of PA programs in keeping OA healthy and stated that cost should not be a hindrance. Reducing PA program costs, subsidizing programs, or creating a financial reward (such as paying for eight classes and getting one free) were all suggestions made by participants to address the potential barrier of program cost. Also suggested was the need to provide free passes to companions of OA that may require assistance to attend PA programs.

Relevance. The suitability of PA programs was important to participants. Addressing program content, awareness of programs, and the need for follow up in both the medically supervised and community-based exercise programs was identified.

One participant suggested that an assessment protocol is needed in order to help participants and instructors determine which level or type of PA program is most suitable. Two participants suggested that a "staged PA program" might be beneficial in order to have OA of the same physical ability together in the same PA programs. Yet, one participant mentioned that having OA of varying abilities may itself be beneficial to participants.

Further addressing group PA program content, participants suggested program instructors discuss certain topics more, such as the importance of PA and how to fall properly. One participant suggested that handouts would be helpful. Two participants expressed the importance of instructors communicating the purpose of particular exercises. Red stated,

> Well, just the instructor's aspect of things. Like explaining the purpose of that exercise. Why are you doing this? Just emphasize this sort of thing. Give you a little more incentive to put more effort into that, if that is the case. (Red}

One participant suggested it would be important to take time at the beginning of the medically supervised group exercise program to allow program participants to share information with each other.

> I think it would be worthwhile if people in the beginning [of the medically supervised group exercise program] would, as a group, tell each other why they are there. What particular ailment has brought them to the class? Because it appears that everybody is there for different reasons. I think that would be interesting, it would just give us a little more insight into the issues that people face and that allows us to reflect on our own. (Ronald)

Ronald also suggested this information sharing would also be valuable to do at the end of the medically supervised exercise program, in order to discuss any improvements individuals have experienced.

In order to address these various barriers that OA may face in engaging in PA, participants identified the need for follow up from PA instructors.

> I wish (the recreation centre) or (medically supervised group exercise program staff) would phone. I have done it. Say “Gosh, missed you at the class. Are you sick? Do you have trouble getting here?” Or whatever. And there are buses for the handicapped. What is your reason for not participating? Really try to find out what is the reason for giving up. OK. Well. Right after you get back we would love to see you, you know, or something like that. (Elizabeth)

Synthesizing Quantitative & Qualitative Data

All twelve participants stated qualitatively that they had remained active since completion of the medically supervised exercise program during the semi-structured interviews. These data fit well with the results from the PASE questionnaires. In the one case where a participant was still engaged in PA, but had experienced a decrease in PA engagement, the decrease is explained by the participant no longer acting as a caregiver and no longer being engaged in outdoor gardening. For this participant, the caregiving role that the individual had been involved in during the first administration of the PASE questionnaire had been temporary while family had been visiting from out of town. Despite this decrease in PA, the participant continued to be actively engaged in daily walks, light sport and recreation (lawn bowling), light housework, and heavy housework.

Despite identifying a number of barriers to attending community-based group exercise programs, the majority of participants involved in this study remained engaged in various forms of self-directed, community-based group exercise programs. Seventy-five percent of participants that completed the medically supervised exercise program between April through to December 2014 were engaged in community-based group exercise at the time they completed the second PASE questionnaire (8 weeks post program completion). At the time of the interview (8 – 10 weeks post program completion) the percentage of individuals that were engaged in community-based group exercise classes had risen to 100%.

Seventy-five percent of participants that had completed the medically supervised exercise program March 2011 – August 2013 remained engaged in group exercise programs

that were based in the community. The one individual that was not currently enrolled in group exercise explained that she had sustained an injury during a previous community-based exercise class and was still working on recovering from the injury.

Phase II: Retrospective Chart Review

A retrospective chart review of twelve individuals that attended the medically supervised group exercise program from January 2013 – April 2014 was conducted to investigate the type and frequency of maintained PA after completion of the medically supervised group exercise program in a broader sample. Information from these individuals was collected by HCPs two to six months after discharge from the medically supervised group exercise program and is displayed in Table 8.

Table 8

Retrospective chart review data

Participant	Engaged in PA	Type of PA	Frequency of PA	Barriers
1	Yes	walking group PA	3-4 x per week 1 x per week	
2	Yes	walking home exercise	1-2 x per week 1 x per week	
3	Yes	group PA	3 x per week	
4	No			
5	No			Too busy
6	Yes	home exercise	6 x per week	
7	Yes	home exercise	2-3 x per week	Class cancelled due to low registration
8	Yes	walking	unspecified	Too busy
9	No			Physical health
10	Yes	Group PA	4 x per week	
11	Yes	Walking	unspecified	Too busy
12	No			

Results indicate that 67% of the individuals involved in this chart review remained engaged in PA. The eight individuals that did remain engaged in PA reported being engaged in various forms of PA: walking only (*n* = 2), home exercise only (*n* = 2), and group PA classes only

(*n* = 2). Two individuals reported being engaged in a combination of types of PA: one individual reported doing walking and group PA, while the other individual reported being engaged in home exercise and walking.

Out of the twelve individuals involved in this retrospective chart review that had been engaged in the medically supervised exercise program, which was offered in a group format, only three individuals (25%) remained currently engaged in group PA. These included yoga, chair yoga, pool classes, adult day program exercises, and chair exercises.

Weekly PA engagement ranged from two to three times (*n* = 2), three to four (*n* = 2), and five to seven (*n* = 2). PA frequency information was not available regarding two of the eight individuals that reported remaining active. Neither was information regarding the length of time individuals were engaged in PA included as part of the chart data.

Barriers to maintaining PA engagement were cited by five individuals. Three reported being “too busy”. One individual was unable to engage in PA due to physical health issues. One individual reported registering for a group PA program, but the program was cancelled due to low registration.

Chapter 5: Discussion

The purpose of this study was to investigate PA engagement among OA following discharge from a medically supervised group exercise program and to explore the facilitators and barriers that influenced PA engagement. In Phase I, questionnaires were used to investigate PA engagement as well as semi-structured qualitative interviews were completed with 12 participants to explore facilitators and barriers that influenced PA engagement. In Phase II, reviews of medical charts were conducted retrospectively to gather further information on PA engagement and barriers among an additional 12 participants. While facilitators and barriers to PA among OA in general have been well documented (Costello et al., 2011), facilitators and barriers particular to maintaining PA after discharge from a supervised exercise program have not been widely explored with qualitative or mixed method designs. This study was able to highlight facilitators for and barriers to maintaining PA among this particular group of OA that were personally-, socially-, and program-based, and also synthesize suggestions provided by the participants to alleviate cited barriers. In this concluding chapter, the results are discussed in terms of the literature, including implications for practice, potential knowledge mobilization actions, and future research.

Despite reports of high engagement of inactivity among OA (Butler-Jones, 2010), the eight participants involved in the medically supervised exercise program from April through to December 2014 in Phase I of this study were able to maintain PA engagement after completion of the medically supervised exercise program. Results from PASE questionnaires completed by 12 participants in this study revealed that participants maintained PA engagement most

commonly by participating in self-directed activities such as walking, light sport or recreation, muscle strengthening activities, and light housework. It is important for HCPs and individuals that are designing and implementing PA programs for OA to be mindful of the large contribution of household activities, light or heavy, to overall PA engagement among OA. Structured or purposeful 'exercise' is only one type of PA (WHO, 1996). Bethancourt et al. (2014) suggested the need for HCP or PA instructors to emphasize to OA that walking or daily household activities (e.g., gardening or mowing the lawn) constitute legitimate types of PA, particularly to those OA that do not enjoy exercise. Providing programs or services that assist and encourage OA to remain engaged in household and outdoor PA, such as cleaning or gardening, may be beneficial in maintaining or increasing PA engagement among OA. Additionally, incorporating activities of daily living into exercise classes, may be beneficial in helping to illustrate the importance of maintaining PA for independence. For example, placing light weights in a laundry basket or in shopping bags, would serve to strengthen muscles, as well as demonstrate the importance of strength in being able to maintain independence with daily tasks. One participant highlighted this point by reporting that she stayed active so she could stay strong enough to do chores to take care of herself.

Facilitators and barriers that influenced PA engagement among participants in this study after completion of the medically supervised exercise program were personally-, socially-, and program-based. These results are consistent with previous literature investigating facilitators and barriers among OA to PA in general, which used a social-ecological theoretical framework to highlight the fact that the process of engaging in PA and using PA programs is layered in a

network of personal, social, environmental, and structural barriers and facilitators (Belza et al., 2004; Bethancourt et al., 2014). More importantly, this study extends these findings to highlight their importance in relation to maintaining PA after completion of a medically supervised exercise program.

Participants in this study were all motivated to remain engaged in PA due to a keen personal awareness of the importance of PA in relation to their overall health. This desire to maintain health and the knowledge that PA was key to doing so was the facilitator most often cited in literature exploring PA engagement among OA in general (Belza et al., 2004; Costello et al., 2011; De Groot & Fagerstrom, 2011; Grossman & Stewart, 2003; Newson & Kemps, 2007; Patel et al, 2013; Petursdottir et al., 2010; Rasinaho et al., 2006; Stathi et al., 2014; Stathokostas, 2013). Most participants appreciated the value of living an active lifestyle over their history of being active. While the habit of PA has been shown to partially mediate the relationship between prior and later PA (van Bree et al., 2015), 25% of participants stated that the medically supervised exercise program increased their awareness of the importance of PA as a strategy for successful aging. Therefore, effectively communicating the numerous benefits of initiating and sustaining PA should be viewed as a critical part of health promotion among OA (Stathokostas, 2013). This communication may be most effective when provided personally by HCPs or PA instructors in order to encourage continued PA engagement, or could be communicated to inactive OA by doctors or other HCPs in order to encourage initiation of PA (Schutzer & Graves, 2004). Despite knowing the important contribution of PA to overall health, the literature suggests that for many OA this knowledge in isolation is often not enough to

garner adherence to PA engagement (Grossman & Stewart, 2003) and therefore represents only a piece of this complex construct.

As previously noted in the literature (Franke et al., 2013), the need to be socially connected to others was cited by participants as a motivator for continued PA engagement. The importance of support received from friends, spouses, health care professionals, or the group PA setting itself was also identified to facilitate maintained PA engagement among participants in this study. The critical role of social support, or a lack of, has previously been cited as influencing PA among OA in general (Belza et al., 2004; Moschny et al., 2011; Petursdottir et al., 2010; Rasinaho et al., 2006; Stathokostas, 2013), as well as among OA attempting to maintain PA levels after completion of a supervised PA intervention (Sze et al., 2008; Tak et al., 2012). Participants reported that social support and interaction can also be gained from the members and instructor of an exercise group. Therefore, facilitating this type of socially engaging and supportive environment should be a goal of exercise group instructors.

A key finding from this study was the importance of having support from a HCP to remain active upon completion of the medically supervised exercise program. In July 2014 an initiative was implemented where HCP support was provided to participants by rehabilitation assistants (RAs) as part of the medically supervised exercise program. RAs helped guide participants to suitable self-directed PA programs located in the community and offered to attend community classes that were new to participants in an effort to enhance participants' sense of comfort, confidence and safety. Retrospective chart review data showed that only 25% of individuals remained engaged in group PA two to six months after completion of the medically supervised group exercise program prior to the implementation of this initiative. In

comparison, 75% of participants that completed the medically supervised group exercise program after July 2014 remained engaged in group PA eight weeks later and 100% of the these participants were engaged in group PA at the time of their interview (8-10 weeks after completion of the program). This support from the RA, particularly attending the community PA program, may have been a contributing factor to the higher rates of group PA participation and was stated specifically as a key factor by participants.

The importance of regular, ongoing support from a HCP in order to successfully maintain PA engagement after completion of a supervised PA intervention has been cited in previous studies (Beauchamp et al., 2013; Cockram et al., 2006; Fielding et al., 2007; Sze et al., 2008). Beauchamp et al. (2013) employed a case manager to provide ongoing support to OA participants that had completed a supervised PA intervention in order to address the various potential obstacles that participants might face when transitioning from supervised to self-directed PA. The case manager attended the first session to introduce the participant to the fitness consultant, liaise with the fitness consultant, provide support and encouragement to the participant, and problem solve any logistic or equipment issues. The case manager remained available to the patient by phone or email throughout the self-directed PA program. The role of the case manager in the study by Beauchamp et al. and the role of the RAs involved in the current study both exemplify practical ways to provide ongoing, personal support to OA. While Beauchamp et al. theorized that the presence of a case manager contributed to their participants maintaining PA after completion of the supervised PA intervention, they did not specifically examine this component. Participants from the current study were able confirm

that HCP support after completion of the supervised exercise program (in this case, an RA) was helpful to maintaining PA engagement.

Forkan et al. (2006) suggested that a greater emphasis on addressing patients' barriers individually may be important when planning post-discharge exercise programs. The barriers cited in this study were largely program-based. The importance of accessible and suitable PA programs with knowledgeable and caring instructors was highlighted by participants in this study.

Accessibility of programs. The need to make programs more accessible was identified in this study as necessary to enable OA to maintain PA engagement. Participants in this study identified transportation, registration issues, cost, and time of day as influential program factors that impact program accessibility. The importance of providing accessible, affordable, and convenient programs to OA in general has been identified previously regarding PA among OA in general (Bethancourt et al., 2014; Costello et al., 2011).

Transportation issues, such as being unable to drive or having to share a vehicle, were identified as barriers to attending PA programs by participants in this study, and echo others' experiences in attempting to maintain PA after completion of a supervised PA intervention (Beauchamp et al., 2013; Sze et al., 2008). Transportation issues were also identified as barriers to attending PA programs in general (Belza et al., 2004; deGroot & Fagerstrom, 2011; Moschny et al., 2011; Stathokostas, 2013). Participants suggested improving existing transportation options or providing assistance to OA for arranging transportation as ways to mitigate these

obstacles. Providing programs in various community locations has also been suggested to increase accessibility to PA programs (Beauchamp et al., 2013; Rasinaho et al., 2006).

Program accessibility was also affected by the ability to register for a desired program. In some cases, programs were cancelled due to low registration. Alternately, programs that were very popular resulted in participants being placed on a waitlist. Program scheduling was directly connected with registration issues and the popularity of a program. Participants in this study identified that late morning PA programs were preferable over late afternoon programs. Offering more programs at various times or asking participants about their preferences regarding times would help to improve registration issues.

The need to provide low cost PA programs to OA was also identified in this study. OA are often on a limited budget, therefore making program cost a barrier to maintaining PA engagement. While a financial incentive had been created for individuals in this study, - participants' monies paid to register for the medically supervised program were re-invested into community programs - , this only overcomes the financial burden of one month of registered classes. The costs to attend various local exercise groups that focus on balance, strength, and mobility comparable to the medically supervised exercise program range from $59 - $99 per month. This cost may be an insurmountable barrier for low income and/or fixed-income OA.

The importance of providing low cost or subsidized PA programs in order to make programs accessible to OA of all income engagement has also been highlighted in previous research (Belza et al., 2004; Bethancourt et al., 2014; Cockram et al., 2006; Rasinaho et al.,

2006; Stathi et al., 2014; Stathokostas, 2013). Subsidizing and investing in PA programs for OA, may be one viable prevention-based solution to reducing health care costs. Page, Batra, Ghouse, and Palmer (2014) analyzed the economic impact of providing a PA program (EnhanceFitness) to OA in South Florida. Page et al. compared the cost of delivering the PA program to the health care costs of program users versus nonusers and found the potential for overall societal cost savings. Participants in this study stressed the importance of the health care system and governments providing accessible, low cost PA programs to OA as a preventative and proactive approach to health care rather than a reactive one.

Suggestions regarding PA program content were also made by participants in the current study, beginning with an assessment protocol to determine which self-directed PA program level would be most suitable for each OA. This would also serve to inform the instructor of the specific needs of each client. It was also recommended by participants in this study to provide informational handouts and verbal instructions from PA instructors regarding the purpose of each exercise, as well as provide time for group participants to share their goals and experiences. Ensuring PA program content is suitable and effective has also been identified as a key feature to effective PA programs for OA (Moschny et al., 2011; Petursdottir et al., 2010; Stathokostas, 2014). Evidence-based, standardized, programs might be one way to provide strong PA programs and reduce variations between PA programs with the same goals.

Instructor knowledge and approach. Participants in this study had been instructed by a physiotherapist and two RAs during the medically supervised group exercise program and had become accustomed to a very personal approach, focussing on their own unique medical issues

and safety concerns. Participants highlighted the value of knowledgeable and nurturing PA leaders, the impact this had on their experiences and clearly reported that this directly influenced their willingness to participate in community PA programs. It is critical for community PA instructors to accommodate the special and individual needs of this medically complex population in order to provide safe and appropriate PA classes. In the literature, preferred instructor attributes include an understanding of the ageing process, knowledge of PA barriers, be able to facilitate social interaction, and display an encouraging, enthusiastic and pleasant demeanor (Costello et al., 2011; Horne et al., 2013; Stathi et al., 2014).

Telephone calls by PA instructors were suggested by one participant in this study in order to follow up with OA that have missed PA classes to help navigate barriers and serve as encouragement. Telephone counselling may also enhance participant motivation and participation by serving as a source of social influence and support (Schutzer & Graves, 2004).

Implications for Practice and Knowledge Mobilization

The identification of PA program-based components in this study confirms the need to address and eliminate barriers in order to make the active choice the easy choice among OA (Stathi et al., 2014). Forkan et al. (2006) found that the presence of barriers moreso than facilitators were most likely to predict PA engagement after completion of a supervised PA program. Participants in this study were able to provide numerous suggestions regarding how to eradicate program barriers.

Participation

Participants suggested PA program providers directly ask OA about program factor preferences. The principle of participation has been identified as a core tenet within the Ottawa Charter for Health Promotion (WHO, 1986), as it is integral to "helping people to increase control over and improve their health". Stathi et al. (2014) found that involving OA in the design and evaluation of new and existing programs critical to program success. In addition to gathering programmatic ideas from OA, program developers and policy makers must ensure that the OA contributions are actually incorporated into PA programs (Stathi et al., 2014). Engaging OA in shaping the design and implementation is needed in both medically supervised PA programs, as well as community-based PA programs serving OA.

Multilevel interventions

Program-based barriers point to the need to address PA engagement among OA at the level of populations in their environmental context, rather than only at the individual level (Prohaska et al., 2006). Effective health promotion requires multilevel interventions that address individual, community, and organizational level factors (Best et al., 2003; Bethancourt et al., 2014). At each level, local socio-economic status, cultural, social, and environmental factors need to be considered (BHFNC for Physical Activity and Health, 2013). For example, WHO physical activity promotion strategies aim to be consistent and reflective of the economic, political, and cultural realities of the societies in which they are implemented. (Chodzko-Zajko & Schwingel, 2012).

To emphasize the importance of policies and environments and their role in influencing health promotion efforts, Golden, McLeroy, Green, Earp, and Lieberman (2015) presented an "upended" version of the social ecological model. Rather than placing the individual at the centre of the nested model, Golden et al. placed health-related and social policies at the centre and conceptualized ways that individuals, social networks, and groups can foster healthy policies. Their model emphasizes the critical role and centrality that policies and environments play in health promotion rather than placing the majority of the focus and onus of responsibility on the individual. Figure 5 (below) depicts how the factors cited in this study influence PA engagement among OA following completion of the medically supervised exercise program aligned with the "upended" version of the social ecological model.

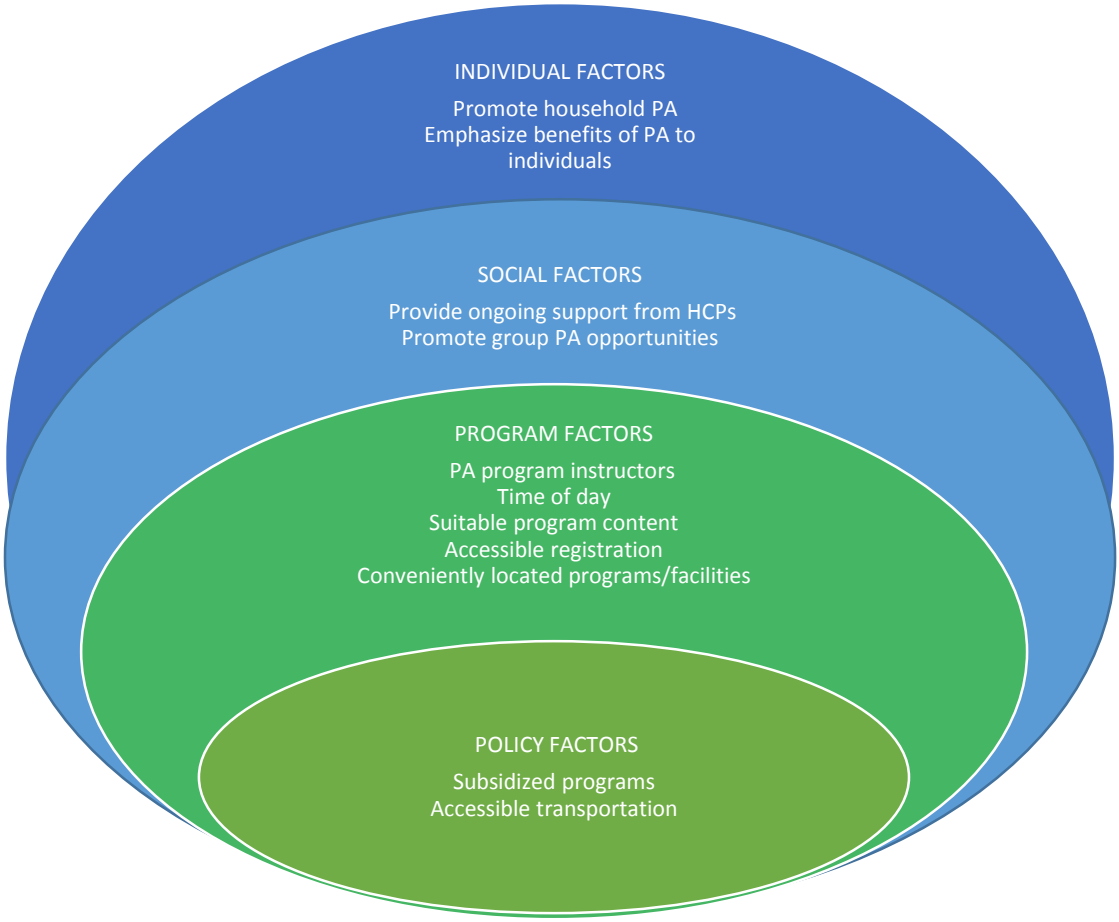

Figure 5. Factors influencing maintenance of physical activity engagement among older adults following completion of a medically supervised exercise program.

Encourage Intersectoral Action

In order to plan ways to promote PA among OA, local partnerships that involve diverse membership (e.g., individuals, communities, and organizations) and that share an embraced goal are needed (BHFNC for Physical Activity and Health, 2013; Stathi et al., 2014). Health

promotion strategies cannot exist in isolation and they are not merely the responsibility of the health and academic sectors alone; multisectoral action is key to effective policies and programs (Chodzko-Zajko & Schwingel, 2012). Partnerships that may be effective in the promotion of PA among OA occur at many levels, such as partnerships between local governments and citizen groups, partnerships between healthcare providers and fitness instructors, or partnerships between universities and local health authorities.

For example, in this study the partnership between the local health authority and the local recreation centre allowed for an alternative delivery of the medically supervised exercise program, whereby the program was held at the recreation centre rather than in a hospital setting. This provided opportunities for program participants to become familiar with amenities in the local community prior to their discharge. Additionally, this partnership placed the medically supervised exercise program instructors and community PA instructors in the same location, facilitating opportunities for knowledge sharing and familiarity with each other's programs. This partnership fostered the request for sharing the results of this study with the local community. In order to support mobilization of this research within the local community, an executive summary of the study results has been prepared in Appendix K.

Evaluate programs

In addition to informing program design, evaluation provides another means for gathering feedback from OA regarding issues related to program logistics and program content. While program evaluation was not mentioned specifically by participants in this study, it is an important component to providing appropriate and successful programs. It has been

recommended that program evaluation be an integral component of the planning process of any program (Stathokostas, 2013). There is a need to evaluate programs before (needs assessment), during (process evaluation), and after (impact or outcome evaluation) the program in order to gauge success along the way (Health Communication Unit, 2007). Program evaluation is needed for both the medically supervised and community-based exercise programs. An evaluation could be as simple as a one page survey developed by PA program providers, or it could be a more formal process of adhering to an evaluation framework. The evaluation framework most commonly mentioned in the sources used for this paper was the RE-AIM framework (Belza, 2007; Hughes et al., 2011; Prohaska et al., 2006; Stathi et al., 2014; Stathokostas, 2013).

There is a call in the literature for increased attention to external validity (Lobb & Colditz, 2013; Pratt et al., 2012; Chatterji et al., 2013), to embrace context and adapt interventions from one population to another as a way to "compliment the emphasis so far on the internal validity of well controlled efficacy trials" *(*Pratt et al., 2012, p. 283). RE-AIM is a framework created by Russell E. Glasgow, PhD, and colleagues to help program planners, evaluators, funders, and policymakers plan, implement, and evaluate health programs in, and relevant for, "real world settings" (Belza, 2007). The elements of RE-AIM include consideration of program reach, effectiveness, adoption, implementation, and maintenance. These features of RE-AIM could be used to further advance the knowledge base with regards to PA for OA.

Participants in this study identified the need for all of the RE-AIM elements to be addressed. The need to increase reach or awareness of available PA programs for both the

medically supervised exercise program and community-based PA programs was cited by participants. It is important to involve as many OA as possible in PA programs, as PA among OA can reduce health and social care costs by postponing the onset of frailty and chronic disease (WHO, 1996). Further investigation into the effectiveness of PA among OA in terms of the impact of PA on local health care costs would be beneficial.

Successful adoption of PA programs hinges on building successful partnerships within the local community (Belza & the PRC-HAN Physical Activity Conference Planning Workgroup, 2007). Involving community programmers and local governments in program development, implementation, and/or evaluation could increase adoption of programs. Higher adoption of PA programs for OA by a variety of locations, such as local recreation centres, churches, and residences, could assist in reducing barriers identified in this study such as transportation and cost.

Program content and instructor training were identified to impact PA engagement among participants in this study and are key components of successful program implementation. Addressing OA needs and checking in with them regularly, as well as regularly meeting with PA instructors and community partners needs to be done to enable program maintenance (Belza & the PRC-HAN Physical Activity Conference Planning Workgroup, 2007). The use of RE-AIM as a tool to guide program evaluation could help to reduce program-based barriers experienced by OA.

Promote Further Research and Knowledge Mobilization

While research in the field of PA among OA has been growing, more and diverse study is still needed in multiple areas (Hughes et al., 2011). In addition, to enable knowledge mobilization of the current study results, there needs to be a philosophical, economic, cultural, and political commitment to increasing levels of PA as an integral and essential component of preventative health care and to remove barriers to engagement in PA that exist across multiple domains. This is essential to allow for the realization of the long term benefits of reduced health care costs and improved health outcomes.

Research regarding theory development in this field is needed. Crosby and Noar (2010) stated that theory development has not proceeded at the same pace as health promotion practice. They argued that theory should be practice-based, largely ecological in nature, and easily accessible to practitioners, in order to be put to use in a timely manner. The most commonly used models and theories in this field, such as the Transtheoretical Model, Health Belief Model, and theories of Reasoned Action and Planned Behaviour (Glanz et al., 2002; Li et al., 2009), continue to focus on the individual, therefore ignoring the broader determinants of health (Primary and Community Health Branch, 2008). There is a call for further research to focus on multiple engagement examining individual, interpersonal, organizational, community, and social or environmental approaches (Anderson & Prohaska, 2014), as well as the influence of the social, built, and natural environments (Franke et al., 2013). In particular, vanStralen et al. (2009) suggested more research should specifically address environmental determinants such as access to PA facilities, PA program format, and perceived quality of the program.

Future practice-based research utilizing an “upended social ecological” model, containing a focus on the dynamic interaction between policies, environment, interpersonal connections, and individual factors with a life-course perspective (Golden et al., 2015) could address future research needs identified by Crosby and Noar. Figure 5 presented in this chapter offers a useful starting point.

An initiative exemplifying such an approach is WHO’s Age-friendly Cities and Communities initiative, which speaks to the importance of the built and social environments in relation to population health (WHO, 2007). The initiative addresses the importance of issues such as outdoor spaces and buildings, transportation, social participation, and civic participation in order to create environments that support OA to live healthful lives. One possible way for communities to promote PA among their OA population and make the healthy choice the easy choice, could be to work towards integrating age-friendly principles into operational, budgetary, and strategic planning processes.

Future studies employing a community-based participatory research (CBPR) approach (Minkler & Wallerstein, 2003) engaging OA in identifying current needs, research design, implementation, and dissemination would also add valuable knowledge to this area. CBPR with OA in general is an underdeveloped field, but can be an empowering process that facilitates co-learning, capacity building, and sustainability (Blair & Minkler, 2009). For example, Gallagher and Scott (1997) involved participants and key stakeholders in the development, data collection, and dissemination of their project to create safer environments for individuals at risk of falling. A Seniors Quality of Life Project conducted by Bryant et al. (2004) focussed on OA

participants as the driving force to guide the identification and investigation of determinants of their quality of life. Locket, Willis, and Edwards (2005) used the qualitative data collection method photovoice to empower OA to identify environmental barriers and facilitators to walking. All three of the above mentioned studies spoke to the many benefits of a CBPR approach.

In order to study multiple sites or programs at once utilizing a CBPR approach, multisite translational community trials (mTCT) may also be constructive (Katz, Murimi, Gonzalez, Njike, & Green, 2011). The mTCT is a blend of multisite randomized controlled trials and the principles of CBPR used specifically for "concurrent evaluation of translation from efficacy into effectiveness in diverse communities in a single trial" (Katz et al., p.19). This approach may also benefit from applying RE-AIM to study design. To date, there are no such hybrid designs published in the scholarly literature.

To increase internal validity of data, future research methods, objective measures of PA could be employed. This study utilized subjective recall of PA, but more objective measures could strengthen information regarding PA engagement in the future. While direct measures (such as accelerometry and pedometry) used to capture PA have limitations in regards to the type of information they are able to capture and issues with low compliance of measurement protocols, they are generally considered to be more valid than indirect measures (Kowalski, Rhodes, Naylor, Tuokko, & MacDonald, 2012). Considering the gaps in tools to effectively measure PA among OA (Kowalski et al., 2012), the use of these objective measures of PA in combination with qualitative research would provide rich data.

More research among special populations of OA should also be considered. Research regarding racial or ethnic minority groups, OA with low socioeconomic status, and individuals with physical, intellectual, or mental health disabilities is needed (Hughes et al., 2011; Prohaska et al., 2006).

Strengths and Limitations

A strength of this study was the rich information provided by study participants, both during the initial interview and from feedback received from the member check process. Feedback regarding initial themes that were developed was received from ten of the twelve study participants. This verification process was important for data trustworthiness and to show respect to the participants and ensure that the results accurately portrayed their experiences and reflections (Yeh & Inman, 2007). Study participants were able to provide realistic suggestions for barriers that OA are currently facing. This information gleaned from a real-world setting highlights the external validity of this study. In this regard, this study responds to the need identified by Green and Glasgow (2006) for more practice-based evidence.

A stronger voice from inactive OA would have strengthened this study. It was not expected that all individuals that were interviewed in this study would remain physically active 2 to 48 months after completion of the medically prescribed group exercise program. The literature suggests 57% of OA are considered to be physically inactive (Butler-Jones, 2010). While OA residing within the local health authority region have been reported as more active than the Canadian population in general (Statistics Canada, 2013), this may not be a truly representative sample of OA. Less active OA may have been more hesitant to meet to discuss

their PA engagement. While all participants that had completed the medically supervised group exercise program were provided with letters of invitation, less active OA or OA that were not planning on maintaining PA may have been less inclined to volunteer for this study. Also, posters placed at the local recreation centre would have only attracted participants that were active and currently attending the recreation centre. In the future, perhaps posters placed at medical offices or clinics, or personal referrals from health care professionals, would lead to the recruitment of less active OA.

A further limitation to this study was the level of detail contained in the secondary data from the retrospective chart reviews. Complete data regarding frequency, quantity, intensity and/or type of PA for each OA was not available in most charts. Additionally, facilitators to maintaining PA were not identified in any of the charts and barriers were cited in only five charts.

While the PASE questionnaire was chosen as the most suitable questionnaire for use with the population involved in this study, PASE scores did not translate to the Canadian physical activity guidelines. Objective measures of PA done in combination with a subjective questionnaire would add further strength to research in this area (Kowalski et al., 2012).

Conclusion

While interest and research in the field of PA among OA has been growing, there is still much work to be done. Despite decades of health promotion research that has demonstrated the impotency of individually-oriented approaches to behaviour change (Johnson, Scott-Sheldon, & Carey, 2010; Michie, 2008; Michie, Abraham, Whittington, McTeer, & Gupta, 2009),

this study has served as another reminder of the power of multi-level, multi-sector approaches that consider the broader determinants of health. Further, there is a need for HCPs and PA instructors to continue to communicate the benefits of PA, provide ongoing health care professional support, and work across sectors to reduce program related barriers to promote PA engagement among OA discharged from a medically supervised exercise program. Advancing the field will demand engaging participants in the design, implementation and evaluation of programs. Finally, this study has proposed several areas for future research intended to reduce PA program barriers among OA and assist OA to maintain PA.

Given the expected rise in Canada's population of OA, health promotion should be seen as an essential investment. Morey et al. (2003) suggested that making an effort to assist the OA population in initiating and maintaining long term exercise is a public health mandate. Societal benefits of promoting PA for OA include reduced health and social care costs, enhancing the productivity of OA, and promoting a positive and active image of OA (Stathi et al., 2014; WHO, 1996). Work in the area may be one of the "best buys" for public health in an effort to prevent premature decline and disability (Stathi et al., 2014). Rather than applying stereotypes to OA or viewing illness as a normal part of ageing, our society should keep older people at the heart of the family and community, understand and plan for the needs of older people, and value their contribution to society (WHO, 2012). These actions could add life to years and everyone benefits in societies where OA thrive (WHO, 2012).

A statement by Canada's Chief Public Health Officer, Dr. David Butler-Jones, addresses the importance of this subject:

Health promotion, injury prevention, and efforts to encourage and increase social participation and inclusion should be seen as essential investments that can save money, maintain and improve quality of life, and drive healthy economies. As is often cited in health circles, prevention is preferable to treatment. Our ability to support the needs of an older population – and ensuring this population is engaged in our efforts – will go a long way to determining our future success in achieving healthy aging. It is something from which all Canadians can benefit. (Butler-Jones, 2010, pg.i).

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Appendix A

Table 1. Socio-demographic and personal facilitators and barriers to physical activity among older adults

Categories (Number of citations)	**Facilitator (F)**	**Barrier (B)**	**Stated as both F & B**
Socio-Demographic			
2 - SES		Lower SES: Stathokostas, 2013	Petursdottir et al., 2010
1 - Increased Age		Stathokostas, 2013	
1 - Gender		Female: Stathokostas, 2013	
1 - Ethnic Group / Culture		Marginalized group: Stathokostas, 2013	
Personal			
11 - Physical health or Chronic conditions		De Groot & Fagerstrom, 2011; Grossman & Stewart, 2003; Moschny et al., 2011; Newson & Kemps, 2007; Rasinaho et al., 2006; Stathi et al., 2014; Stathokostas, 2013; Wright & Hyner, 2009	Belza et al., 2004; Bethancourt et al., 2014; Petursdottir et al., 2010
6 – Lack of Time		Costello et al., 2011; Grossman & Stewart, 2003; Moschny et al., 2011; Patel et al., 2013; Stathokostas, 2013; Wright & Hyner, 2009	
2 – History of PA	Stathi et al., 2014		Petursdottir et al., 2010
1 – Quality of Sleep			Petursdottir et al., 2010

Table 2. Psychological facilitators and barriers to physical activity among older adults

Categories (Number of citations)	**Facilitator (F)**	**Barrier (B)**	**Stated as both F & B**
11 - Desire to maintain or improve health/ View of PA as beneficial	Belza et al., 2004; Costello et al., 2011; De Groot & Fagerstrom, 2011; Grossman & Stewart, 2003; Newson & Kemps, 2007; Patel et al., 2013; Rasinaho et al., 2006; Stathi et al., 2014	Lack of: Stathokostas, 2013	Patel et al., 2013; Petursdottir et al., 2010;
6 - Motivated to exercise for the sake of exercise		Lack of: Bethancourt et al, 2014; Costello et al, 2011; De Groot & Fagerstrom, 2011; Moschny et al., 2011; Patel et al., 2013; Stathi et al., 2014	
3 – Self-efficacy	High: Franke et al., 2013;	Lack of: Costello et al., 2011; Stathokostas, 2013	
3 – Fear of exercise or injury		Costello et al., 2011; Moschny et al., 2011; Rasinaho et al., 2006	
1 – Good Mood / Personality			Petursdottir et al., 2010
1 - Past experience with PA			Rasinaho et al., 2006
1 - Appearance	Grossman & Stewart, 2003		

Table 3. Social and environmental facilitators and barriers to physical activity among older adults

Number of citations + Categories	**Facilitator (F)**	**Barrier (B)**	**Stated as both F & B**
Social			
5 - Peer and family support	Belza et al., 2004	Lack of: Moschny et al., 2011; Rasinaho et al., 2006; Stathokostas, 2013	Petursdottir et al., 2010
2 - Physician advice & support	Horne et al., 2010		Petursdottir et al., 2010
3 - Opportunity to Socialize & create friendships	Costello et al., 2011; Franke et al., 2013; Stathi et al., 2014		
2 - Fitness professional support/encouragement	Costello et al., 2011; Horne et al., 2010		
1 - Physical therapist's professional care			Petursdottir et al, 2010
1 - Maintaining family relationships	Grossman & Stewart, 2003		
Environmental			
7 - Transportation		Lack of: Belza et al., 2004; De Groot & Fagerstrom, 2011; Moschny et al., 2011; Stathokostas, 2013	Franke et al., 2013; Petursdottir et al., 2010; Stathi et al., 2014
6 – Weather Conditions		Poor: Belza et al., 2004; De Groot & Fagerstrom, 2011; Franke et al., 2013; Grossman & Stewart, 2003; Stathi et al., 2014	Petursdottir et al., 2010;
3 - Neighbourhood safety		Unsafe: Belza et al., 2004; 2013; Stathi et al., 2014 Stathokostas, 2013	
1 - Rural setting		Stathokostas, 2013	

Table 4. Program-based facilitators and barriers to physical activity among older adults

Number of citations + Categories	Facilitator (F)	Barrier (B)	Stated as both F & B
Program-Based			
5 - Accessible programs (affordable, conveniently located)	Bethancourt et al., 2014; Stathi et al., 2014	Lack of: Belza et al., 2004; Stathokostas, 2013	Petursdottir et al., 2010;
3 - Suitable content Programs		Lack of: Moschny et al., 2011; Stathokostas, 2013	Petursdottir et al., 2010;
4 - Knowledgeable and Engaging Instructors	Bethancourt et al., 2014; Costello et al., 2011; Horne et al., 2010; Wright & Hyner, 2009		

Appendix B

University of Victoria

Letter of Invitation

island health

Study Title: "Facilitators and barriers to maintaining physical activity: The experiences of older adults upon discharge from a medically supervised exercise program."

Why have I been asked to participate? You are being invited to participate in this research because you have been involved in the SARIN balance classes. We want to better understand why some older adults stay physically active after completing the SARIN program and why others do not. Your experiences will assist health care professionals and community fitness instructors to understand factors that impact ongoing physical activity levels, which could help guide future physical activity programs.

What is involved? If you choose to participate in this study, you will be asked to:

A) Fill out two short questionnaires (requiring 5-10 minutes of your time). The first questionnaire will be administered during one of your final SARIN balance classes when you are completing your re-tests of balance and strength. The questionnaire will be completed a second time over the telephone or in person approximately 6 – 8 weeks after you have completed the SARIN balance classes.

B) You will also be asked to participate in your choice of either a one hour group interview or a thirty minute individual interview. This interview will be scheduled with you shortly after you complete the telephone questionnaire.

C) In addition to the time it takes to participate in the interview, you will be invited to review the interview themes with the researcher as a way to ensure that the results are accurate from your perspective. This will take up to an additional 15-30 minutes of your time.

If you are willing to be contacted in order to learn more about this research and to determine if you would like to be involved, please fill out the back page of this form and give it to the SARIN Administrative Assistant.

Participating in this research is voluntary. Choosing not to participate in this study will in no way effect your therapy or access to the SARIN program.

I, _____,
consent to being contacted by the researcher, Melody Burgoyne, about the above mentioned research project.

Phone Number: _____

Best time to contact: _____

_____ _____

Signature Date

The Human Research Ethics Boards at the University of Victoria and Island Health have approved the ethical conduct of this research.

If you have any questions about the ethical conduct of this research please contact the Human Research Ethics Office
University of Victoria: 250-472-4545 ethics@uvic.ca
Island Health: 250-370-8620 researchethics@viha.ca

Appendix C

Script

When speaking with potential participant

Thank you, _____ (*name of potential participant*), for giving me permission to contact you so that I may provide you more details about this study. Are you still interested in hearing more about the study?

If no: Thank you for your time and I would like to reassure you that choosing not to participate in this study will in no way effect your therapy or access to the SARIN program.

If yes: Thank you for your interest. The objective of this study is to better understand why some older adults stay physically active after completing the SARIN program and why others do not. Your experiences will assist health care professionals and community fitness instructors to understand factors that impact ongoing physical activity levels, which could help guide future physical activity programs.

If you choose to participate in this study, you will be asked to fill out two questionnaires and participate in your choice of either a one hour group interview or a thirty minute individual interview. The questionnaire will require approximately ten minutes of your time to complete. The first questionnaire will be administered during one of your final SARIN balance classes. The questionnaire will be completed a second time over the telephone approximately 6 – 8 weeks after you have completed the SARIN balance classes. 8 – 10 weeks after you have completed the SARIN classes you may participate in either a group or individual interview. In addition to the time it takes to participate in the interview, you will be invited to review the interview themes as a way to ensure that the results are accurate from your perspective. Interview results will be mailed to you and you will be able to contact the researcher if you would like any changes made. This will take up to an additional 15-30 minutes of your time.

Do you have any other questions regarding this study?

Please remember that choosing not to participate in this study will in no way effect your therapy or access to the SARIN program.

Are you willing to participate in this study?

- ☐ Yes
- ☐ No

If no: Thank you for your time and I would like to reassure you that choosing not to participate in this study will in no way effect your therapy or access to the SARIN program.

If verbal consent for participation is obtained, record this on consent sheet and ask the following: Would you prefer to participate in a one hour group interview or a 30 minute individual interview? *Record preference.*

I will schedule a time with you for this interview shortly after you complete the second questionnaire.

A consent sheet was mailed to you. Do you have any questions about the information in the consent form? Would you like to take a moment to review that form with me now?

If no: Please do not hesitate contact me or to ask me any questions about this form if any questions arise in the future.

If yes: Read through form with individual.

Please do not hesitate to contact me at any time should you have any further questions. I can be reached by telephone at #250-208-2092 or by e-mail at melody.burgoyne@viha.ca. Thank You.

Appendix D

Have you been involved with SARIN balance classes?

If so, we would like to hear from you! A study entitled "Facilitators and barriers to maintaining physical activity: The experiences of older adults upon discharge from a medically supervised exercise program" is being conducted to better understand how to help older adults stay physically active after completing the SARIN program.

What is involved? If you choose to participate in this study, you will be asked to:

- Participate in a 30 minute individual interview.
- Complete a brief questionnaire about your physical activity practices.
- You may also choose to review the interview themes with the researcher as a way to ensure that the results are accurate from your perspective. This will take up to an additional 15-30 minutes of your time.

Your experiences will assist health care professionals and community fitness instructors to understand factors that impact ongoing physical activity engagement, which could help guide future physical activity programs.

If you are willing to participate or learn more about this research please contact Melody Burgoyne:
Telephone: #250-208-2092
Email: melody.burgoyne@viha.ca

The Human Research Ethics Boards at the University of Victoria and Island Health have approved the ethical conduct of this research.

This research is under the supervision of Dr. Hundza (#250-721-8387 or shundza@uvic.ca) and Dr. Wharf Higgins (#250-721-8377 or jwharfhi@uvic.ca).
Please feel free to contact them if you have any questions.

Appendix E

Script

When speaking with potential participant

Thank you, _____ (*name of potential participant*), for giving me permission to contact you so that I may provide you more details about this study. Are you still interested in hearing more about the study?

If no: Thank you for your time and I would like to reassure you that choosing not to participate in this study will in no way effect your therapy or access to the SARIN program.

If yes: Thank you for your interest. The objective of this study is to better understand why some older adults stay physically active after completing the SARIN program and why others do not. Your experiences will assist health care professionals and community fitness instructors to understand factors that impact ongoing physical activity engagement, which could help guide future physical activity programs.

If you choose to participate in this study, you will be asked to complete a short questionnaire and participate in a thirty minute interview. You will also be invited to review the interview themes as a way to ensure that the results are accurate from your perspective. Interview results will be mailed to you and you will be able to contact the researcher if you would like any changes made. This will take up to an additional 15-30 minutes of your time.

Do you have any other questions regarding this study?

Please remember that choosing not to participate in this study will in no way effect your therapy or access to the SARIN program.

Are you willing to participate in this study?

- ☐ Yes

☐ No

If no: Thank you for your time and I would like to reassure you that choosing not to participate in this study will in no way effect your therapy or access to the SARIN program.

If verbal consent for participation is obtained, record this on consent sheet and set up time for interview:

_____

Thank You. A consent sheet will be mailed to you. Please take a moment to read the consent form before your interview. The form and any questions you might have about it will be discussed at the start of the interview.

Please do not hesitate to contact me at any time should you have any further questions. I can be reached by telephone at #250-208-2092 or by e-mail at melody.burgoyne@viha.ca. Thank You.

Appendix F

University of Victoria

Participant Consent Form

island health

Study Title: "Facilitators and barriers to maintaining physical activity: The experiences of older adults upon discharge from a medically supervised exercise program."

This study is being conducted by Island Health and the University of Victoria. This research is being conducted by Melody Burgoyne, a graduate student in the Social Dimensions of Health program at UVIC. Melody is also a rehabilitation assistant with Island Health (#250-208-2092 or melody.burgoyne@viha.ca). This research is under the supervision of Dr. Hundza (#250-721-8387 or shundza@uvic.ca) and Dr. Wharf Higgins (#250-721-8377 or jwharfhi@uvic.ca). Please feel free to contact them if you have any questions.

What is the purpose of this study? We want to know what will help older adults stay active when they leave a medically supervised physical activity program. We want to better understand why some older adults stay physically active after completing the SARIN program and why others do not.

Why is this study important? Physical activity has been shown to be important for healthy aging. Your experiences will help health care professionals and fitness instructors to understand how to improve physical activity levels of older adults.

Why have I been asked to participate? You have been invited to participate because you have been part of a medically prescribed, supervised physical activity program (the SARIN balance class).

Your participation is voluntary. Taking part in the study is your decision. You do not have to be in this study if you do not want to. You may quit being in the study at any time without telling us why. Choosing not to participate in this study will in no way effect your therapy or access to the SARIN program.

What is required of me? You will be asked to:

A) Fill out 2 short questionnaires (this will take 5-10 minutes of your time). The first one will be done during one of your final SARIN balance classes. The second one will be done over the telephone about 6 – 8 weeks after you have finished the SARIN balance classes. If it is hard for you to hear over the telephone, plans can be made for this second questionnaire to be done in person.

B) Join in your choice of either a 1 hour group interview or a 30 minute individual interview. This interview will be booked with you after you complete the telephone questionnaire. During the interview you will be asked about your experiences with physical activity since completing the SARIN balance classes. You do not have to answer any questions that you do not want to. All interviews will take place at the Peninsula Health Unit. All interviews will be audio recorded. You may end the interview or leave the group interview at any time. There is no need to explain why you have changed your mind.

C) The results of this study will be mailed to you in order to make sure they are accurate from your perspective. You will be able to contact the researcher if you would like any changes made. This may take up to an extra 15-30 minutes of your time.

Are there risks or benefits associated with taking part in this study? There are no risks linked with taking part in this study. You may benefit from participating in this study by helping health care and fitness professionals to better understand the needs of older adults. This may help to improve physical activity programs that are offered to older adults.

Will I receive payment for taking part in this study? No payment will be made to people who take part in this study. Snacks will be provided during the interview or group interview.

Confidentiality: Your participation is confidential.

- All questionnaire and interview data will be matched to a false name of your choosing. No real names will be used in the write up or any reports.
- Please do not share any information you would prefer to keep private.
- Please do not tell the names of group interview members to other people. Please do not talk about the group interview discussion with other people.

We will ask that you and all other group members respect the privacy of everyone in the group. If you are not comfortable with these guidelines, you are welcome to choose to do an individual interview instead.

Use of data:

- Data will be transcribed by Melody Burgoyne
- Data will be analyzed by Melody Burgoyne, Dr. Hundza, and Dr. Wharf Higgins.
- Should you choose to leave from this study, it is your right to remove your data from this study.
- Data will be stored in a locked cabinet or a password protected computer server at the University of Victoria. Electronic data will be erased and paper data will be shredded after 5 years from the end of this study.
- The results of the study may be published or presented at professional meetings, but your identity will not be revealed. You will have the choice to attend a short presentation of the results or have the results mailed to you.

Please remember that your participation in this study is voluntary

Consent for initial PASE questionnaire (sign below)

_____ _____ _____

Name of Participant *Signature* *Date*

Verbal consent for second PASE questionnaire

_____ _____ _____

Name of Participant *Signature* *Date*

Consent for interview (sign below)

_____	_____	_____
Name of Participant	*Signature*	*Date*

Consent for focus group (sign below)

_____	_____	_____
Name of Participant	*Signature*	*Date*

A copy of this consent letter will be left with you, and the researcher will take a copy.

The Human Research Ethics Boards at the University of Victoria and Island Health have approved the ethical conduct of this research.

If you have any questions about the ethical conduct of this research please contact the Human Research Ethics Office
University of Victoria: 250-472-4545 ethics@uvic.ca
Island Health: 250-370-8620 researchethics@viha.ca

Appendix G

University of Victoria

Participant Consent Form

island health

Study Title: "Facilitators and barriers to maintaining physical activity: The experiences of older adults upon discharge from a medically supervised exercise program."

This study is being conducted by Island Health and the University of Victoria. This research is being conducted by Melody Burgoyne, a graduate student in the Social Dimensions of Health program at UVIC. Melody is also a rehabilitation assistant with Island Health (#250-208-2092 or melody.burgoyne@viha.ca). This research is under the supervision of Dr. Hundza (#250-721-8387 or shundza@uvic.ca) and Dr. Wharf Higgins (#250-721-8377 or jwharfhi@uvic.ca). Please feel free to contact them if you have any questions.

What is the purpose of this study? We want to know what will help older adults stay active when they leave a medically supervised physical activity program. We want to better understand why some older adults stay physically active after completing the SARIN program and why others do not.

Why is this study important? Physical activity has been shown to be important for healthy aging. Your experiences will help health care professionals and fitness instructors to understand how to improve physical activity engagement of older adults.

Why have I been asked to participate? You have been invited to participate because you have been part of a medically prescribed, supervised physical activity program (the SARIN balance class).

Your participation is voluntary. Taking part in the study is your decision. You do not have to be in this study if you do not want to. You may quit being in the study at any time without telling us why. Choosing not to participate in this study will in no way effect your therapy or access to the SARIN program.

What is required of me? You will be asked to:

A) Complete a short questionnaire and participate in a 30 minute individual interview. This interview will be booked with you over the telephone. The questionnaire will be completed at the start of the interview. During the interview you will be asked about your experiences with physical activity since completing the SARIN balance classes. You do not have to answer any questions that you do not want to. All interviews will take place at the Peninsula Health Unit. All interviews will be audio recorded. You may end the interview at any time. There is no need to explain why you have changed your mind.

B) The results of this study will be mailed to you in order to make sure they are accurate from your perspective. You will be able to contact the researcher if you would like any changes made. This may take up to an extra 15-30 minutes of your time.

Are there risks or benefits associated with taking part in this study? There are no risks linked with taking part in this study. You may benefit from participating in this study by helping health care and fitness professionals to better understand the needs of older adults. This may help to improve physical activity programs that are offered to older adults.

Will I receive payment for taking part in this study? No payment will be made to people who take part in this study. Snacks will be provided during the interview or group interview.

Confidentiality: Your participation is confidential.

- All questionnaire and interview data will be matched to a false name of your choosing. No real names will be used in the write up or any reports.
- Please do not share any information you would prefer to keep private.

Use of data:

- Data will be transcribed by Melody Burgoyne
- Data will be analyzed by Melody Burgoyne, Dr. Hundza, and Dr. Wharf Higgins.

- Should you choose to leave from this study, it is your right to remove your data from this study.
- Data will be stored in a locked cabinet or a password protected computer server at the University of Victoria. Electronic data will be erased and paper data will be shredded after 5 years from the end of this study.
- The results of the study may be published or presented at professional meetings, but your identity will not be revealed. You will have the choice to attend a short presentation of the results or have the results mailed to you.

Please remember that your participation in this study is voluntary

Consent for interview (sign below)

_____	_____	_____
Name of Participant	*Signature*	*Date*

A copy of this consent letter will be left with you, and the researcher will take a copy.

The Human Research Ethics Boards at the University of Victoria and Island Health have approved the ethical conduct of this research.

If you have any questions about the ethical conduct of this research please contact the Human Research Ethics Office
University of Victoria: 250-472-4545 ethics@uvic.ca
Island Health: 250-370-8620 researchethics@viha.ca

Appendix H

PHYSICAL ACTIVITY SCALE FOR THE ELDERLY

(P A S E)

New England
Research Institutes, Inc.

9 Galen Street
Watertown, MA 02472
(617) 923-7747

INSTRUCTIONS:

Please complete this questionnaire by either circling the correct response or filling in the blank. Here is an example:

During the past 7 days, how often have you seen the sun?

[0.] NEVER	[1.] SELDOM (1-2 DAYS)	[2.] SOMETIMES (3-4 DAYS)	[3.] OFTEN (5-7 DAYS)

Answer all items as accurately as possible. All information is strictly confidential.

LEISURE TIME ACTIVITY

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

[0.] NEVER ↓ GO TO Q.#2 | [1.] SELDOM (1-2 DAYS) ↓ | [2.] SOMETIMES (3-4 DAYS) ↓ | [3.] OFTEN (5-7 DAYS) ↓

1a. What were these activities?

_____

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

[1.] LESS THAN 1 HOUR [2.] 1 BUT LESS THAN 2 HOURS

[3.] 2-4 HOURS [4.] MORE THAN 4 HOURS

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

[0.] NEVER ↓ GO TO Q.#3 | [1.] SELDOM (1-2 DAYS) ↓ | [2.] SOMETIMES (3-4 DAYS) ↓ | [3.] OFTEN (5-7 DAYS) ↓

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

[1.] LESS THAN 1 HOUR [2.] 1 BUT LESS THAN 2 HOURS

[3.] 2-4 HOURS [4.] MORE THAN 4 HOURS

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

[0.] NEVER ↓ GO TO Q.#4 | [1.] SELDOM (1-2 DAYS) ↓ | [2.] SOMETIMES (3-4 DAYS) ↓ | [3.] OFTEN (5-7 DAYS) ↓

3a. What were these activities?

_____

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

[1.] LESS THAN 1 HOUR [2.] 1 BUT LESS THAN 2 HOURS

[3.] 2-4 HOURS [4.] MORE THAN 4 HOURS

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

[0.] NEVER [1.] SELDOM [2.] SOMETIMES [3.] OFTEN ↓ (1-2 DAYS) (3-4 DAYS) (5-7 DAYS) GO TO Q.#5 ↓ ↓ ↓

4a. What were these activities?

_____

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

[1.] LESS THAN 1 HOUR [2.] 1 BUT LESS THAN 2 HOURS

[3.] 2-4 HOURS [4.] MORE THAN 4 HOURS

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

[0.] NEVER → GO TO Q.#6 | [1.] SELDOM (1-2 DAYS) | [2.] SOMETIMES (3-4 DAYS) | [3.] OFTEN (5-7 DAYS)

5a. What were these activities?

_____

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

[1.] LESS THAN 1 HOUR [2.] 1 BUT LESS THAN 2 HOURS

[3.] 2-4 HOURS [4.] MORE THAN 4 HOURS

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

[0.] NEVER → GO TO Q.#7 | [1.] SELDOM (1-2 DAYS) | [2.] SOMETIMES (3-4 DAYS) | [3.] OFTEN (5-7 DAYS)

6a. What were these activities?

_____

6b. On average, how many hours per day did you engage in exercises to increase muscle strength and endurance?

[1.] LESS THAN 1 HOUR [2.] 1 BUT LESS THAN 2 HOURS

[3.] 2-4 HOURS [4.] MORE THAN 4 HOURS

HOUSEHOLD ACTIVITY

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

[1.] NO [2.] YES

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

[1.] NO [2.] YES

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

Please answer YES or NO for each item.

		NO	YES
a.	Home repairs like painting, wallpapering, electrical work, etc.	1	2
b.	Lawn work or yard care, including snow or leaf removal, wood chopping, etc.	1	2
c.	Outdoor gardening	1	2
d.	Caring for an other person, such as children, dependent	1	2

spouse, or an other adult

WORK-RELATED ACTIVITY

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

[1.] NO [2.] YES

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

_____ HOURS

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

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

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

[3] Walking, with some handling of materials generally weighing less than 50 pounds.

[**Examples:** mailman, waiter/waitress, construction worker, heavy tool and machinery worker.]

[4] Walking and heavy manual work often requiring handling of materials weighing over 50 pounds. [**Examples:** lumberjack, stone mason, farm or general laborer.]

THANK YOU FOR TAKING THE TIME AND EFFORT TO COMPLETE THIS QUESTIONNAIRE

Appendix I

PASE
Physical Activity Scale for the Elderly

Administration and Scoring Instruction Manual

INTRODUCTION

The Physical Activity Scale for the Elderly (PASE) is an easily administered and scored instrument that measures the level of physical activity in individuals aged 65 years and older. The development of this instrument was supported by a Small Business Innovation Research grant from the National Institute on Aging. The instrument is comprised of self-reported occupational, household and leisure activities items over a one-week period and may be administered by telephone, mail or in-person. The PASE scoring algorithm was derived from physical activity measured by movement counts from an electronic physical activity monitor, activity diaries, and self-assessed activity levels in a general population of non-institutionalized older persons. The PASE can be used to measure physical activity levels in epidemiologic surveys of older people as well as to assess the effectiveness of exercise interventions.

ADMINISTRATION INSTRUCTIONS

The PASE may be administered by interview or completed by elderly respondents. The instrument is printed in a large type face to make it easy for older persons to read. Self-administered or interviewer-administered versions of the instrument can be completed in 5 to 15 minutes.

The first page of the questionnaire provides general instructions and shows an example of a completed item. Respondents should be encouraged to answer each item by circling the correct response. All items refer to activities performed in the previous seven days. "Never" and "No"

responses should always be marked to indicate any activities the respondent did not perform during that period.

The leisure activity items require respondents to first report the number of days per week the activity was performed and then the number of hours per day. Space is also provided for respondents to record the types of activities in which they engaged. These reports should be reviewed before computing PASE scores to ensure that specific sports and recreational activities have been recorded in the appropriate categories.

SCORING INSTRUCTIONS

PASE scores are calculated from weights and frequency values for each of 12 types of activity. Responses to the first question about sitting activities are not scored. The PASE scoring form is shown in Table 1.

TABLE 1

PASE SCORING FORM

PASE Item	Type of Activity	Activity Weight	Activity Frequency	Weight times Frequency
2.	Walk outside home	20	a.	
3.	Light sport / recreational activities	21	a.	
4.	Moderate sport / recreational activities	23	a.	
5.	Strenuous sport / recreational activities	23	a.	
6.	Muscle strength / endurance exercises	30	a.	
7.	Light housework	25	b.	
8.	Heavy housework or chores	25	b.	
9a.	Home repairs	30	b.	
9b.	Lawn work or yard care	36	b.	
9c.	Outdoor gardening	20	b.	
9d.	Caring for another person	35	b.	
10.	Work for pay or as volunteer	21	c.	

PASE SCORE:	

Activity Frequency Values:

a. Use hours per day conversion table below
b. 1 = activity reported in past week, 0 = activity not reported
c. Divide work hours reported in Item 10.1 by seven; if no work hours or if job involves mainly sitting with slight arm movements (Item 10.2 = 1), then activity frequency = 0.

ACTIVITY TIME TO HOURS PER DAY CONVERSION TABLE

Days of Activity	Hours Per Day of Activity	Hours Per Day
0. Never		0
1. Seldom	1. Less than 1 hour	.11
	2. 1-2 hours	.32
	3. 2-4 hours	.64
	4. More than 4 hours	1.07
2. Sometimes	1. Less than 1 hour	.25
	2. 1-2 hours	.75
	3. 2-4 hours	1.50
	4. More than 4 hours	2.50
3. Often	1. Less than 1 hour	.43
	2. 1-2 hours	1.29
	3. 2-4 hours	2.57
	4. More than 4 hours	4.29

To Compute a PASE Score:

1. Review the leisure time activities recorded by respondents or interviewers to ensure that sports and recreational activities are correctly classified as light, moderate, or strenuous. Appendix A shows the appropriate activities for each of these categories; a detailed description of more complex coding situations may be found in Appendix B. Household activities should not be recorded as sports or recreation.

2. Determine the frequency value (hours per day in the one-week reporting period) for each activity. For the walking, exercise, and sports/recreation items, frequency values are derived from the number of days and hours per day of activity, as shown in the conversion table at the bottom of the scoring form. Household activity values are "1" if an activity was reported in the past seven days and "0" if it was not. The frequency value for paid or volunteer work is the number of hours worked in the past week divided by seven. The activity frequency is zero for jobs that involve mainly sitting with slight arm movements.

3. Multiply the activity weight by the activity frequency for each item.

4. Sum the activity weight by the activity frequency products for all 12 items. We recommend that these totals be rounded to the nearest integer. PASE scores may range from zero to 400 or more.

An example of these scoring procedures is presented in Table 2 for a respondent who had a part-time job, walked outdoors, and engaged in light sports, activity, light housework, and lawn work during the previous week. The PASE score for this respondent is 149.5, which may be rounded to 150.

PASE SCORING EXAMPLE

Respondent reports:

- Walking outside home (sometimes; 1-2 hours per day)
- light sports (golf with a cart; seldom; 2-4 hours per day)
- work involving sitting or standing with some walking (20 hours per week)
- light housework and lawn work in past seven days

PASE Item	Type of Activity	Activity Weight	Activity Frequency	Weight times Frequency
2.	Walk outside home	20	.75	15.0
3.	Light sport / recreational activities	21	.64	13.4
4.	Moderate sport / recreational activities	23	0	0
5.	Strenuous sport / recreational activities	23	0	0
6.	Muscle strength / endurance exercises	30	0	0
7.	Light housework	25	1	25.0
8.	Heavy housework or chores	25	0	0
9a.	Home repairs	30	0	0
9b.	Lawn work or yard care	36	1	36.0
9c.	Outdoor gardening	20	0	0
9d.	Caring for another person	35	0	0
10.	Work for pay or as volunteer	21	2.86	60.1
			PASE SCORE:	149.5

The computer code to calculate PASE scores is reproduced in Appendix C.

VALIDITY AND RELIABILITY OF THE PASE

The validity and reliability of the PASE were established in a random sample (N = 222) of individuals aged 65-100 years. PASE scores were validated through comparisons with physiologic and health status data measured in the home. In this sample, PASE scores were significantly correlated with balance, grip strength, leg strength, self-assessed health status, and Sickness Impact Profile scores. PASE scores also exhibited temperature-related seasonal variation. The reliability of PASE scores was evaluated by stability over repeated administrations three to seven weeks apart. The test-retest reliability coefficient was .75 (95% CI = .69 -.80). Reliability for mail administration (r = .84) was higher than for telephone administration (r= .68). A detailed description of the development of the PASE as well as reliability and validity results may be found in Appendix D.

PRELIMINARY NORMS

Preliminary norms for PASE were established in a general population of older adults. In this sample scores ranged from 0 to 361. The mean score was 102.9 (standard deviation = 64.1); the median was 90. Mean scores (and standard deviations) by age and gender were as follows:

	AGE GROUP		
	65-69 yrs.	70-75 yrs.	76-100 yrs.
MEN	144.3 ± 58.6	102.4 ± 53.7	101.8 ± 45.7
WOMEN	112.7 ± 64.2	89.1 ± 55.5	62.3 ± 50.7

APPENDIX A:
ACTIVITY CATEGORIES

Light Sport and Recreation

archery
badminton
billiards
boating (canoeing, rowing, sailing)
bocci
bowling
catch
croquet
darts
fishing
frisbee
golf with a power cart
horseshoes
musical program
riflery
shuffleboard
swimming: no laps
table tennis

Moderate Sport and Recreation

barn chores
dancing (ballroom, ballet, disco)
fencing
football
golf without a cart
horseback riding
scuba diving
skating (ice, roller)
sledding
snorkeling
softball / baseball / cricket
surfing
tennis (doubles)
trampoline
volleyball

Light Housework

drying dishes
dusting
hanging up laundry
ironing
laundry
meal preparation
washing dishes

Strenuous Sport and Recreation

aerobic dance or water aerobics
backpacking
basketball
bicycling / exercise bike
board sailing
handball / paddleball
racquetball
hiking
hockey (ice or field)
jogging
lacrosse
mountain climbing, running
rope skipping
rowing machine
rowing / canoeing for competition
skiing (cross country, downhill, water)
snow shoeing
soccer
stair climbing
squash
swimming laps
tennis (singles)

Muscle Strength and Endurance

calisthenics
hand weights
physical therapy with weights
push-ups
sit-ups
weight-lifting

Heavy Housework

carrying wood
mopping floors
moving furniture
scrubbing floors
sweeping
vacuuming
washing walls
washing windows
washing cars

APPENDIX B:
PASE CODING EXAMPLES

The following examples are provided as guidelines regarding the administration and coding of the PASE.

QUESTION 1

Example: Respondent watches the news every day for one hour. On Tuesday, the respondent plays bingo for three hours. Also, the respondent attends meetings twice a week. One meeting lasts one hour, and the other meeting lasts two hours.

Since the respondent watches TV every day, the interviewer would code sitting activities as often (5-7 days). During the week, the respondent reported 13 hours of sitting (7 hours of TV watching, 3 hours of Bingo, and 3 hours of meeting). Dividing the total hours/week (13) by the days engaged in sitting activities per week (7) results in hours per day engaged in sitting activities (1.9 hours; 1 but less than 2 hours).

Visiting with others, sewing, paperwork, playing musical instruments, playing cards, and/or bingo are considered sitting activities.

QUESTION 2

Example: The respondent walks 30 minutes to 1.5 hours per day.

The average time spent walking was 1 hour. One but less than 2 hours per day is coded for walking.

Example: Three times a week, the respondent walks 3-4 times a day for 15 minutes.

Coding. Throughout the PASE, the number of days rather than the number of occasions is coded. Therefore, the respondent walked sometimes (3-4 days). The respondent averaged 52.5 minutes of walking (3.5 times x 15 minutes) on those days, which is coded as less than one hour of walking outside the home or yard.

Any leisure time, household or work related activity that involves walking is coded entirely under the appropriate activity category (light, moderate, or strenuous sport and recreation, muscle strength and endurance, or work-

related). Hence, walking as part of golf would be coded only as moderate sport and recreation (Question 4) and not as walking (Question 2).

Walking within the respondent's yard is excluded from the question. Treadmill walking should be included under Question 2.

QUESTION 3

Example: The respondent plays golf 4 days per week for 4 hours/day. Three days a week, the golfer uses a power cart. One day a week, the golfer walks the course either pulling a cart, carrying the clubs, or the caddy carries the clubs.

Only golf with the power cart would be coded under light sport and recreation. Specifically, the respondent golfed with a cart sometimes (3-4 days/week) for 2-4 hours/day. Golfing without a cart would be marked under moderate sport and recreation as seldom (1-2 days) for 2-4 hours per day. Putting or hitting golf balls at a driving range are coded for light sport and recreation.

Stretching is not coded under any activity category in the PASE.

QUESTION 4

Gardening and lawn work are not coded under leisure time activities. Gardening and lawn work are considered household activities. Question 9B addresses lawn work, and Question 9C pertains to gardening.

QUESTION 5

Example: The respondent swims laps but considers the activity light rather than strenuous sport and recreation.

Swimming laps is coded a strenuous sport and recreational activity regardless of the respondent's assessment of the activity's intensity. Leisure time activities are preassigned activity categories as listed in Appendix A.

Example: The respondent participates in a one-hour aerobics class, 3 days per week. The class consists of 20 minutes of stretching, 20 minutes of hand weights or calisthenics, and 20 minutes of aerobic dance.

Coding. The aerobic class would be coded under two categories. The 20 minutes of aerobic dance would be coded under strenuous activities, and the 20 minutes of calisthenics would be coded under muscle strength and endurance. The 20 minutes of stretching would not be coded under any activity category. Under strenuous activities, the interviewer would list aerobics and circle less than 1 hour/day for 3-4 days per week. Likewise, aerobics would be listed under muscle strength and endurance for less than 1 hour/day for 3-4 days per week.
Climbing stairs as part of an exercise regimen is coded under strenuous sport and recreation. However, stair climbing as part of daily activities is not coded in the PASE.

QUESTION 6

Strenuous work activity, such as moving furniture, is not included in this question. Only activities that are done specifically to increase muscular strength and endurance are used in Question 6.

QUESTION 7

Drying dishes, clothes washing, ironing, hanging up laundry, taking out the garbage, and preparing meals are considered light housework. (See Appendix A.)

QUESTION 8

See Appendix A for applicable activities.

QUESTION 9A

Home repair includes home improvement and maintenance projects such as painting, plumbing, and carpentry.

QUESTION 9B

Snow removal (sweeping snow, shoveling snow or using a snowblower) is considered to be lawn work or yard care. Lawn mowing is counted as lawn work regardless of the type of mower (riding, power, or push) used.

Stacking wood as a household chore is considered to be heavy housework (Question 8); chopping wood outdoors should be coded under Question 9B.

QUESTION 9C

Example: Respondent does outdoor gardening in season. In February, the respondent has not started the garden yet.

Outdoor gardening is coded "no". Only activities performed during the past seven days are coded.

QUESTION 9D

Dependency is defined as a person requiring assistance with activities of daily living (food preparation, personal hygiene, household cleaning). Division of labor within a household (i.e. meal preparation, laundry, yardwork) is not considered dependency.

Babysitting is included in Question 9D. Babysitting is not included in Question 10 as a work-related activity.

Pet care is not considered part of Question 9D.

QUESTION 10

Only work performed during the past 7 days is coded.

Example: The respondent works half the time sitting or standing with some walking, and the other half of the time walking, with some handling of materials.

Higher rather than lower activity levels are coded if the respondent indicates two categories of physical activity required on the job or volunteer work.

Respondents should be encouraged to give their best estimate of the number of hours they worked during the previous seven days. However, if a range of hours is reported (e.g. 15-20 hours), use the midpoint of the range as an estimate.

APPENDIX C:
COMPUTER CODE FOR PASE SCORING

The following code may be used to calculate PASE scores by computer. Questionnaire items are designated by "Q" followed by the PASE item number, e.g., Q9C refers to questionnaire item 9C (outdoor gardening).

```
RECODE Q2, Q3, Q4, Q5, Q6 (0=0)(1 =1.5)(2=3.5)(3=6)(ELSE = -1).
RECODE Q2A, Q3B, Q4B, Q5B, Q6B (1 =.5)(2=1.5)(3=3)(4=5).
COMPUTE Q2 = Q2 * Q2A/7.
COMPUTE Q3 = Q3 * Q3B/7.
COMPUTE Q4 = Q4 * Q4B/7.
COMPUTE Q5 = Q5 * Q5B/7.
COMPUTE Q6 = Q6 * Q6B/7.
RECODE Q7, Q8, Q9A, Q9B, Q9C, Q9D (1=0)(2=1)(ELSE = -1).
RECODE Q10 (1=0)
IF (Q10B = 1) Q10 = 0.
IF (Q10B ≥ 2) Q10 = Q10A/7.
COMPUTE PASE = 20*Q2 + 21 *Q3 + 23*(Q4 + Q5) + 30*Q6 +
25*(Q7 + Q8) + 30*Q9A + 36*Q9B + 20*Q9C + 35*Q9D + 21*Q10.

MISSING VALUE ALL (-1).
```

APPENDIX D:

PASE DEVELOPMENT, RELIABILITY AND VALIDITY ANALYSES

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THE PHYSICAL ACTIVITY SCALE FOR THE ELDERLY (PASE): DEVELOPMENT AND EVALUATION

RICHARD A. WASHBURN, KEVIN W. SMITH, ALAN M. JETTE and CAROL A. JANNEY
New England Research Institute, Inc., Watertown, MA 02172, U.S.A.

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Abstract—A Physical Activity Scale for the Elderly (PASE) was evaluated in a sample of community-dwelling, older adults. Respondents were randomly assigned to complete the PASE by mail or telephone before or after a home visit assessment. Item weights for the PASE were derived by regressing a physical activity principal component score on responses to the PASE. The component score was based on 3-day motion sensor counts, a 3-day physical activity diary and a global activity self-assessment. Test–retest reliability, assessed over a 3–7 week interval, was 0.75 (95% CI = 0.69–0.80). Reliability for mail administration ($r = 0.84$) was higher than for telephone administration ($r = 0.68$). Construct validity was established by correlating PASE scores with health status and physiologic measures. As hypothesized, PASE scores were positively associated with grip strength ($r = 0.37$), static balance ($r = +0.33$), leg strength ($r = 0.25$) and negatively correlated with resting heart rate ($r = -0.13$), age ($r = -0.34$) and perceived health status ($r = -0.34$); and overall Sickness Impact Profile score ($r = -0.42$). The PASE is a brief, easily scored, reliable and valid instrument for the assessment of physical activity in epidemiologic studies of older people.

Elderly Physical activity assessment questionnaire

INTRODUCTION

Physical activity is a modifiable behavioral risk factor related to the maintenance of health and effective function in older people [1]. Evidence from the Alameda County Study showed that, among the elderly, participation in leisure time physical activity was associated with a decreased 17-year follow-up mortality risk that was independent of age, socioeconomic status, health status, smoking, relative weight and alcohol consumption [2]. Mor [3] reported that those individuals 70–74 years of age from the Supplement on Aging cohort who did not participate in regular exercise or could not walk a mile without resting were more likely to suffer a decline in functional status over a 2-year period after controlling for medical conditions and demographic factors. Maintaining an active lifestyle in later years has been associated with a decreased risk for falls and fractures [4, 5] as well as preventing age-associated declines in bone density [6, 7], cardiovascular fitness [8] and muscular strength [9, 10]. However, limited information is available regarding the specific types and amount of physical activity necessary for maximum health benefits in older people.

Research on physical activity and health in older people has been hampered by the lack of physical activity assessment methods designed for older people and suitable for use in epidemiologic research. Techniques such as movement counters [11, 12], heart rate monitoring [13] or activity diaries [14, 15] are available but all suffer important shortcomings. Cost is the major problem. Movement counters, monitors and diaries are expensive in either equipment requirements (motion sensor, heart rate monitoring) or time and effort required by both respondent and investigators (diaries). Logistical problems and

subject burden are also concerns. Pick-up and delivery of equipment, and respondent co-operation in detailed data recording limit their use to studies of small, highly selective samples.

A physical activity questionnaire is a practical and widely used approach for physical activity assessment in epidemiologic investigations [16]. Activity questionnaires have been used in studies relating physical activity to fall and fracture risk, balance and gait characteristics, bone density, and coronary heart disease in older people [4, 5, 17–19]. Unfortunately, activity questionnaires currently in use with older people have been designed for younger populations [20–22]. The Centers for Disease Control Behavioral Risk Factor Surveillance System, for example, contains a physical activity questionnaire designed to monitor the physical activity habits of the U.S. population. It uses the same questions and response format for respondents age 18 to over 70 years [23]. Results from recent work strongly indicates that physical activity questionnaires designed for use with younger people (i.e. age-neutral) are inaccurate when used with older people [24]. In comparing responses from an age-neutral questionnaire with physical activity estimates from a 3-day diary, the age-neutral questionnaire underestimated the time spent in physical activity by approximately 2 hours 45 minutes per day. The magnitude of the absolute reporting error by questionnaire was small for strenuous activities (approximately 5 minutes/day) but was substantial (2 hours 20 minutes/day) for less strenuous physical activity categories (i.e. walking, household chores, light sport and recreation). Questionnaires designed for younger people suffer from other shortcomings when used with older people. The time frame over which activity is assessed can be too long (months, years), domains of activity most likely engaged in by older people are not included or emphasized (walking, light-moderate housework, outdoor work, etc.), and an open-ended response format (for example, asking how many minutes per week one engages in a specific activity) can be difficult for older people to report accurately.

An accurate physical activity instrument designed specifically for older people would fill an important need in epidemiologic research. This project was undertaken to design and evaluate an age-specific physical activity questionnaire that would overcome the problems inherent in existing methods.

METHODS

Instrument development

We reviewed over 40 publications from the scientific literature on questionnaire assessment of physical activity. From these papers we prepared a list of physical activity categories and specific items within each category that were most relevant for older people. This list was distributed to two consultants, authorities in the area of physical activity assessment (Dr R. E. LaPorte and Dr S. N. Blair), who reviewed the material and met with project investigators. Occupational, household and leisure time activities were included in the initial questionnaire. In addition, the initial questionnaire included items on living situation, sleep, and restricted activity days as potential discriminators of activity among older people whose activity levels were, in general, quite low. Investigators and staff developed a draft questionnaire which formed the first version of PASE (*P*hysical *A*ctivity *S*cale for the *E*lderly). This version of PASE was pilot tested in a small sample of older persons living in Boston and Amherst, MA (age 65–74, $n = 12$; age 75–84, $n = 15$; age 85+, $n = 9$). Trained interviewers conducted interviews to assess the appropriateness of the items, comprehensibility, and completeness. Open-ended evaluation questions were asked to solicit feedback on all aspects of the PASE. Results were used to prepare a final version of the instrument which was reviewed by three age-eligible volunteers. The validity and reliability of this instrument was assessed in the field in the second phase of this study.

Sampling procedures

The target area for the study consisted of 23 western Massachusetts cities and towns within a 25-mile radius and the same telephone area code as Amherst, MA. This area contains two cities (Springfield and Chicopee) that had populations exceeding 50,000 residents in 1980 as well as suburban and rural communities of varying sizes. All persons aged 65 years or older living in their own households without serious mental or physical impairments were eligible for the study. The size of the sample was based on a statistical power analysis of the number of cases needed to detect validation correlations exceeding 0.2 and to obtain test–retest coefficients with a 95% confidence interval of 0.06.

A two-stage procedure was employed to select study respondents. Towns were stratified by

median 1980 household income (less than or more than $20,000). Half of the towns in each stratum were randomly selected. Due to its size, the city of Springfield was a separate self-representing stratum. In the second stage, 1989 Massachusetts street lists (a state-mandated census of persons of voting age) in the selected towns were used to identify eligible older adults. Persons born in 1924 or earlier were systematically sampled from these lists at a rate proportional to the total number of adults aged 65 or older in each town. Unequal selection probabilities in the first stage were offset by sampling eligible adults in Springfield at half the rate used in the other 11 towns to produce a self-weighting sample of individuals in the target area.

Survey protocol

Each adult in the sample was randomly assigned to one of four groups based on the type of PASE administration (telephone or mail) and the timing of data collection (home visits conducted before or after the PASE questionnaire). Half of the sample received home visits first and then completed either the mail or telephone questionnaire; the other half were administered the physical activity questionnaire prior to the home visit. Using the addresses appearing in the street lists, each eligible person was sent an introductory letter explaining the purposes of the study. Subjects were then contacted by telephone to schedule a home visit. A minimum of 10 calls was made to each household to locate respondents. Persons who had died, lived in nursing homes, had serious cognitive impairments, or could not speak or read English were not eligible. Persons assigned to groups in which interviews were to be conducted prior to visits were asked to complete the PASE even if they refused to permit a home visit. Baseline respondents were recontacted 3 weeks later and asked to complete a second questionnaire to assess test–retest reliability.

In-home protocol

All home visits were conducted by trained field technicians between January 1990 and February 1991. Written informed consent was obtained from all respondents. Home visit measures were collected in the following order. Blood pressure (BP) was measured three times using a standard mercury sphygmomanometer with the respondent seated for at least 5 minutes prior to measurement with legs uncrossed at the time of readings. The last BP reading was used in the analysis. Height and weight were measured using standardized procedures patterned after the Pawtucket Heart Study protocol [25], with respondents in stockinged feet and indoor clothing. Height was rounded up to the nearest eighth of an inch and weight was rounded down to the nearest pound.

Grip strength of the dominant hand was assessed with respondents in a standing position. Static balance of the dominant leg (same side as dominant arm) was assessed by the one leg stance test with eyes closed [26]. Respondents in stockinged feet were instructed to close their eyes and raise their non-dominant foot from the floor. Balance time (to the nearest 0.1 second) was assessed with a stopwatch from the time the non-dominant foot left the floor until either the dominant foot was displaced, the non-dominant leg touched the dominant leg, or the non-dominant leg touched the floor.

Isometric knee extensor strength at 60° knee flexion was measured with a portable Isokinetic, Inc. (Grand Rapids, MI) knee unit [27]. This unit consists of a padded seat and a bracket that holds a spring gauge and a cuff assembly for attachment to the respondent's leg directly above the lateral malleolus. Respondents sat on the padded seat with their popliteal fossa placed against the front of the padded surface. For stabilization the thigh of the leg being tested was strapped to the seat. Respondents sat with a straight back with hands grasping the side of the padded seat and were asked to exert maximal force against the ankle cuff. Testing of the dominant leg always preceded testing of the non-dominant leg.

The results of three separate trials were recorded for grip strength, static balance and leg strength. The mean of these three trials was used in statistical analyses.

Health status was assessed by the Sickness Impact Profile (SIP), a measure of the impact of disease on daily activities and behaviors in 12 functional areas [28, 29]. Demographic characteristics were reported using standard items from national surveys. At the conclusion of the home visit, field technicians explained the use of the movement counter and an activity diary. Respondents were asked to wear the movement counter and record their activity patterns for the next 3 days.

Activity monitor. Physical activity was monitored using a Caltrac Personal Activity Computer (Hemokinetics Inc., Madison, WI). Details regarding development and construction

of the Caltrac as well as the validity of the Caltrac for older people are available elsewhere [30, 31]. The Caltrac is a small, lightweight (9.5 cm × 7.0 cm × 1.25 cm; weight = 75 g) device designed to measure acceleration via a piezoelectric bender element. A numerical score (kcal) is provided by a liquid crystal display. The total kcal score is a function of the respondent's basal metabolic rate calculated by a computer chip programmed with the respondents age, height, weight and gender, plus additional caloric expenditure resulting from body movement. Since our purpose was to use the Caltrac only as a movement counter, we by-passed the metabolic program as instructed by the manufacturer and used daily Caltrac counts in the analysis. Respondents were instructed to wear the Caltrac on a belt over the dominant hip and record Caltrac readings and the time of day both in the morning and on retiring for the evening on a chart attached to an activity diary.

Activity diary. For each waking hour during the 3 day observation period, respondents were asked to maintain an activity diary of the amount of time spent in eight activity categories: lying down, sitting, standing, standing light work (dishes, dusting), standing moderate/heavy work (carpentry, gardening, lifting), walking, light sport and recreation (golf, bowling, ball games), and heavy sport and recreation (running, cycling). Daily energy expenditures (METS) were calculated by multiplying the amount of time spent in an activity by a MET value reflecting the intensity of that activity. MET values ranged from 1.0 for lying down to 6.0 for heavy sport and recreation [32].

After the third day, respondents also completed a 5-point scale assessing their level of physical activity. Scale values ranged from 1 = not active at all to 5 = extremely active.

Caltracs, diaries and self-report scale scores were returned to the investigators by mail. Daily averages for the Caltrac counts and diary METS were determined for the 3-day monitoring period. Data were not included in the averages if the reporting periods for the diary and Caltrac differed by more than 2 hours on a given day.

PASE scoring

To devise a set of weights for the PASE items that would provide the best overall estimate of an older person's physical activity level, a criterion measure of physical activity was created from a principal components analysis of Caltrac counts, METS totals from the activity diary, and the global self-report of physical activity. This approach, which is rooted in classical test theory [33] and confirmatory factor analysis [34], treats these three measures as fallible indicators of an unobserved physical activity construct. A principal component score for each subject was computed from the respective item loadings. These component scores, which represent our most refined estimate of the underlying physical activity construct, were then regressed on responses to the questionnaire to derive the optimal item weights for the PASE. Total PASE scores were computed by multiplying the amount of time spent in each activity (hours per day over a 7-day period) by the respective weights and summing over all activities.

Validation and reliability assessment

The stability of the PASE over time was assessed by the test–retest reliability correlation between baseline scores and follow-up scores reported 3–7 weeks later. To validate PASE scores, Pearson correlations were computed between these scores and measurements taken during home visits. Validation measures included physiologic characteristics known to be affected by activity levels (heart rate, body mass index, balance, grip and leg strength) [9, 10, 35–37] as well as aspects of health status that influence the ability to perform physical activities (total SIP score, self-assessed health status, and selected acute and chronic health conditions). Correlations with the validation measures were also computed for six respondent subgroups (based on mode of questionnaire administration, gender and age) to determine the consistency of these associations. In addition, we examined seasonal trends and respondent characteristics associated with PASE scores.

RESULTS

Response rates

Dispositions for the 1288 names sampled from the street lists are shown in Table 1. Two hundred twenty-four persons (19.8%) were ineligible for the study. Contact was not made with another 159 whose eligibility status could not be determined. Of those known to be eligible, 36.0% consented to a home visit and to complete the PASE. An additional 15.5% completed the PASE but refused a home visit. Table 2 compares the background characteristics of participants with non-participants. Non-participants were on average 2 years older than

Table 1. Disposition of street list names

Number of Cases	Disposition
159	No contact (moved, telephone disconnected, unlisted telephone number, no answer)
224	Ineligible (deceased, nursing home resident, mental/physical impairment, younger than 65 years)
136	Refused telephone screener
251	Refused home visit, not asked to complete PASE
122	Refused home visit, and failed to complete PASE
119	Refused home visit, but completed PASE
277	Completed home visit and PASE
1288	Total names sampled from street lists

Table 2. Background characteristics of participants and non-participants

Characteristics	Non-participants ($n = 668$)[a]	Participants: Home visit and PASE ($n = 277$)	Participants: PASE only ($n = 119$)
Age (yr)	75.0**	73.0	73.4
Percent female	61.7*	57.0	71.4
Percent living with spouse	40.9	48.7	40.3
Town income (median dollars in thousands)	18.9	18.9	18.5
Percent employed	17.2	17.7	18.8
Perceived health (1 = excellent to 5 = poor)	2.89[b]	2.73	2.86
Activity level (1 = very high to 5 = very low)	2.98[b]	2.89	2.98
Worry about health (1 = not at all to 4 = most of the time)	2.32[b]	2.26	2.34

[a]Includes no contact cases, screener refusals, and those who failed to complete a PASE.
[b]$n = 378$ non-participants who refused home visit and PASE but completed telephone screening.
*$p < 0.05$; **$p < 0.01$.

participants. Women were more likely than men to refuse a home visit. However, those who completed the telephone screener but refused to participate in all other aspects of the study were similar to participants with respect to perceived health, physical activity levels and perceived worry about their health.

PASE score descriptive statistics

Figure 1 shows the results of the principal components analysis for the 193 subjects with complete data for the Caltrac, activity diary and global self-report item. The inter-item correlations among the three physical activity measures were moderately high and in the expected direction. The three measures had similar factor loadings on a single underlying component (eigenvalue = 1.87). The internal consistency of these items as measured by Cronbach's alpha was 0.69. The resulting component scores (mean = 0, standard deviation = 1) ranged from −2.44 to 3.54 with higher scores indicating greater physical activity.

Weights for individual activities were estimated by regressing component scores on the complete set of items in the original version of the PASE. Twelve types of activity accounted for 41.4% of the variation in component scores. Seven low expenditure activities (sleeping, napping, quiet activities, flexibility exercises, stair climbing, shopping or errands, and jobs involving sitting with slight arm movements) that were not significantly associated with

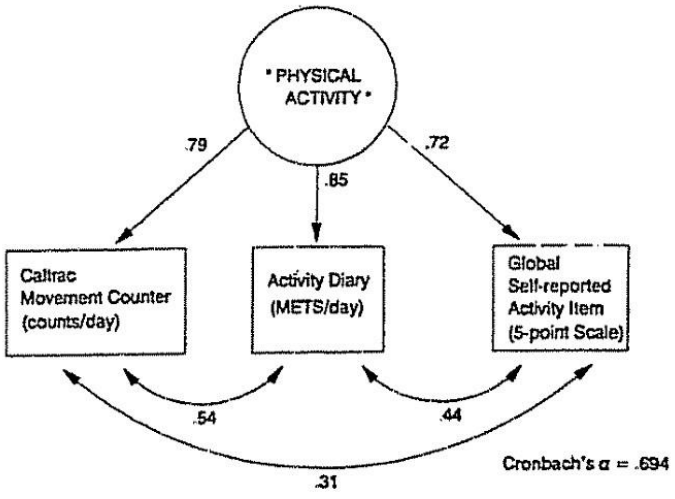

Fig. 1. Relationships between physical activity component and indicators of physical activity ($n = 193$). Curved arrows signify zero-order correlations; straight arrows indicate component loadings.

Table 3. PASE item weights and contributions to total score ($n = 314$)

PASE activity	Sample mean	PASE weight	Contribution to total PASE score
Muscle strength/ endurance	0.05 hr/day	30	1.5
Strenuous sports	0.07 hr/day	23	1.6
Moderate sports	0.11 hr/day	23	2.5
Light sports	0.09 hr/day	21	1.9
Job involving standing or walking	0.53 hr/day	21	11.1
Walking	0.65 hr/day	20	13.0
Lawn work or yard care	45.6%*	36	16.4
Caring for another person	24.2%*	35	8.5
Home repairs	22.0%*	30	6.6
Heavy housework	47.4%*	25	11.8
Light housework	89.5%*	25	22.4
Outdoor-gardening	26.8%*	20	5.4
			102.7

*Percentage of sample engaging in that activity during week.

activity levels were eliminated from the final version of the instrument. Activity weights in general did not differ significantly by mode of questionnaire administration (mail vs telephone), timing of administration (i.e. before or after home visits), age group or gender.

Table 3 displays the contribution of each questionnaire item to the overall PASE score as determined by the product of the sample mean and activity weight. The PASE questionnaire assesses involvement in half of these activities in terms of hours per day over a 7-day period; the other six items are scored 1 = engaged in activity or 0 = did not engage in that activity during the previous 7 days. As expected, the highest PASE weights were found for the more strenuous types of activity. The activities making the largest average individual contributions to the total PASE score were light housework, lawn work/yard care, walking, heavy housework, and jobs involving standing or walking.

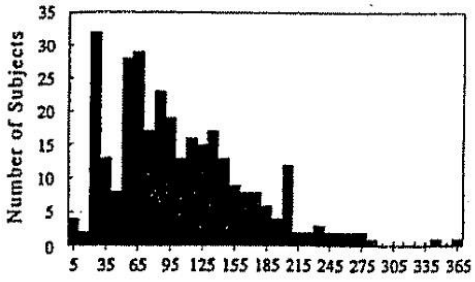

Fig. 2. Distribution of PASE scores in a general population age 65–100 yr.

PASE scores observed in this sample of older persons ranged from 0 to 360; the overall score distribution was skewed slightly to the right (Fig. 2). The mean sample score was 102.9 with a standard deviation of 64.1. The median score was 90. PASE scores declined with age and were consistently higher for men than women in each age group (Fig. 3).

Validation results

The results of the PASE validation analyses are summarized in Table 4 for the 222 subjects who completed a baseline instrument and the tests administered during the home visit. PASE scores were significantly associated with two of the three health status indicators, exhibiting

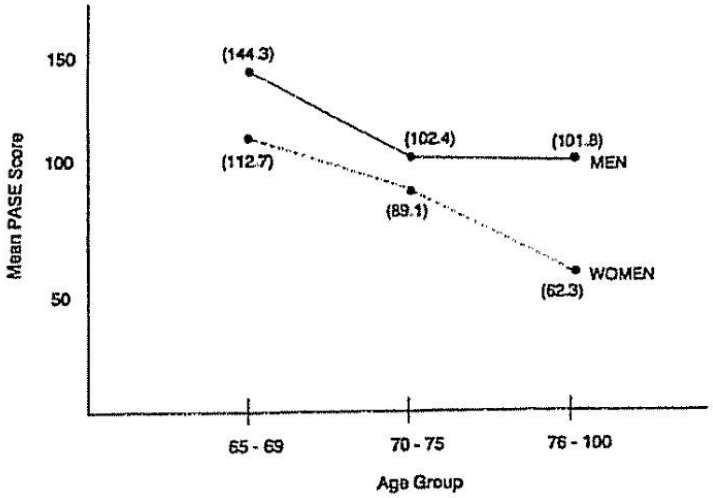

Fig. 3. Mean PASE score for men and women by age.

Table 4. Validity correlations for mail and telephone versions of PASE by mode, gender and age group

Validation measures	All subjects	Mode		Gender		Age group	
		Mail Questionnaire	Telephone Questionnaire	Female	Male	65–70	71–99
Perceived health (1 = excellent, 5 = poor)	−0.34**	−0.26*	−0.37**	−0.41**	−0.29**	−0.39**	−0.24**
Any restricted activity days (1 = yes, 0 = no)	−0.12	0.03	−0.21**	−0.23**	0.07	−0.16	−0.09
Sick Impact Profile Total Score	−0.42**	−0.42**	−0.46**	−0.37**	−0.40**	−0.36**	−0.42**
Heart rate	−0.13*	−0.32**	−0.01	−0.15	−0.03	−0.16	−0.12
Systolic BP	−0.09	−0.03	−0.14*	−0.19*	0.08	−0.09	0.01
Diastolic BP	−0.07	0.12	0.06	0.05	0.04	0.05	0.09
Body mass (kg/m²)	0.01	−0.05	0.03	0.08	−0.04	−0.10	0.01
Grip strength	0.37**	0.34**	0.37**	0.40**	0.32**	0.26**	0.38**
Balance	0.33**	0.39**	0.33**	0.33**	0.29**	0.14	0.42**
Dominant leg strength	0.25**	0.24*	0.26**	0.32**	0.06	0.12	0.25**
Non-dominant leg strength	0.28**	0.23*	0.30**	0.33**	0.10	0.09	0.33**
n	222	78	144	120	102	103	119

*$p < 0.05$ (1-tailed); **$p < 0.01$ (1-tailed).

strong correlations with Sickness Impact Profile scores and perceived health status, but a much weaker relationship with restricted activity days in the previous week. PASE scores were also positively correlated with grip strength, static balance, and leg strength in both the dominant and non-dominant legs. Activity levels measured by PASE were not associated with body mass index or blood pressure readings in this sample. With few exceptions, these correlations were consistent by mode of administration, gender, and age group. The pattern of statistically significant correlations across a variety of health status and physiologic measures provides strong evidence for the convergent validity of the PASE scoring algorithm.

PASE scores exhibited seasonal variations (Fig. 4). As one would expect in New England, the highest levels of physical activity are reported during the summer months while the lowest levels occurred during the coldest months of winter. The correlation between average monthly temperatures and monthly PASE means in this sample was 0.83 ($n = 12$ months).

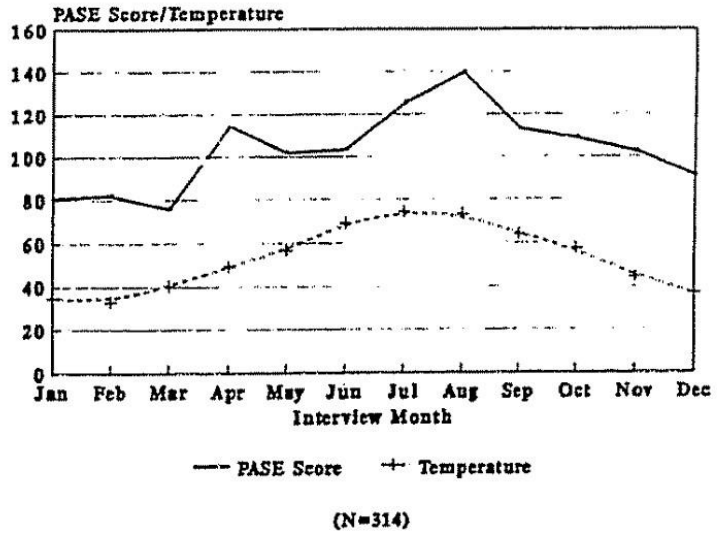

Fig. 4. Mean PASE scores and air temperatures by month of interview.

Table 5. Ordinary least squares regression of PASE score on sociodemographic factors and co-morbidity ($n = 282$)

Variable	Unstandardized coefficient	SE
Age (yr)	−1.93**	(0.56)
Gender (1 = female, 0 = male)	−16.88*	(6.76)
Race (1 = black/hispanic, 0 = white)	30.23	(18.73)
Lives alone	−11.26	(6.87)
Education (yr)	0.53	(1.24)
Employed	33.74**	(7.10)
Mode of administration (1 = mail, 0 = telephone)	17.83*	(6.56)
Average temperature (°F)	0.42	(0.22)
Sequence (1 = home visit first, 0 = home visit second)	1.28	(6.48)
Vision (1 = poor, 4 = excellent)	6.17	(4.64)
Current smoker	−13.69	(8.52)
Heart disease	−1.53	(7.89)
Cancer	21.48*	(8.43)
Hypertension	−16.30*	(6.14)
Arthritis	−5.06	(6.40)
Chronic respiratory disorder	−20.57*	(9.19)
Fracture	−4.00	(9.86)
Stroke	−8.30	(14.23)

Explanatory variables were coded: 1 = yes, 0 = no unless otherwise indicated.
*2 tailed $p \leq 0.05$; **2 tailed $p \leq 0.01$.

Sociodemographic and co-morbidity effects

Finally, Table 5 shows the multiple regression findings for sociodemographic and medical conditions hypothesized to affect physical activity for 282 subjects who completed both the baseline PASE and background questionnaires. This model accounted for nearly 38% of the variation in PASE scores.

Younger respondents, men, black and Hispanic subjects, and those who were employed all tended to have higher PASE scores than other members of the sample. Persons suffering from hypertension or chronic respiratory diseases had significantly lower PASE scores, while activity levels were higher than average for those with cancer. Scores also increased with outdoor temperature.

Controlling for demographic and health status variables, reported levels of physical activity were influenced by mode of administration. The mail version of PASE produced significantly higher activity scores (17.8 points on average) compared with telephone administration. Mail and telephone subjects were similar with respect to all but two covariates. Those responding by mail were more likely to be employed and to have suffered fractures than telephone respondents. The order in which subjects completed various components of this investigation, however, did not influence physical activity scores.

Test–retest reliability

Reliability was evaluated by determining the extent to which PASE scores were stable over repeated administrations. Two hundred fifty-four subjects completed both baseline and follow-up questionnaires over a 3–7 week interval. The test–retest reliability coefficient was 0.75 (95% CI = 0.69–0.80). Reliability for mail administration ($r = 0.84$) was higher than that for the telephone version of PASE ($r = 0.68$).

DISCUSSION

We have developed a physical activity survey for use with older people that is brief (5 minutes), easily scored, and can be administered by telephone, by mail or in person. Such an instrument suitable for use in studies of physical activity and health in older populations has not previously been available. The brevity of the PASE makes it feasible for use in large scale epidemiologic studies where limited time is available to assess physical activity.

The PASE was designed to assess activities commonly engaged in by older persons, thus avoiding one serious pitfall of age-neutral instruments. The focus of most age neutral physical activity surveys primarily on sport and recreational activity is not appropriate for older people. Our results underscore the importance of using a physical activity survey specific to older people. In the current study's sample, for example, the amount of time spent in all sport and recreational activity was only 5.4 minutes per day. However, considerable amounts of time were spent in other types of physical activity such as lawn work, caring for others, housework and gardening, activities which are underrepresented in age-neutral questionnaires.

The scoring procedures were developed using physical activity estimates derived from a representative sample of healthy, community-dwelling older individuals. Weights for individual activity areas were derived empirically to reflect each activity's contribution to overall physical activity as measured by three independent criterion measures. An important advantage of this approach to constructing scoring rules is that it avoids having to make questionable assumptions needed to estimate caloric expenditure of individual activities based on recall of the frequency, intensity and duration of the activity. Obtaining the detailed information needed to generate accurate caloric expenditure

estimates is beyond the scope of a brief physical activity assessment instrument.

Comparisons with data collected during home visits provide strong evidence for the convergent validity of the PASE. The correlations between PASE scores and health status, strength and balance were all in the hypothesized direction and of moderate strength (range $r = 0.25$ to $r = 0.42$). Larger correlations would not be expected given the influence of factors other than physical activity on health-related variables. Only one other study has assessed the validity of physical activity questionnaire with older respondents. However, this analysis was based on a small, non-representative sample using only 24-hour activity recalls and pedometer counts as validation criteria [38].

The PASE test–retest reliability coefficient (0.75) exceeds those reported for other physical activity surveys. Sallis *et al.* [20], for example, reported a 2 week test–retest correlation of 0.67 for the Five-Cities Activity survey in 53 men and women of a mean age of 41. In a random population sample of 633 men and women, ages 25–65 years, Washburn *et al.* [39] reported a 7–12 week test–retest correlation for the Harvard Alumni Physical Activity survey of 0.58. Like the PASE, both the Five-Cities and Harvard Alumni surveys are based on 7 day recalls. In the current study, discordance between physical activity estimates over the 3–7 week follow-up period can reflect actual changes in physical activity as well as unreliable reporting. In this context, the PASE test–retest correlations of 0.68 for telephone and 0.84 for mail administration are comparatively large for a physical activity assessment instrument.

The observed effect of mode of administration on physical activity estimates is of concern. Our results indicated that PASE scores were nearly 18 points higher, on average, when the PASE was administered by mail compared to telephone. The direction of this effect suggests that the observed difference was most likely due to respondents' double reporting activities in the mail version of PASE. For example, field staff indicated that subjects reported walking in response to the question specifically on walking and again under light or moderate recreational activity. This did not occur in the telephone version where the interviewer could probe in response to questionable information. However, interviewer probing may introduce inconsistency in the responses and be responsible for the lower test–retest reliability seen with the telephone version. The high reliability coefficient for mail administration indicates that random error is not a major problem with the mail version of the instrument.

Because of these concerns, we recommend that the telephone version of PASE be the method of first choice and suggest that the mail questionnaire be used in a modified form. Additional respondent instructions have been added to the mail version clarifying the proper categorization of activities. These clarifications should reduce reporting error in the mail version. The revised mail version of PASE, however, should be field tested to confirm that the recording problem has been corrected. Although we did not specifically evaluate the reliability and validity of a face-to-face version of PASE, our experiences with telephone interview administration suggest this mode of administration should provide reliable and valid physical activity assessments.

This investigation was unique in applying an empirical approach to constructing a physical activity instrument and in evaluating it in a probability sample of community-dwelling older adults. Although our analysis reveals that participants as compared with non-participants were slightly younger and more likely to be male, there were no differences between participants and non-participants in employment, perceived health, concern about health or level of physical activity. This implies that the validation and reliability results may be generalized to the population of community-dwelling older persons. The substantive finding that physical activity of older persons, as measured by PASE, is related to age, gender, employment status, and chronic respiratory disease factors in this sample were consistent with the literature [40, 41]. It is not clear, however, why PASE scores for those individuals reporting cancer were higher than average unless many of these cancers were in remission.

Future administration of PASE in larger samples of older persons will be needed to develop normative values of physical activity in older persons. In addition, it is important to determine the sensitivity of PASE in detecting change in physical activity to assess its utility as an evaluation instrument.

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Appendix J

Draft Interview Guide

- Have you been able to remain physically active since you completed your medically supervised exercise program?
- What have you been doing to stay physically active since you completed your supervised activity program? Prompts: For example, have you been: walking, doing home exercise, attending group physical activity, gardening, swimming, or dancing?
- What do you think has motivated you to stay physically active?
- Did you learn anything from the medically supervised exercise program that helped to change your attitudes or knowledge around being active?
- What has helped you to stay active? Is it programs in the community? Support from family and friends? Etc.
- What did the medically supervised exercise program do to prepare you to stay active?
- Do you plan on continuing to stay active?
- What do you see as the benefits of staying active?
- What are the downsides of being active?
- If you were a health care professional or physical activity instructor working in this program, what would you do to help participants stay active?

Appendix K

Executive Summary

The purpose of this study was to investigate physical activity (PA) engagement among older adults (OA) following discharge from a medically supervised group exercise program and to explore the facilitators and barriers that influenced PA engagement. A number of findings from this research may be valuable to health care providers, PA programmers, and PA instructors working with OA to promote successful and healthy ageing.

Among this select group of OA, we found that:

- Facilitators and barriers that influenced PA engagement among participants in this study after completion of the medically supervised exercise program were personally-, socially-, and program-based.
- Exercise is only one type of PA; encouraging OA to stay active by walking and engaging in household PA is important in addition to encouraging formal exercise opportunities.
- There is a need to effectively communicate the numerous benefits of physical activity.
- Group physical activity provides a valuable opportunity for social interaction and support among group members and between members and instructors.
- Ongoing support from health care providers is important to support a successful transition to self-directed PA. This can be done by offering to individually guide participants to suitable self-directed PA programs located in the community and offering to attend community classes that are new to participants in an effort to enhance participants' sense of comfort, confidence and safety.

- Convenience is an important factor in maintaining PA engagement. The location of PA programs and facilities, transportation issues, program registration, and time that a program is held (morning versus afternoon) all effect convenience.
- Affordability is key; many OA are on a limited income.
- Programs need to be relevant to OA. Relevance may be influenced by the knowledge level and approach of PA instructors, assessment protocol used to direct participants to suitable PA programs, program content, program size, program name, and follow up.

Recommendations:

- Directly involve OA in the planning, implementation, and evaluation of programs in order to address and eliminate barriers to PA.
- Focus on multilevel interventions. Interventions that aim to increase PA among OA should involve multiple levels of influence including individual, community, and organizational level factors.
- Intersectoral action is necessary. Local partnerships that involve a diverse membership and that share an embraced goal are needed.
- Evaluate programs. Evaluation could be done before, during, and/or after the program in order to gauge program success and participant satisfaction.
- Further research in this field involving theory development, various methodologies, and involving special populations of OA would further add to this area of study.