A MIXED-METHODS EVALUATION OF A FALL PREVENTION PROGRAM AT A CONTINUING CARE RETIREMENT COMMUNITY

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ABSTRACT

Background

One-third of Americans over age 65 experience a fall each year. Risk of falling increases with age, thus individuals over the age of 80 are more prone to experience falls. Falling is a major public health concern due to its costly and disabling consequences.

Falls result from an interaction between environmental hazards and inadequate physiology to cope with the hazards. Most fall risk factors are modifiable and preventable. The common threads throughout the literature suggest that in order to ensure fall prevention efforts are effective, interventions should be multi-factorial (containing educational, behavioral change and exercise components) and individualized as much as possible.

Fall prevention research with older adults who are community-dwelling or institutionalized is plentiful. However, fall prevention efforts in continuing care retirement community (CCRC) settings are under-studied.

The primary purpose of this study was to examine the influence of a fall prevention program (called Seniorcize) on the reduction of fall risk factors among high-functioning residents at Asbury Heights, a CCRC, in Pittsburgh, PA. A secondary purpose of this study was to examine the contextual factors at the study site, which influence program participation.

Methods

Quantitative data were collected and analyze on dependent variables (balance, gait, fear of falls, and depression) for 82 high-functioning Asbury Heights residents. Outcomes from Seniorcize participants were compared with nonparticipants. To explore facilitators and barriers of program participation, qualitative data were also collected via interviews with key informants and two focus groups—one with Seniorcize participants and one with nonparticipants.

Results

Outcomes on the dependent variables were not significantly different between the group of Seniorcize participants and the group of nonparticipants. The frequency of program participation was only significantly related to depression. Male participants had significantly less fear of falling than females.

Facilitators to program participation pertained to staff, equipment, class offerings, and publicity. Barriers included pre-conceived notions of Seniorcize participants, competing priorities, and limited personnel.

Public Health Significance

CCRCs need to examine the individualized needs and motivations of high-functioning residents. Interventions should include customized education and behavioral assessments, in addition to exercise routines.

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PREFACE

I am grateful for my ancestors and the many under-represented minority scholars who have blazed this trail for me and whose shoulders I stand on daily. “People will not look forward to posterity who never look backward to their ancestors.” (Edmund Burke). I am also indebted to my parents and siblings for encouraging me and being supportive throughout all of my professional and academic pursuits.

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1.0 INTRODUCTION TO THE STUDY

1.1 OVERVIEW

Falls are the leading cause of injury for older adults, and recovery from falls among seniors is difficult, which often leads to pain, poor mobility, and loss of independence. Most older adults admitted to hospitals for fall-related injuries are not sent home when they recover; instead, they are discharged to nursing homes or assisted-living care centers. To prevent falling, seniors can engage in regular physical activity, which improves strength, balance, and coordination. Preventing falls among older adults will promote the health of an aging population, ensure prolonged independence for seniors, and lower rising healthcare costs. This study includes an examination of the etiology of falls and the ways to reduce falls risk among residents within a continuing care retirement community (CCRC).

In this chapter, the significance and the context of the study are outlined. The next chapter will review factors that affect falls risk, falls prevention, and the efficacy of common interventions. Subsequent chapters will include a report of an evaluation study of an exercise program provided for high-functioning seniors. The exercise program studied is called Seniorcize, and it is housed at Asbury Heights, a CCRC in Pittsburgh, Pennsylvania. In brief, this study includes an evaluation of the impact of Seniorcize on the well-being of Asbury Heights' residents and an examination of residents' attitudes and perceptions of Seniorcize.

1.2 BACKGROUND OF THE PROBLEM

According to the tenth revision of the International Classification of Diseases (ICD 9), a fall is defined as an unexpected event where a person falls to the ground from an upper level or the same level (World Health Organization [WHO], 2007). Cassel and Lee (2000) found that senior citizens' falls most frequently occur in the home, followed by public buildings, residential institutions, hospitals and trade and service areas, streets and highways, and other locations. As the number of Americans age 65 and older has increased, falling among older adults has become a major public health problem. In fact, one-third of older adults in the United States (US) experience a fall sometime in their adult life (Centers for Disease Control [CDC], 2008). Risk of falling increases with age, thus individuals over the age of 80 are more prone to falls (Rubenstein & Josephson, 2002). In Pennsylvania, the average age for a fall death is about 75 years old, but the average age for fall hospitalizations is approximately 70 years old (Pennsylvania Department of Health [PDH], 2007).

Rubenstein and Josephson (2003) defined a risk factor as "a characteristic or a situation found significantly more often among individuals who subsequently experience a certain adverse event than individuals not experiencing the event" (para. 2). Many potential risk factors exist for older adults who fall. Factors vary from conditions of the body (intrinsic risk factors) to circumstances within the environment (extrinsic risk factors; Masud & Morris, 2001). There is rarely only one cause for an older adult falling; often, older adults fall from a combination of different risk factors.

The intrinsic risk factors for falls are more likely to develop as individuals get older. For example, muscles can become weaker, and eyesight and hearing may worsen with age. Other common risk factors include chronic illnesses, such as Parkinson's disease (late stages), arthritis,

diabetes, cataracts, postural hypotension and heart problems, and multiple medications (Masud & Morris, 2001).

Environmental (or extrinsic) factors are the hazards in our surroundings that may contribute to falling. Some examples are loose rugs, an extension cord running across a room, or uneven pavement. Such environmental factors are seldom the single reason for falling among older adults. Nonetheless, a fall may be triggered if, for instance, a person has one or more intrinsic risk factors and encounters environmental hazards.

Ten to 25.0% of falls among older adults result in significant injuries and sometimes require hospitalization (Rubenstein, Powers, & MacLean, 2001). Older adults are hospitalized for fall-related injuries five times more often than they are for injuries from other causes (Stevens, Rose, Cameron, & Pynoos, 2005). In 2011, more than 2.4 million older adults were treated in emergency departments for fall-related injuries, and nearly 689,000 older adults were hospitalized (CDC, 2013b). Consequences of falls are more serious in older adults because their bodies are frail, they are unable to get up after falling, and they may have underlying bone disease (e.g., osteoporosis).

Among people age 65 and older, unintentional falls are the leading cause of unintentional injury deaths in the US (CDC, 2013d). Though all falls do not result in injuries and death, falls are problematic because they have potentially long-lasting psychological consequences. The fear of subsequent falls is a concern for many older adults who have experienced a fall (Murphy, Dubin, & Gill, 2003). For example, older adults who have fallen before may lose confidence to go out and may voluntarily reduce daily activities (Mendes da Costa et al., 2012). Overall, quality of life for older adults who fall may suffer, and in many cases, some people will feel isolated, suffer from low self-esteem, and may become depressed (Arfken, Lach, Birge, &

Miller, 1994). These consequences are often called 'post-falls syndrome' because they occur after falls or after people have recovered from fall-related injuries (Murphy & Isaacs, 1982).

Many of the risk factors for falls are modifiable, and some can be eliminated. Preventing falls depends on individuals and health professionals assessing and determining the risk factors that can be eliminated or reduced (Lord, Sherrington, & Menz, 2001). For instance, if an older adult has muscle weakness and poor balance, interventions may include chair aerobics and tai-chi and may also include installing safety equipment into the home. Older adults who take a number of medications for many ailments should ask their doctors to re-evaluate medications and to discuss how interactions affect balance and/or gait.

By 2020, the annual cost of fall-related injuries is expected to reach $54.9 billion (CDC, 2013b). Falls and injuries are associated with increased institutional costs that result from labor, equipment, and utilization costs (fallers typically experience increased lengths of stay); furthermore, these costs climb with the severity and frequency of falls (Rizzo et al., 1998). Non-injurious falls are associated with increased healthcare utilization, yet fallers use an additional $12,000 more per person in healthcare resources than do non-fallers (Tideiksaar, 1996). Even single falls are associated with greater rates of being hospitalized, contacting physicians, and using nursing homes. For older adults who experience one or more injurious falls (compared with non-fallers), home health provider costs increase seven-fold, hospitalization costs increase three-fold, and emergency room costs increase four-fold (Tideiksaar, 1996).

Just as falls and loss of independence increase the economic burden on individuals, CCRCs experience similar economic increases. To remain financially viable in the long term, CCRCs, such as Asbury Heights, generally depend on high occupancy rates and may be at risk financially if occupancy drops below certain levels. In a study conducted by the U.S.

Government Accountability Office (GAO), CCRC managers noted that high occupancy and the ability to quickly fill vacancies are necessary for CCRCs to fund general operations and build financial reserves, including reserves to satisfy refund obligations with respect to entrance fees (GAO, 2010). According to the authors of the study,

> The operational model of CCRCs depends on having residents enter independent living units and pay entrance and monthly fees. The often large entrance fees can help CCRCs maintain cash reserves, and the monthly fees collected from independent living residents—whose cost to the CCRC is generally lower—help subsidize care for residents who require assisted living or nursing care. (GAO, 2010, p. 9)

The authors also mentioned that

> Because older Americans may be staying in their homes longer and thus moving into CCRCs at a higher age, residents may spend less time in independent living units than they had in the past. This can negatively affect CCRCs' long-term financial condition because residents in independent living may help subsidize those living in assisted living or nursing care. (GAO, 2010, p. 10)

Asbury Heights' first intervention aimed at reducing fall risks among its residents was known as the Falls-Free Program, which was implemented in 2000. The inaugural program was operated by contractors and has morphed numerous times over the years once Asbury Heights hired its own full-time exercise staff. The current rendition of the exercise program, called Seniorcize, has been created to help residents stay mobile and flexible, while providing opportunities for socialization as well. The Executive Director of Asbury Heights, John Zanardelli, stated that he wants to keep residents healthy and independent as long as possible (Personal communication, February 16, 2007).

1.3 PURPOSE OF THE STUDY

The primary purpose of this study was to examine if exercising reduces falls risk factors among high-functioning (e.g., absence of disability, dementia, and normal walking speeds) residents at Asbury Heights. The study was a cross-sectional descriptive study of the differences in falls risk assessment scores between a group of older adults who participate in exercise and a group of older adults who do not exercise. The falls risk assessment measured balance and gait; this study was also used to assess geriatric depression and fear of falling (FoF). A secondary purpose of this study was to examine the contextual factors at the study site that influence exercise participation.

1.4 SIGNIFICANCE OF THE STUDY

Falls interventions significantly impact older adults because of the substantial morbidity and mortality, functional deterioration, institutionalization, and costly health and social services associated with falls. Falls prevention research with older adults who are community dwelling or institutionalized is plentiful; however, CCRCs (which combine community and institutional dynamics) are understudied. As demonstrated in the following literature review (Chapter Two), little Level I (systematic reviews) or Level II (randomized controlled trials) evidence exists for the effectiveness of falls prevention strategies in CCRC settings. This study can advance researchers' understanding of falls prevention strategy implementation, especially the facilitators and barriers of exercise among high-functioning older adults in CCRCs.

1.5 CONTINUING CARE RETIREMENT COMMUNITIES

The CDC (2013c) defined aging in place as the ability to live in one's own home and community safely, independently, and comfortably, regardless of age, income, or ability level. CCRCs provide opportunities for older adults to age in place with a continuum of care provided by or within one community. CCRCs also offer healthy older adults independent housing units, social services, dining services, and healthcare when, and if, the course of aging raises the need. The Ziegler National CCRC Listing and Profile (Ziegler Capital Markets, 2009) identified 1,861 CCRCs in the U.S. that provide multi-levels of care on a single campus. Over 80% of CCRCs in the U.S. are not-for-profit, and there are 189 CCRCs in Pennsylvania.

Older adults who choose to reside in a CCRC will contract in advance for a life-long commitment from the CCRC to care for them in the event of increased needs in the future. Residents who begin to need assistance with activities of daily living (e.g., bathing or dressing) may be transferred to assisted living or skilled nursing facilities on the premises. Aging in place enables residents to maintain relationships and transition to various levels of care, when appropriate, without migration from the community. Individuals who choose CCRC contracts differ from older adults who reside in traditional assisted living facilities because there is no contract of this nature; assisted living residents pay for such services upon entry.

Due to the contractual nature of CCRCs, 38 states have CCRC-specific regulations that are overseen by a variety of state departments (GAO, 2010). Some states oversee CCRCs through departments that concentrate on insurance, financial services, or banking. Other states regulate CCRCs through departments of social services, aging and elder services, or community affairs. In Pennsylvania, CCRCs are licensed by the State of Pennsylvania Insurance Department. Asbury Heights is one of 18 licensed CCRCs in Allegheny County, PA.

2.0 LITERATURE REVIEW

2.1 INTRODUCTION

The risk for falling increases with age; thus, adults over age 65 have the highest risk of fall-related death and serious injuries (WHO, 2007). In Pennsylvania, the average age for a fall death was about 75 years (the median is 80), and approximately 78.0% of these fall deaths occurred to individuals who were 65 years old or older (PDH, 2007). During older age, both genders are at high risk for falling. Falls are more common among older women, but older men are more likely to die from falls (Stevens, Corso, Finkelstein, & Miller, 2006).

Major personal risk factors for falls consist of a variety of physical (e.g., visual impairments), psychological (e.g., dementia), and functional changes (e.g., muscle weakness) that occur in older adults (Friedman, Munoz, West, Rubin, & Fried, 2002). Falls are also influenced by individuals' surrounding environments, both inside and outside of their homes (Rubenstein, 2006). Most falls are associated with one or more identifiable risk factors (e.g., weakness, unsteady gait, confusion, and certain medications; Masud & Morris, 2001).

The etiology of falls is discussed in this chapter, including a review of the most common risk factors and consequences of falls and an examination of interventions for evidence-based falls prevention. Finally, the variables of this study will be introduced with a brief overview of CCRCs.

2.2 FALLS

2.2.1 Defining Falls

Researchers have various definitions and classifications of falls, which makes it difficult to compare studies. For instance, Buchner et al. (1993) and Cesari et al. (2002) considered only falls that resulted in contact with the ground, but Tideiksaar (2002) included falls when a person "comes to rest on the ground or another lower level such as a chair, toilet or bed" (p. 15). Some researchers classified falls as unintentional occurrences, but Tideiksaar described falls as incidences that may be either inadvertent or intentional (The prevention of falls in later life, 1987; Lach et al., 1991). Other definitions were broad and counted falls as the "…position of no longer being supported by both feet, accompanied by (partial or full) contact with the ground or floor" (Means, Rodell, O'Sullivan, & Cranford, 1996, p. 1032), and researchers from the Kellogg Group (The prevention of falls in later life, 1987) specified that falls were those "…other than as a consequence of the following: Sustaining a violent blow, Loss of consciousness, Sudden onset of paralysis, as in a stroke, An epileptic seizure" (p. 4). Further, researchers may have also classified falls as injurious or non-injurious. For the purposes of this study, which does not involve an examination of falls incidence at Asbury Heights, there will not be an operational definition for falls.

2.2.2 Incidence of Falls

Research findings about the annual occurrence of falls varied significantly because of inconsistent research methodologies, definitions of falls, and populations studied. Participants'

poor memory recalls also influenced the inconsistencies in reporting. Cummings, Nevitt, and Kidd (1988) found that retrospective studies (studies that are used to look backwards and examine exposures to suspected risk) underestimate the incidence of falls by 13.0%–32.0%, when compared to prospective studies (studies that are used to watch for outcomes). Outcomes of prospective studies may vary because of the data collection methodology. In a study by Fujimoto et al. (2000), incidences varied significantly in three groups of similar older men. Out of three groups, data were collected monthly for one group, every three months for the second group, and annually for the third group. The self-reported falls (postal questionnaire, followed by a phone call) were 20.5%, 15.9% and 6.4%, respectively.

After reviewing a large sample of rigorous population studies, Masud and Morris (2001) reported that the annual incidence of falls among community-dwellers was 28.0% to 35.0% for individuals aged 65 or older, and 32.0% to 42.0% for individuals aged 75 or older. Results of a study about falls among the Medicare population estimated that falls reported in 2002 ranged from 3.7 million (single fall) to 3.1 million (recurrent falls), with an estimated 2.2 million people having a medically injurious fall (Shumway-Cook et al., 2009).

Every 11 minutes, an older adult Pennsylvanian is hospitalized for a fall-related injury (PDH, 2007). In 2005, state-wide Pennsylvania hospitals reported a total of 62,826 hospital discharges for fall-related injuries (age-adjusted rate 420.9 per 100,000 persons). The mean age of all cases was slightly more than 70 years (PDH, 2007). According to the 2006 Pennsylvania Behavioral Risk Factor Surveillance Services (BRFSS) survey, 15.0% of respondents over age 45 indicated that they had fallen in the past three months (PDH, 2007).

2.2.3 Cost of Falls

The economic burden of falls among older adults is on the rise, for both direct and indirect costs. Direct costs include the out-of-pocket expenses for the patient and the insurance provider. Direct costs cover medication, medical equipment, fall-related home modifications, insurance processing, acute and long-term care, and rehabilitation (Englander, Hodson, & Terregrossa, 1996). The indirect costs include lost productivity of individuals or caregivers, and lost income (Parrott, 2000).

In 2000, for non-fatal falls, the total direct medical costs of all fall injuries for Americans age 65 and older totaled about $19 billion (Stevens et al., 2006). By 2020, the annual direct and indirect cost of fall injuries is expected to reach $54.9 billion (CDC, 2013a). According to Carroll, Slattum, & Cox (2005),

> Inpatient hospitalizations [for falls-related conditions] accounted for 65% of total costs, followed by office-based medical visits and home health care, each accounting for about 10% of total direct medical costs, and hospital outpatient visits for 7.6%. About 78% of fall-related costs were reimbursed by Medicare (p. 307).

Among Pennsylvanians hospitalized for fall-related injuries in 2005, the average length of stay was five and a half days; however, the longest hospital stay was 446 days. The most common length of stay was three days (PDH, 2007). Total charges associated with these Pennsylvania hospitalizations amounted to over $2.19 billion, and government sources paid for about 80.0% of these charges, totaling more than $1.78 million.

In a study by Shumway-Cook et al. (2009), Medicare beneficiaries were divided into three fall status categories (no falls, one fall, and two or more falls). Compared with older adults who reported no falls, total aggregate healthcare costs were $2,000 (29.0%) higher in older

adults who reported one fall and $5,600 (79.0%) higher among individuals who reported recurrent falls (Shumway-Cook et al., 2009). The percentage of total costs by healthcare category was similar across the three fall status categories with a range of 3.0% to 5.0% of healthcare dollars being spent on home health, 30.0% to 36.0% being spent on inpatient care, 30.0% to 36.0% being spent on provider costs, 11.0% to 13.0% being spent on outpatient costs, and 17.0% to 19.0% being spent on medications (Shumway-Cook et al., 2009). For beneficiaries reporting medically injurious falls, compared with individuals who had non-medically injurious falls, the total healthcare costs were 44.0% higher (Shumway-Cook et al., 2009). Comparing individuals who had medically injurious falls to individuals who had non-injurious falls, the proportion of total healthcare costs devoted to inpatient care was 39.0% and 32.0%, respectively (Shumway-Cook et al., 2009).

2.3 FALLS RISK FACTORS

Biological, behavioral, and environmental risk factors place some older adults at greater risk for falls and fall-related injuries (Friedman et al., 2002). Most risk factors are identifiable, some are preventable, and, if addressed, can minimize the impacts of falls. Scott, Dukeshire, Gallagher, and Scanlan (2001) concluded that "evidence is lacking as to what degree any particular risk factor must be reduced to produce a change in falls or fall-related injuries, the impact of reducing two or more risk factors simultaneously, and the interplay among risk factors in producing falls" (p. 8). To provide a broader understanding of falls, this section will include some of the more common risk factors of falls, many of which are addressed by falls risk

assessments and interventions. However, the variables of interest within this study were gender, balance, gait, depression, and FoF.

2.3.1 Biological Factors

2.3.1.1 Gender. Compared to men, women are more likely to fall and sustain a fracture during a fall (Stevens et al., 2006). In the US, women make up 70.5% of the total cases of older adults who visit hospitals' emergency departments and 81.0% of the hospitalizations for unintentional fall-related injuries (Stevens & Sogolow, 2005). In a nationally representative sample of emergency department visits from January 2001–December 2001, older women sustained fall-related injury rates 40.0% to 60.0% higher than men did of comparable ages. Diagnoses were mostly fractures, which occurred at a rate 2.2 times higher for women than they did for men (Stevens & Sogolow, 2005). Factors that may contribute to women having higher rates of fall-related injuries include lower levels of physical activity (American Geriatrics Society, British Geriatrics Society, & American Academy of Orthopaedic Surgeons Panel on Falls Prevention, 2001), loss of bone density (Melton, Chrischilles, Cooper, Lane, & Riggs, 1992), frequent use of multiple medications, and being single (Kalache & Ebrahim, 1996). In 2005, the rate of fall hospitalizations in Pennsylvania for females was 1.6 times that of males (618.9 vs. 384.6 per 100,000 persons; PDH, 2007).

Though older women and men may have different outcomes after falling, men are slightly more likely to die as a result of a fall. In 2010, the death rate due to unintentional falls for men over age 65 was 56.66 per 100,000, and the death rate for women of the same age and of the same cause was 51.57 per 100,000 (Web–based Injury Statistics Query and Reporting System [WISQARS™], 2013). Rates of fall-related traumatic brain injuries (TBI) are also

slightly higher in males than they are in females (Thomas, Stevens, Sarmiento, & Wald, 2008). The rates for fall-related TBI hospitalizations were 146.3 per 100,000 among men over age 65 and 158.3 per 100,000 for women over age 65.

2.3.1.2 Musculoskeletal Conditions. De-conditioning and co-morbidities are common conditions in elders and may lead to natural weakening of the muscles, loss of muscle tone, and joint disorders (e.g., arthritis; Blake et al., 1988; Liao et al., 2012). These changes may slow an individual's reaction times during a fall after the brain senses a fall is happening. Another musculoskeletal condition of aging is osteoporosis (Muraki, 2013). Regular physical activity has been known to offset such changes (Cress et al., 2005).

The CDC has projected that 67 million Americans (almost 25.0% of the adult population) will suffer from arthritis by 2030 (Cheng, Hootman, Murphy, Langmaid, & Helmick, 2010). Generally, osteoporosis affects people over age 65, and it is more prevalent in women than it is in men. Osteoporosis may account for the difference between a fall that is uneventful and a fall that ends in fracture and permanent disability. According to the National Osteoporosis Foundation (n.d.), studies have shown that approximately one in two women and up to one in four men age 50 and older will experience an osteoporotic fracture.

2.3.1.3 Strength, Balance, and Gait. All body movements, simple or complicated, are a result of the integrated action of muscles making appropriate movements at the joints. Muscles are also responsible for posture, and they provide support for our bones and joints. During the aging process, older adults experience reduction of muscle strength in both upper and lower limbs, and changes in flexibility, agility, and endurance (Milanović et al., 2013; Tinetti, Speechley, & Ginter, 1988).

Balance and gait (the way a person walks) are influenced by muscle strength and flexibility of joints; therefore, poor balance and poor gait are common conditions among older adults and have been linked to falls in many studies (Delbaere et al., 2012; Hausdorff, Rios, & Edelberg, 2001; Robinovitch et al., 2013; Spink, Menz, & Lord, 2008). Balance and gait problems are common among individuals who have experienced stroke, which at times, make movement and coordination difficult, due to numbness and weakness (Lewek, Bradley, Wutzke, & Zinder, 2013). Common co-morbidities that are associated with balance and gait are foot ailments and postural hypotension.

Foot ailments are a co-morbidity related to poor balance, falls, and FoF among older adults (Blake et al., 1988; Harada, Oka, Shibata, Kaburagi, & Nakamura, 2010). As humans age, the feet are more prone to problems. The bones and joints change their shape and may become deformed. For instance, feet tend to spread and lose the fatty, shock-absorbent cushion underneath, and the skin becomes drier and thinner (Jerlin, n.d.). Due to loss of pain and touch sensation, damage to the feet can often go unnoticed. Severe damage to nerves (i.e., peripheral neuropathy) stops the feet from working properly and disturbs balance and postural awareness. Thus, the risk of a fall is increased (Tamaoka, 2013). In one study of over 10,581 Japanese community-dwelling elders, Harada et al. (2010) found that 46.0% of males and 39.0% of females reported at least one foot problem. Among the self-reported foot problems, specifically tinea pedis, skin problems, nail pain, and functional impairment were significantly associated with falling within the past year. In healthy older adults, foot pain, especially from plantar fasciitis, increased risk for falling (Chaiwanichsiri, Janchai, & Tantisiriwat, 2009). Also, older adults commonly wear footwear that is likely to increase their risk of falls, such as slippers or moccasins (Jessup, 2007). To illustrate, Sherrington and Menz (2003) found that

among 95 patients who had suffered a hip fracture, the majority of participants (75.0%) wore shoes with at least one theoretically suboptimal feature, such as absent fixation (63.0%), excessively flexible heel counters (43.0%), and excessively flexible soles (43.0%), all features that negatively influence balance.

Another factor related to poor balance and increased falls risk is postural (or orthostatic) hypotension, which is the sudden fall in blood pressure that occurs when quickly changing position (e.g., lying down to standing, or sitting to standing; Azidah, Hasniza, & Zunaina, 2012). In a study of 91 fallers, Gray-Miceli, Ratcliffe, Liu, Wantland, and Johnson (2012) reported that, among fallers who were found to also have postural hypotension, none reported dizziness prior to falling, but half reported loss of balance. Postural hypotension is also a frequent feature of Parkinson's Disease (PD), which is a known predictor for falls (Murphy & Isaacs, 1982; Perez-Loret et al., 2012). PD is a slowly progressive disorder of the nervous system that affects parts of the brain that are instrumental for posture and balance and compromises abilities such as walking, writing, and talking (Kataoka, 2011). PD often develops after the age of 50; symptoms usually start on one side of the body and include tremors in hands, arms and feet; rigidity of muscles (experienced as stiffness); and slowness of movements (Conradsson, Löfgren, Ståhle, Hagströmer, & Franzén, 2012).

Lastly, the respiratory system loses efficiency during aging, which affects oxygen exchange. These changes are indicated by shortness of breath and fatigue, leading to anxiety and reduction in activities of daily living (ADLs; Graf, 2006). Balance and gait may be impacted by fatigue and decreased stamina, increasing the risk of falling (Cress et al., 2005).

2.3.1.4 Visual Impairment. Visual impairment is a common problem among older adults. A report by National Eye Institute (NEI; 2002) stated that the leading causes of vision impairment

and blindness in the US are primarily age-related eye diseases. Cataracts affect nearly 20.5 million Americans aged 65 and older. Approximately, 2.2 million Americans have been diagnosed with glaucoma, and another two million do not know they have it. More than 1.6 million Americans over age 60 have advanced macular degeneration. Further, dry eyes, presbyopia (progressively diminished ability to focus on near objects), and blepharitis (chronic inflammation of the eyelid) cause considerable morbidity.

Poor vision has been recognized as a potential age-related risk factor for hip fractures. In the Blue Mountain Eye Study (Australia), Ivers et al. (2003) found a strong association between poor vision and hip fractures occurring within two years of an eye examination. Impaired visual acuity, visual field loss, and posterior subcapsular cataract were all statistically and significantly associated with an increase of hip fracture. These associations were found to be stronger for older adults aged 75 and older.

2.3.1.5 Dementia. Severe dementia has been shown to significantly predict one or more falls among older adults living with the condition (Sylliaas, Selbæk, & Bergland, 2012). Dementia is one of the most common and serious disorders later in the lives of many, which results in a decline in memory and other cognitive functions and ultimately leads to a loss of independent function. Approximately 75.0% of individuals with dementia have Alzheimer's Disease (AD). Vascular dementia and Parkinson's Disease, with or without concomitant Alzheimer's Disease, are responsible for much of the remainder of pathologically confirmed causes of dementia (Morris, 1994).

Plassman et al. (2007) conducted the Aging, Demographics, and Memory Study (ADAMS) and estimated a total of 3.8 million individuals with dementia and just over 2.5 million with Alzheimer's Disease in the US. For older adults who live with dementia, the

estimated financial cost per person that was attributable to dementia care ranged between $41,689 and $56,290, depending on the method used to value informal care (Hurd, Martorell, Delavande, Mullen, & Langa, 2013). Hurd et al. (2013) further suggested that, in the US, the total financial cost of dementia in 2010 was between $157 billion and $215 billion.

For victims of fall-related hip fractures, an Australian study estimated that between 24.0% and 29.0% of them have been diagnosed with dementia (Scandol, Toson, & Close, 2013). Even among older adults who are not diagnosed with dementia, Delbaere et al. (2012) reported that individuals with mild cognitive impairment are at increased risk for injurious or multiple falls. In a study of 21,587 Minnesota nursing home residents, falls risks among cognitively impaired elders was examined, and Nazir, Mueller, Perkins, & Arling (2012) concluded,

> Compared with residents with normal or mild CI, the likelihood of a new fall was significantly higher among residents with moderate CI (OR = 1.43). The risk decreased slightly (OR = 1.34) for residents with more advanced CI, whereas the presence of severe CI was not significantly associated with new falls. (p. 819e1)

2.3.1.6 Depression. The emotional health of older adults is closely related to their health status and falls risk. Physical activity has been shown to reduce depression symptoms and self-reported pain of older adults (Quijano et al., 2007). Also, previous falls (or near falls) may have a psychological impact on older adults, often inducing a FoF. Emotional or mental disorders associated with falls include depression and anxiety (Campbell, Reinken, Allan, & Martinez, 1981; Stalenhoef, Diederiks, Knottnerus, Kester, & Crebolder, 2002). These conditions often lead to poor sleep patterns, loss of energy, unexplained aches and pains, poor concentration, social withdrawal, and/or substance abuse.

According to the U.S. Surgeon General (1999), depression is not a normal part of aging. The estimate of older adults who live with major depression in the community ranges from less than 1.0% to about 5.0% but rises to 13.5% in individuals who require home healthcare and rise again to 11.5% for older adults who are hospital patients. Older adults with untreated depression are likely to also suffer from co-morbidities (Depression and Bipolar Support Alliance, 2006). Prognoses for other diseases (e.g., heart disease, cancer, Parkinson's, and diabetes) tend to improve upon treating co-existing depression. Women are almost twice as likely as men to experience depression. One in eight women will experience clinical depression in her lifetime (National Alliance on Mental Illness, 2009). Women are 70% more likely than men are to experience depression during their lifetime (Kessler et al., 2003).

2.3.1.7 FoF. Tinetti, Richman, and Powell (1990) defined FoF as a lack of self-efficacy (also known as falls-efficacy) that one may avoid falls while doing everyday activities. Approximately 30.0% of people who have FoF have no recent history of falls, but for community-dwelling elders who report falling within the past year, the FoF rate almost doubled (Evitt & Quigley, 2004). FoF may lead to excessive avoidance of ADLs and recreation. Excessive FoF and inactivity can lead to physical dysfunction, resulting in loss of strength and increased falls risk (Cumming, Salkeld, Thomas, & Szonyi, 2000).

2.3.2 Behavioral Factors

2.3.2.1 Lack of Exercise. Older adults who are more physically active are better able to counter some effects of the aging process. Physical inactivity, another personal risk factor associated with falls among older adults, is highest among older age groups and increases with age. More

specifically, physical inactivity rates vary from 30.4% for individuals 18–24 years old, to 48.0% for adults 65–74 years old, and to 61.3% for individuals 75 years old and older (U. S. Department of Health and Human Services [HHS], 2002). Cress et al. (2005) showed that multi-dimensional physical activity improves aerobic capacity, strength, and balance.

In a study of 6,109 men and women ages 45 to 74, Davis et al. (1994) reported that men are more physically active than women. A 1993–1995 study of 2,025 California residents showed that men had greater lower body strength (Oman, Reed, & Ferrara, 1999). Muscle weakness and loss of lower body strength in older adults, often caused by inactivity, is a well-known risk factor for falling (Stevens & Sogolow, 2005).

2.3.2.2 Nutrition. Good nutrition feeds the mind and nourishes the body; therefore, nutrition must be monitored closely as metabolism changes during aging. Poor nutrition and shortages of vitamins and specific nutrients in the body can contribute to obesity, fatigue, delirium, osteoporosis, other physical burdens, and, ultimately, falls (Ponce, 2012).

Metabolism rates also slow down as people age, causing food to be absorbed and utilized less and causing poor metabolism of drugs. Adverse effects of these changes in the endocrine system include reduced stamina and susceptibility to drug toxicity (Evans, 2011). These effects increase risk of falls in older adults.

2.3.2.3 Polypharmacology. Medication toxic effects and drug-related problems can have profound medical and safety consequences for older adults and can economically affect the healthcare system (Fick et al., 2003). These consequences are compounded by the common changes that occur with age, the prevalence of multiple chronic diseases requiring multiple medications, and the lack of geriatric expertise in ambulatory care (Bushardt, Massey, Simpson,

Ariail, & Simpson, 2008). To illustrate, older adults make up 13.0% of the American population, yet they consume an average of 30.0% of all prescription drugs (Williams, 2002). The Center for Behavioral Health Statistics and Quality (2012) reported that "[i]n 2009, more than one half million drug-related emergency department (ED) visits made by adults aged 50 or older resulted in hospitalization. The majority of these visits (71 percent) involved adverse reactions to pharmaceuticals" (para. 1). In the US, about 40.0% of older adults who are community-dwellers taking prescription medications experience ADEs, and similar results were reported in nursing homes (Auerbach, 1999).

Older adults' adverse reactions to medications may result from factors such as polypharmacy, drug interactions, medication non-adherence, and/or sensitivity to medications (due to age and/or disease; Hanlon, 2003; Williams, 2002. Consequently, ADEs increase the risk of geriatric syndromes (e.g., cognitive impairment, falls/hip fractures, and urinary incontinence) and diminished functional status (Hanlon, 2003). According to the American Geriatrics Society, British Geriatrics Society, and American Academy of Orthopaedic Surgeons Panel on Falls Prevention (2001), there is a consistent association between psychotropic medication use (i.e., neuroleptics, benzodiazepines, and antidepressants) and falls in all settings (i.e., community, long-term care, hospital, and rehabilitation). Furthermore, the following have been associated with an increased risk of falling in older adult patients: tricyclic antidepressants, other heterocyclic antidepressants, combinations of polypharmacy (four or more prescription medications), the initiation of a new drug treatment in the previous two weeks, and consuming a variety of medications (Fuller, 2000).

2.3.2.4 Medication and Alcohol Misuse. Any use of alcohol by older adults can also increase the risk of falls. Alcoholic drinks impair judgment, slow reaction time, relax inhibitions, and

impair motor coordination, any or all of which may lead to a fall. According to the National Institute on Alcohol Abuse and Alcoholism (NIAAA; 1998), approximately 90.0% of older adults are using medications (prescription or over-the-counter); thus, consuming alcohol may induce adverse drug–alcohol interactions in older adults. Content levels of body water decrease with age, so small amounts of alcohol can result in higher blood alcohol levels in older adults. In one American study conducted over three years, half of 7,772 trauma patients who were 65 years old or older tested positive for alcohol in their bloodstream; of the patients who tested positive for alcohol in their bloodstream, 50.0% were involved in a fall (Division of Aging and Seniors—Health Canada, 2002).

Drug abuse may not be associated with older adults very often; however, statisticians are seeing a rise in drug abuse, primarily among people age 50 and above (Substance Abuse & Mental Health Services Administration [SAMHSA], 2010). In fact, approximately 4.7% of adults age 50 or older had used an illicit drug in the past year, based on data from 2006 to 2008. Though the overall illicit drug use rate was lower among adults age 65 or older, nonmedical use of prescription-type drugs was more common among older adults than marijuana use, which is more common for older adults ages 50–54 (.8% versus .4%; SAMHSA, 2010).

2.3.3 Environmental Factors

2.3.3.1 Risks at home. Many older adults want to remain living in their homes for as long as possible (Fausset et al., 2011); however, a large majority of falls take place in older adults' homes rather than away from their residences (Stevens et al., 2005). Because of their desire to stay in their homes, environmental risk factors in homes significantly contribute to falls and fall-related injuries. Hazards that may lead to or contribute to falls are common in homes of older

adults (Gill, Williams, & Tinetti, 2000). One study showed that 80.0% of the homes investigated had at least one hazard, and 39.0% had five or more hazards (Carter, Campbell, Sanson-Fisher, & Gillespie, 2000).

The three biggest problem areas for older adults are outside steps to an entrance, inside stairs to another level, and unsafe bathrooms. Stevens et al. (2005) reported that some of the most common environmental factors affecting the risk of falling for older adults include poor or inadequate lighting; changes in floor surfaces or slippery surfaces (e.g., wet or polished floors and nonslip-resistant bathtub surfaces); high-gloss floors and/or walking surfaces; problems associated with stairs (e.g., lack of handrails); inappropriate chair or cabinet heights; clutter, storage problems, and tripping hazards, such as furniture or throw rugs; poor sidewalk and pavement conditions; and pets and pet-related objects. Such environmental risk factors are more likely to exist in older adults' homes because they may live in older homes, and their diminished capacities make activities of daily living, such as climbing stairs and bathing, difficult.

2.3.3.2 Outdoor risks. Increased susceptibility to falls was found more evident with outdoor environmental risks and increasing age (Li et al., 2006; Rubenstein, 2006). Falls, trips, and slips that occur in public places are often due to poor conditions of road surfaces, footpaths, and steps. The majority of fallers reported their accidents were caused by tripping or slipping on objects or uneven surfaces in these types of locations. Additionally, inadequate lighting and abrupt elevation changes, such as curbs or dents in footpaths can lead to falls (Parker, Twemlow, & Pryor, 1996). Weather also plays a role in outdoor falls (Jacobsen, Sargent, Atkinson, O'Fallon, & Melton, 1995). Ice and snow are common weather-related risk factors documented in studies (Parker et al., 1996). Jacobsen et al. (1995) reported that women 75 years old and older fall more

on days of freezing rain and snow than they do on days of better weather, 60.0% and 22.0%, respectively.

2.4 HEALTH CONSEQUENCES OF FALLS

2.4.1 Physical Injuries and Death

Unintentional falls are the leading cause of unintentional injury deaths in the US among people age 65 and older (CDC, 2013a). Between 2001 and 2005, a total of 4,408 Pennsylvanians died as a result of fall-related injuries (age-adjusted rate 5.9 per 100,000). Moreover, the rate of fall deaths increased every year from 2001 to 2004 but showed a slight decrease in 2005 (PDH, 2007). Similar to the US, falls are the leading cause of injury death for older adults who live in Pennsylvania, averaging three deaths every day (PDH, 2007).

Fatalities may still arise, even when falls do not immediately result in injury (classified as "non-injurious falls"). Non-injurious falls may occur if fallen older adults cannot get up and cannot summon help. Lying on the floor for an extended period of time may lead to pressure sores, dehydration, hypothermia, and death. According to Skelton and Todd (2004), almost 50.0% of older adults require help to get up after at least one fall, but only 10.0% of falls result in lying down for more than an hour. These occurrences of lying down too long after falling may be reduced with improved balance, gait, and strength.

Injurious falls are defined as falls resulting in injuries that require medical attention (Ray et al., 1997). Some common injuries among older adults who fall are hip fractures, head injuries, shoulder injuries, soft-tissue injuries and bruises, and sprains and strains (Alexander, Rivara, &

Wolf, 1992; Evitt & Quigley, 2004). Research conducted by Cassel and Lee (2000) showed that fractures were by far the most common primary injury observed (66.0%), followed by open wounds (10.0%), traumatic complications (6.1%), bruises/hematomas (5.3%), and intra-cranial injuries, not including skull fractures (3.0%). A lower extremity was the most frequently injured body site (47.4%), followed by an upper extremity (19.3%), trunk (15.9%), and head/face (13.0%). Fractures most often occurred to the lower extremity (58.1%, predominantly neck of femur and ankle) followed by the upper extremity (22.0%, mostly radius, ulna, and humerus), and trunk (18.0%, mostly involving the chest, abdomen/pelvis, and spine/back). For older adults in Pennsylvania, fractures were the leading principal diagnosis category for fall hospitalizations (53.4%), and hip fractures accounted for 20.9% of the primary diagnoses after falling (PDH, 2007).

2.4.2 Psychological and Social Effects

Falling may result in significant morbidity, disability, and mortality for older adults. However, most falls do not result in physical injury (Curtin, 2005). Most non-injurious falls (75.0%–80.0%) are never reported to health professionals (Skelton & Todd, 2004). Though many falls do not produce injuries, non-injurious falls have been associated with personal and social consequences. For instance, loss of self-confidence, depression, social withdrawal, confusion, and loneliness can occur, even when there are no injuries (Tinetti et al., 1990; Skelton & Todd, 2004).

2.5 EFFECTIVE FALLS PREVENTION STRATEGIES

Several single risk factor strategies are commonly implemented in efforts to prevent falls and fall-related injuries among older adults, many of which are limited in their applicability due to their single focus. Generally, these single factor strategies center on either exercise (e.g., Tai Chi or chair aerobics) or home modifications (e.g., grab bars or hand rails).

As shown, falls often result from a complex multitude of factors, so strategies that address a number of factors simultaneously are more suitable and effective. The researcher will explore more effective multi-factorial interventions and their applicability to community-dwelling groups and institutionalized populations. The following section shows information that may help practitioners develop prevention programs for evidence-based falls modeled after best practices.

2.5.1 Exercise-Based Strategies

Physical fitness (e.g., adequate strength, power, flexibility, balance, and endurance) is instrumental for older adults to stay mobile and adequately perform ADLs (Skelton, 2001). Musculoskeletal conditions, such as arthritis and osteoporosis, are associated with hip and spinal fractures, and proper exercise can be a protective factor that can reduce disability and pain from those ailments (Jenkins, 2003). Not all older adults suffer from the numerous musculoskeletal risk factors mentioned previously; nonetheless, simply and modestly increasing physical activities among more mobile elders can improve overall health and stamina, prevent disease and disability, reduce the risk of stroke, and reduce healthcare costs for our nation (Carbonell, 2003; Carlson et al., 1999). Scott et al. (2001) insisted that it is reasonable to expect that exercises

designed to prevent, reduce, or reverse the adverse physical effects of the aging process (e.g., reduced strength, poor balance, increased body sway, and weakened skeletal structure) may be effective for preventing falls. Carlson et al. (1999) found that older women who spent fewer than four hours a day on their feet had double the rate of hip fractures, compared to older women who were on their feet for four or more hours.

Physical activity offers a great opportunity to extend independent life, reduce disability, and improve the quality of life for older adults (HHS, 1996). Physical activity may also decrease people's FoF and ease depressed moods (Division of Aging and Seniors—Health Canada, 2002); Tinetti et al., 1990). Cress et al. (2005) reviewed physical activity programming for older adults from major organizations and institutions and identified key features of physical activity programs:

- Multi-dimensional activities are optimal for health and functional benefits: endurance (e.g., biking, swimming, and walking), strength (e.g., weights or elastic bands, at a level that requires some physical effort), balance (e.g., Tai Chi), and flexibility training (e.g., stretching).
- Changing principles of behavior enhances adherence: social support (e.g., from family and friends), self-efficacy (e.g., perceived control), active choices (e.g., group activities vs. individual, and choice of location), health contracts, assurances of safety (e.g., educating participants about physical activity risks), and positive reinforcement (i.e., incentives, rewards, and public recognition).
- Managing risk should be the goal for older adults by beginning at low intensity and gradually increasing to moderate physical activity, which has a better risk:benefit ratio.

- Monitoring aerobic intensity is important for ensuring that older adults make progress and stay motivated.

Evidence has suggested that physical activity can reduce falls among older adults (Scott el al., 2001). The consensus in the literature is that exercise effectively maintains and improves strength, endurance, balance, and gait. However, the authors of these sources do not agree on which exercise(s) are more likely to improve older adults' quality of life, regarding intensity, frequency, and duration and for which types of complications (Cress et al., 2005; Latham, Bennett, Stretton, & Anderson, 2004).

Researchers have presented a variety of types of exercises, levels of intensity, and populations targeted. Thus, not one particular exercise program is recommended over another. Some effective exercise interventions measure falls as the outcome, so some recommendations are further complicated, and others measure outcomes that are indirectly associated with falls (e.g., balance, FoF, knee strength, and body sway; Campbell, Robertson, Gardner, Norton, & Buchner, 1999; Carter et al., 2002; Cerny et al., 1998; Li, Fisher, Harmer, McAuley, 2005; Robertson, Campbell, Gardner, & Devlin, 2002).

Additionally, awareness of potential adverse effects of exercise programs (e.g., injuries while exercising) is necessary to ensure effectiveness. For example, in an exercise intervention by Ebrahim, Thompson, Baskaran, and Evans (1997), the intervention group had significantly more falls than did the control group. Some literature also concluded that the effects of exercise strategies are often short lived without consideration for enhancing compliance over the long term (Scott et al., 2001).

2.5.2 Home Modification Strategies

Environmental hazards are involved in many falls, and, as noted above, most falls occur in and around the home. Reviewing hazards and modifying them appropriately is important in falls prevention. Randomized controlled experiments have demonstrated mixed results, such as one evaluated in the systematic review by the Cornell Institute for Translational Research on Aging (CITRA; 2005), which involved assessing and modifying home hazards as a single strategy. Some interventions demonstrated the likelihood of reducing the amounts of falls among older adults, but others did not. Evidence has further suggested that including home modification as part of a prevention program for multi-factorial falls is certainly an effective strategy for reducing falls among older adults (Scott et al., 2001).

Generally, occupational therapists are qualified to identify hazards, recommend modifications, and examine interactions among individuals, their own environment, and activity demands. Occupational therapists usually incorporate behavioral advice and practice into their home assessments, which Hill and Schwarz (2004) suggest could account for the success of this intervention both at home and in other settings. This suggestion contrasts with studies that show that home assessments by professionals from other disciplines (such as nurses) have not effectively reduced the amount of falls among older adults.

Some studies have indicated that simple provision of oral/written feedback, pamphlets about home safety, and advice may be insufficient for reducing falls in the home (Gillespie, Gillespie, Robertson, Lamb, Cumming, & Rowe, 2003; Hogan et al., 2001; Lightbody, Watkins, Leathley, Sharma, & Lye, 2002). Some researchers have suggested that modifying home hazards and assisting financially and/or manually with renovations may be important for successfully modifying home hazards (CITRA, 2005; Division of Aging and Seniors—Health

Canada, 2002; Hornbrook, Stevens, Wingfield, Hollis, Greenlick, & Ory, 1994; Nikolaus & Bach, 2003).

2.5.3 Medication Review

Medication review can be important in reducing the risks of falls for older adults. If physicians review older adults' medicines, they may realize a need to adjust, reduce, or eliminate the use of some medications. Relevant literature has revealed two different perspectives on behavioral change pertaining to medication use, which are a) reducing or eliminating the use of medication associated with an increased risk of falling, such as psychotropic medication, and b) advocating use of certain medications to reduce the risk of falling or of sustaining a fall-related injury. Necessary behavioral changes could include targeting individuals who could benefit from the use of medication to strengthen muscles or bones (Scott et al., 2001).

The class of drugs thought to increase falling risks is benzodiazepines, including sedatives and psychotropic drugs (Division of Aging and Seniors—Health Canada, 2002; Hill and Schwarz, 2004; Scott et al., 2001). Older adults' use of these medications impairs cognitive performance and psychomotor skills; literature has failed to address whether these side effects and/or depression could be the primary cause of the increased risk of falling for older adults. However, according to the systematic review by Hill and Schwarz (2004), few studies have been conducted that demonstrate a reduction in falls or fall-related injuries when older adults stop taking these benzodiazepine drugs. Researchers seem to support withdrawing psychotopic drugs as a means to reduce the amount of falls, but information about the practical application of this strategy is lacking. This lack of information may be a result of when older adults do not adhere to changes in drug regimes. To enhance older adults' medication adherence, clinicians may need

to explore alternative treatments for anxiety and sleep disorders associated with withdrawal from previously prescribed medications (Scott et al., 2001); some options could be aromatherapy, herbal teas, or massages.

Scott et al. (2001) reported that some medications may improve physical functioning to reduce the amount of falls; however, their study revealed that hormone replacements (to enhance muscle strength and improve balance) failed to produce a change in falls. Scott et al. (2001) also reported that taking vitamin D (which aids in the absorption of calcium) and biphosphonate alendronate (which increases bone density) has been shown to reduce the risk of sustaining fractures among women. However, studies found did not include any that targeted community-dwelling older adults in which researchers were able to establish a link between fall-related injuries as an outcome and the use of medications to enhance bone density (Scott et al., 2001).

In a systematic review conducted by CITRA (2005), studies suggested that combining vitamin D and calcium are effective in preventing falls because taking these medications together increases calcium absorption. For frail older adults, neither calcium supplementations alone nor a single dose of 300,000 IU of vitamin D combined with 10 weeks of rigorous exercise were as protective against falls as were calcium and vitamin D combined. Evidence fails to support that "medication review only" as a single strategy is effective at significantly reducing falls and fall-related injuries in older adults. On the other hand, it has been widely respected as an effective component of multi-factorial interventions (Wiens, 2001).

2.5.4 Multi-Factorial Strategies

A number of studies have revealed that multiple strategies directed at a wide range of risk factors are effective in reducing falls and fall-related injuries (Tinetti et al., 1994; Scott et al.,

2001; Hill and Schwarz, 2004; CITRA, 2005). Multi-disciplinary teams of health practitioners trained in detecting and preventing various fall risk factors would be needed to adequately address the myriad of factors that lead to falls among older adults. There is virtually no research about which combination of strategies is most effective in preventing falls and fall-related injuries or on the interplay between multiple risk reduction strategies.

In the CITRA (2005) systematic review of randomized control trials, effective multi-factorial interventions ranged in the number of components included. The most comprehensive experiment reviewed was conducted by Tinetti et al. (1994), in which approximately 300 health maintenance organization (HMO) members aged 70 years or older were assessed for intrinsic and extrinsic fall risk factors. Intrinsic factors studied included medication use, strength, balance, and footwear. Extrinsic factors included lighting, walking surfaces, and problems with bathroom items (such as toilets and tubs). Tinetti et al.'s (1994) multi-factorial intervention included education about drug use and alternatives, skill-building for bathroom usage, environmental modification, and increased exercise. After one year, the intervention group experienced significantly fewer falls than did the control group, and participants in the control group experienced first falls faster than did the intervention group. The intervention group also had fewer injuries and fewer episodes of medical care.

Another effective, but less comprehensive multi-factorial intervention reviewed by CITRA (2005) was conducted by Wagner et al. (1994). Assessments for physical activity, home hazards, alcoholism, prescription usage, hearing, and vision were conducted with approximately 1,500 HMO members aged 65 years or older. The intervention included a two-hour class that tested fitness level during a timed walk, referred participants to alcohol treatment program or educated participants about alcoholism (if necessary), and provided home safety checklists with

information about home inspections. After one year, the intervention group experienced significantly fewer falls than did the controls, but benefits for the intervention group diminished by the second year.

Only one of the reviewed seven randomized controlled multi-factorial interventions by CITRA (2005) was considered ineffective. In this intervention, Shaw et al. (2003) focused on preventing falls among older adults who suffered from cognitive impairment and dementia who presented to an emergency room after a fall. The intervention included a multi-level assessment and intervention for all identifiable risk factors (e.g., depression, environmental conditions, prescriptions, impaired vision, and hearing). CITRA (2005) noted this study as the first randomized controlled trial to include an evaluation of multi-factorial interventions among cognitively impaired older adults. Poor compliance by participants was ruled out as an influence. Effectiveness of individual components has not been examined by most multi-factorial interventions aimed at preventing falls. CITRA (2005) indicated that the design for an intervention yielding this level of detail would be complex because each element of the multifactorial intervention needed to be tested individually (e.g., with its own control group).

One falls prevention study was used to examine *individual* and *combined* effects of a) exercise, b) home modification, and c) referral to a vision specialist. Day, Fildes, Gordon, Fitzharris, Flamer, and Lord (2002) studied 1090 healthy community-dwelling older adults aged 70 years or older and found the most changes when all three interventions were combined, significant changes when older adults exercised only, but no significant changes to the vision component alone or the home hazard component alone. This finding suggests that exercise may be essential for multi-factorial programs. In a meta-analysis of falls interventions by Chang et al. (2004), exercise was found to be the next most effective intervention after multi-factorial

interventions. Exercise was also a component of the multi-factorial interventions examined in CITRA's (2005) systematic reviews.

2.5.4.1 Falls Risk Assessments. Falls risk assessments are used to identify and quantify the many risk factors found to contribute to the risk of falling or sustaining fall-related injuries. Literature has revealed that strategies of these assessments vary widely, including strategies implemented by emergency room nurses and physicians, assessments conducted at health centers, in-home assessments completed by trained personnel, and strategies conducted by untrained volunteers or health visitors; however, most researchers from the reviewed literature agree that individual falls risk profiles are necessary (Baraff, Lee, Kader, & Della Penna, 1999; Division of Aging and Seniors—Health Canada, 2002; Gallagher and Brunt, 1996; Scott et al., 2001; Wagner et al., 1994). A thorough falls risk assessment reviews personal factors, social factors, environmental factors, and medication, which includes, patient health history, current illnesses, current physical conditions, mental status, and sensory deficits (including vision; Rubenstein, Josephson, & Robbins, 1994). Falls risk assessments can be used to progress the development of an effective targeting strategy for a falls prevention program. Physicians or nurses are regarded as the most qualified providers to adequately assess medication risk factors and some personal risk factors, but Senior Safety Specialists are qualified to assess environmental fall risk factors. Scott et al. (2001) found that in multi-factorial interventions, falls risk assessments by nurses or physicians appear to be an effective strategy in reducing falls and fall-related injuries, and that these effects need to be assessed in isolation of other strategies to find its sole value.

Two studies have shown some positive behavior change based on falls risk assessments (Fabacher et al., 1994; Gallagher & Brunt, 1996); however, Scott et al. (2001) concluded these

and other studies (Baraff et al., 1994; Weber, Kehoe, Bakoss, Kiley, Dzigiel, 1996), in which assessments were key components, had insufficient statistical power to detect a change in falls.

2.5.4.2 Education. Although falls prevention education is a critical component of multi-factorial interventions, systematic reviews and reports have shown that education alone does not appear to work as a fall prevention strategy (Division of Aging and Seniors—Health Canada, 2002; Scott et al., 2001). The majority of studies selected as best practices for educational strategies by Scott et al. (2001) also had inadequate statistical power due to small sample sizes (Abreu, Hutchins, Matson, Polizzi, & Seymour, 1998; Alkalay, Alcalay, & Sherry, 1984; Ryan & Spellbring, 1996; Schoenfelder and Van Why, 1997), and were, therefore, unable to detect significant changes in falls. In addition to fall prevention messages, educating older adults about diet, alcohol use, medication use, and other lifestyle behaviors may be effective in reducing the amount of fall risks.

2.5.4.3 Others. Less common single interventions that have also been used in multi-factorial fall prevention programs have included protecting hips, correcting vision, combating footwear and foot problems, and managing syncopal falls and dizziness (Hill and Schwarz, 2004).

2.6 CHAPTER SUMMARY

The literature review above addressed the falls phenomenon among older adults, the most common risk factors for falling, and strategies that are effective at reducing falls risks. Many studies failed to specify an operational definition, leaving room for interpretation to study

participants. This failure to specify definitions can result in many different interpretations of falls. For example, an older adult may describe a fall as a loss of balance, but a healthcare professional may only refer to falls leading to injuries. Therefore, having a universal operational definition of a fall with explicit criteria would be highly useful.

Falls among older adults result in significant injuries and sometimes require costly hospitalization. An estimated 2.2 million people have a medically injurious fall each year (Shumway-Cook et al., 2009). Compared with older adults reporting no falls, total aggregate healthcare costs were 29.0% higher in older adults who reported one fall and 79.0% higher among older adults who reported recurrent falls.

As described in this literature review, falls occur as a result of a complex interaction of risk factors. The most common risk factors reflect biological, behavioral, and environmental factors. The majority of these risk factors are identifiable and modifiable. Women are more likely to fall and sustain fractures than are men, resulting in women having significantly more hospitalizations and emergency department visits than do men. However, fall-related mortality disproportionately affects men. Regular participation in physical activity is integral for older adults to maintain healthy aging and independence. Most falls and resulting injuries among older adults result from a combination of biological conditions and individuals' interactions with their social and physical environments. Reviewed literature also revealed that fall risks are greatly increased for older adults who have multiple risk factors.

Over the past 15 years, research about the prevention of falls among older adults has substantially increased. Promoting appropriate physical activities or exercises to improve strength, balance, and flexibility is one of the most feasible and cost-effective strategies to reduce falls risks among older adults. Studies have shown that some interventions are more effective

than are others, and interventions that are multi-factorial and tailored to individual risk profiles are most effective. The evaluation questions at the heart of this study have been used to explore whether there is an association among a) Seniorcize participation and mobility, as defined by balance and gait measures; b) depression, described by measures of geriatric depression; and c) FoF, assessed via questions of fall-efficacy.

The following chapter is used to discuss the methodology, sampling, sample, measurements, data collection, and analysis of this evaluation study of the Seniorcize program. Chapter Four reports the quantitative findings and analysis, followed by a report of the qualitative findings and analysis in Chapter Five. Chapter Six provides a discussion of the study's findings, states recommendations, and conclusions of this study.

3.0 METHODS

3.1 INTRODUCTION

The primary purpose of this study was to examine how older adults' exercise participation influences the reduction of falls risk factors among high-functioning residents at Asbury Heights. This study is a cross-sectional descriptive study of the differences in various falls risk assessment scores between a group of older adults who participate in exercise and a group of older adults who do not exercise. The falls risk assessment measures are balance and gait, but this study was also used to assess geriatric depression and FoF. A secondary purpose of this study was to examine the factors that influence older adults' exercise participation at the Asbury Heights.

3.2 STUDY SETTING

This evaluation study was conducted at Asbury Heights, a continuing care retirement community, in Pittsburgh, Pennsylvania. Operated by United Methodist Services for the Aging, Asbury Heights offers both an independent and assisted living center and a center for nursing and rehabilitation on one campus. For independent living, residents at Asbury Heights are provided a range of accommodations that best match individuals' general health statuses and

personal needs. Living accommodations include townhomes, one- or two-bedroom apartments, suites, and residential rooms. Meals may be prepared by residents in their living units or may be consumed in the community dining room. Housekeeping services are also provided for all residents.

Asbury Heights has two assisted-living facilities: Asbury Villas and Spring Lane. Assisted living at Asbury Heights offers a personal care community for older adults who want to maintain their independence but need some assistance with daily living activities. Support is customized, so individuals can get the assistance they need while maintaining as much independence as they are safely able to have.

Special services available to residents at Asbury Heights include a beauty parlor, barber shop, country store, ice-cream shop, post office, mini-bus, and chapel. Wellness opportunities available for residents are the Six Dimensional Wellness Program, which addresses holistic needs; the Center for Healthy Aging at Asbury Heights, which provides outreach programming for residents about healthy aging; and the Seniorcize Program, which focuses on physical functioning. All of these amenities offer opportunities for socialization among residents.

3.3 GOALS OF THE PROGRAM

The goal of the Seniorcize program is to reduce falls risk factors among Asbury Heights' high-functioning residents, ultimately reducing falls incidences. Residents in independent living or assisted living are eligible to participate in Seniorcize, with approval from their physician. Seniorcize's program theory (i.e., the intended relationship between program inputs, activities, outputs, and intended outcomes) is depicted in the logic model (see Figure 3.1). The logic model

was developed based on information gleaned from key informants in the interviews described in this dissertation. The logic model was also used to guide the evaluation activities that were completed during this study.

As depicted in the logic model, the program's resources (including program participants, program staff, Asbury Heights management, and other Asbury Heights staff) supported the delivery of Seniorcize offerings, which included resistance training, flexibility exercises, and cardiovascular training. Over time, Seniorcize activities were intended to lead to change in mobility, FoF, and depression. Desired outcomes included higher performances on balance and gait assessments, higher scores on measures of fall-efficacy, and lower rates of depression. Ultimately, the achievement of these outcomes was expected to lead to less falling incidences among participants.

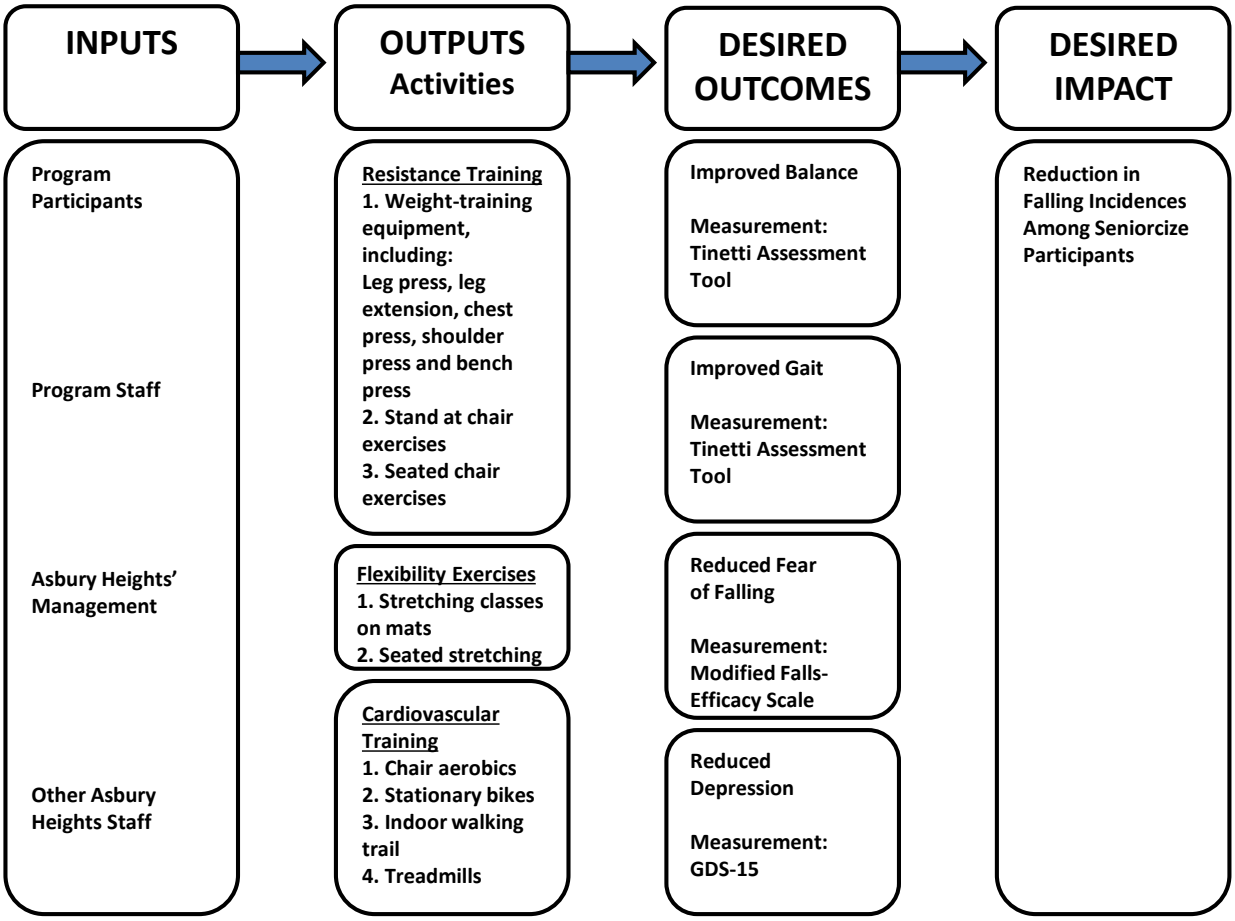


Figure 3.1. Seniorcize Program Logic Model

3.4 STUDY DESIGN

This study involved an embedded mixed-methods design, in which quantitative and qualitative data were collected concurrently. As a result, useful information about the study setting was provided to complement the outcomes data from the various falls risk factor assessments. Methods used included observations, surveys, physiological assessments, and focus groups. The specific aims of this study were the following:

Aim One: Assess how high-functioning older adults' participation in Seniorcize affects balance, gait, geriatric depression and FoF

Aim Two: Identify facilitators and barriers of Seniorcize participation at Asbury Heights

3.5 EVALUATION QUESTIONS

For evaluation of the Seniorcize program, this study consisted of both quantitative and qualitative components. Information is provided regarding balance, gait, FoF, and depression outcomes of Seniorcize participants and the information necessary to assess the program's implementation and opportunities for improvement. Specifically, aim one of this study was addressed by the outcomes evaluation, which is based on the following questions:

1) Is there a significant difference between Seniorcize participants and nonparticipants with regard to measures of mobility, FoF, and depression?
2) Is there an association between frequency of participation in Seniorcize and measures of mobility, FoF, and depression?
3) Is there a significant difference between the two genders with regard to measures of mobility, FoF, and depression?

The purpose of the process evaluation was to address the second aim. The following is the evaluation question for this aim: What are the facilitators and barriers of exercise participation at Asbury Heights?

3.6 OUTCOMES EVALUATION

The outcomes evaluation of this study uses a descriptive, cross-sectional design to examine the effectiveness of Seniorcize. Ultimately, this study was used to investigate how Seniorcize affected the following participant outcomes: balance, gait, geriatric depression, and fall-efficacy.

3.6.1 Sample for the Outcomes Evaluation

The exercise program coordinator at Asbury Heights conducted falls risk assessments every six months. All independent-living and high-functioning assisted-living residents were eligible to attend each assessment event voluntarily. These residents were the study population. Asbury Heights' staff made concerted efforts to recruit eligible residents to attend the risk assessment event on the day of data collection for this study. Participants were not required to engage in physical activity. Certificates for free ice cream sundaes were used as an incentive for participants to attend the falls risk assessment. A total of 82 residents (26 males and 56 females) comprised the sample for the outcomes evaluation.

3.6.2 Variables for the Outcomes Evaluation

The independent and dependent variables were categorized by gender. The two independent variables were participation in Seniorcize (categorical variable) and Seniorcize frequency (continuous variable). The dependent variables (continuous variables) were balance,

gait, Tinetti total score, Modified Falls Efficacy Scale score (MFES), and Geriatric Depression Scale score (GDS).

3.6.3 Measures for the Outcomes Evaluation

This study used numerous validated instruments to measure the outcomes variables. To assess balance and gait, the Tinetti Assessment tool was selected. FoF was evaluated by using the Modified Falls Efficacy Scale. Lastly, the 15-item Geriatric Depression Scale (GDS-15) was administered to rate depression symptoms.

3.6.3.1 Balance & Gait. The Tinetti (1986) Assessment Tool (see Appendix A) was designed to determine elders' risks for falls within the next year by measuring patients' gait and balance. The test is scored on patients' abilities to perform specific tasks. The test takes about eight to 10 minutes to complete.

Clinicians review questions before evaluating patient and ask for any questions regarding the test before beginning. Participants stand with examiners, walk down hallways or across a room. Participants first walk at "usual" pace, then at "rapid, but safe" pace while using usual walking aids. Patients are asked to complete the gait portion with evaluators walking close behind them and evaluating gait steps and drift. Some observations measured include step length and height, step symmetry, step continuity, path, and walking stance.

Patients are then asked to complete the balance portion with evaluators standing close by patients, towards the right and in front while participants sit in hard, armless chairs. Some of the observations measured include sitting balance, attempting to rise, standing balance, turning 360 degrees, and sitting down. Finally, patients are then asked to sit, and the score is then totaled.

Scoring for the Tinetti Assessment Tool is done on a three-point ordinal scale with a range of *0* to *2*. A score of *0* represents impairment of patients, and a *2* represents independence of patients. Individual scores are then combined to form three measures: overall gait assessment score, overall balance assessment score, and combined gait and balance score. The maximum score for gait is 12 points, and the maximum score for balance is 16 points with a total maximum score for the overall Tinetti Tool of 28 points. A higher score indicates better performance. Scores less than 19 are considered High Risk for Falls, for which participants should consider using a walker device, and scores that range between 19 and 24 are considered Risk for Falls.

The creators of the Tinetti Assessment tool tested the tool's inter-rater reliability in a study of 15 patients by having a physician and a nurse test the patients at the same time. Agreement was found on over 85.0% of the items and the items that differed never did so by more than 10.0% (Tinetti, 1986). These results indicate that the Tinetti Assessment Tool has good inter-rater reliability.

3.6.3.2 FoF. The MFES (see Appendix B) was developed by the National Ageing Research Institute and was adapted from the original Falls Efficacy Scale (FES; Tinetti, et al., 1990). The MFES is a one-page form consisting of 14 questions related to particular activities (e.g., getting dressed, taking a bath, crossing roads). Unlike the original FES, this modified scale includes a greater range of outdoor activities. The questions on the MFES are used to determine how confident clients feel in undertaking each activity on a scale of *0* (not confident at all) to *10* (completely confident). Regarding reliability of the MFES, Cronbach's alpha was used to demonstrate internal consistency on the items in the questionnaire, and the result was .95. Test-retest reliability was measured for every question and the overall test by two groups twice, one week apart. Intra-class Correlation Coefficients (ICC) were calculated, with the lowest being .54

for the individual items. The overall ICC for the MFES was .93 (Hill, Schwarz, Kalogeropoulos, & Gibson, 1996).

3.6.3.3 Depression. The Geriatric Depression Scale-Short Form (GDS-15) (see Appendix C) is a self-report measure of depression in older adults (Sheikh & Yesavage, 1986). Users respond in a "Yes/No" format on the test, which was originally developed as a 30-item instrument. The original version proved both time-consuming and difficult for some older adults to complete, so a 15-item version was developed. The shortened form is comprised of 15 items chosen from the Geriatric Depression Scale-Long Form (GDS-L). These 15 items were chosen because of their high correlation with depressive symptoms in previous validation studies. Of the 15 items, 10 indicate the presence of depression when answered positively, and the other five items are indicative of depression when answered negatively. This form can be completed in approximately five to seven minutes, which is ideal for people who are easily fatigued or are limited in their ability to concentrate for longer periods of time. Sheikh and Yesavage (1986) conducted a validation study for this scale, which resulted in a correlation of $r = .84$, $p < .001$.

3.6.4 Data Collection

Data for this study's outcomes evaluation were collected in the course of four consecutive hours in April 2007. A large recreational room was reserved for Asbury Heights' quarterly falls risk assessments (conducted by Asbury Heights' exercise staff). Evaluators for this study joined to screen participants for depression and FoF. When participants arrived to the recreational room, they were briefed on the evaluation study and on the sequence of stations to visit for the various screenings. All participants were screened for mobility first with a hard

copy of the Tinetti Assessment Tool (see Appendix A). The completed assessment forms were given to the evaluator, who noted the name and gender of the participants.

When participants completed the mobility assessment, they were asked to go to the next station, which was a table across the room. The evaluator or a graduate student researcher (subcontracted by the evaluator from the University of Pittsburgh) then administered the depression screening with a hard copy of the GDS-15 (see Appendix C). On the form, participants were asked if they participate in Seniorcize, how many days they participate, and which exercise component they used (e.g., classes, weights, or bike/treadmill). After completing the GDS-15 form, participants were directed to the next station for the FoF screening. At the last station, a hard copy of the MFES (see Appendix B) was used to assess FoF for participants. The evaluator or a graduate student researcher then administered the assessments. After participants completed all three assessments, they received a certificate for a free ice cream sundae at the on-site ice cream parlor.

All data were entered by the evaluator into SPSS (PASW) Version 21 and GraphPad InStat Version 3 (2012) for data analysis, and data were inspected and verified by the evaluator. Frequencies were examined for each variable for out-of-limit responses, but no corrections were needed. No missing responses existed in this study's data set because the evaluator and assistants verified that all forms were complete at the time of data collection, and they used researcher-administered instruments. To manage each respondent's data set, participants were assigned numbers, ranging from 1 to 82.

Participant responses about Seniorcize participation were dichotomized as *yes* or *no* and coded into SPSS as "*0 = no*" and "*1 = yes*." For participant responses about the exercise components used, codes were entered into SPSS to reflect the following: "*1 = classes*," "*2 =*

weights," "*3 = bike/treadmill*," "*4 = classes and weights*," "*5 = classes and bike*," "*6 = bike and weights*," and "*7 = all three*." The self-reported average number of days for Seniorcize participation was entered directly and ranged from *1* through *4*. Gender for each respondent was coded as "*0 = female*" and "*1 = male*."

3.6.5 Data Analysis

3.6.5.1 Descriptive Analyses. Univariate descriptive statistics were used to describe the characteristics of study participants. Frequencies and percentages of the demographic variable (gender) and the two independent variables (participation in Seniorcize and Seniorcize frequency) were calculated. For the dependent variables (balance, gait, Tinetti total score, MFES, and GDS), means and standard deviations were analyzed.

The Shapiro-Wilk test for normality was conducted to evaluate for parametric approaches. Data violated parametric assumptions of normality, so nonparametric methods were appropriate. The nonparametric statistical tests that were used to explore each of the evaluation questions are described within this section of this chapter.

3.6.5.2 Preliminary Analyses. A Mann–Whitney *U* test was conducted to describe the relationship among the independent variables Seniorcize frequency and participation in Seniorcize. Cross-tabulations were performed to assess the relationship between variables gender and Seniorcize participation. The relationship between the variables gender and Seniorcize frequency was explored by conducting a Mann–Whitney *U* test. Lastly, correlations were used to examine the relationships among the five dependent variables.

3.6.5.3 Primary Analyses. Evaluation Question One: Is there a significant difference between Seniorcize participants and nonparticipants with regard to measures of mobility, FoF, and depression?

Bivariate statistics were used to explore differences among the outcome variables. Specifically, the Mann–Whitney *U* test, the non-parametric equivalent of the independent *t*-test, was used to explore differences in balance, gait, Tinetti total score, MFES, and GDS between participants and nonparticipants in the Seniorcize program.

Evaluation Question Two: Is there an association between frequency of participation in Seniorcize and measures of mobility, FoF, and depression?

The non-parametric measure of rank correlation, the Spearman's rho test, was used to examine the association between the frequency of Seniorcize participation and the scores for balance, gait, Tinetti total score, MFES, and GDS.

Evaluation Question Three: Is there a significant difference between the two genders with regard to measures of mobility, FoF, and depression?

The relationship between the variables gender and each of the five dependent variables was explored by conducting Mann–Whitney *U* tests.

3.7 PROCESS EVALUATION

A process evaluation provides contextual information to support analyses of program outcomes and net impacts. Process evaluations show assessments for how the program impacts older adults, provide helpful feedback for refining programs, and shows support for replicating successful program components at similar facilities. The information obtained from process evaluations is also useful and potentially necessary to gain insight into the outcomes evaluation. The following sections address the overall strategies and methods that were used to collect qualitative data.

3.7.1 Measures and Procedures

3.7.1.1 Key Informant Interviews. To develop an accurate, objective, and comprehensive understanding of Seniorcize, the evaluator conducted 30-minute, face-to-face interviews with key staff who were knowledgeable about the creation and intentions of the program. These key informant interviews afforded opportunities for the evaluator to establish rapport and trust with Asbury Heights' managers while also collecting in-depth information about the Seniorcize program. The key informant interviews were guided by the following three questions:

1) What are participants receiving from the program?

2) How satisfied are participants with Seniorcize's services and personnel?

3) How effective is Seniorcize at reaching its target audience?

Informants included Asbury Heights' executive director, communications director, exercise coordinator, and nursing director for independent-living residents. All interviews were

digitally recorded and transcribed by a professional transcriptionist (subcontracted by the evaluator).

3.7.1.2 Focus Groups. During the process evaluation, the evaluator conducted focus groups with Seniorcize participants and nonparticipants on the same day. Using focus groups allowed the evaluator to identify opinions, impressions, and perceptions of Seniorcize in a small group of residents in a short period of time.

The exercise program coordinator provided names of possible participants and personally invited each one to join the focus group discussions. Residents who participated in Seniorcize classes at least three days per week were targeted for Focus Group 1, and nonparticipants were targeted for Focus Group 2. Of those invited, seven females participated in Focus Group 1, and five males and one female participated in Focus Group 2.

The method of open discussions in focus group involved interviewing and probing participants' and nonparticipants' views about the Seniorcize program and its effects. The evaluator facilitated the focus groups, and a University of Pittsburgh research assistant (subcontracted by the evaluator) served as note-taker. The evaluator previously completed a graduate-level course in focus group methods and was a teaching assistant for a graduate-level program evaluation course. The note-taker was a public health analyst in the Graduate School of Public Health at the University of Pittsburgh.

Before the discussion began, the evaluator gave an introduction about the purpose of the focus group and the expectations for individuals' participation. The evaluator stated that everyone's opinions and experiences were important and reassured participants of the confidentiality of their statements. Finally, the evaluator asked that people avoid talking at the same time so that the recording would be understandable. Focus group discussions began with

participants' introductions to each other and the evaluator after the evaluator asked for their names.

The evaluator closely followed the questions and sequence listed within the focus group guide, which asked participants about how they first heard about the Seniorcize program, why they decided to join and stay with the program, which activities have been most (and least) helpful, and what types of services they felt were missing, but needed. They were also asked to provide anecdotal information about their experiences with the program and how it has helped them to overcome problems. The focus group with non-Seniorcize participants discussed questions about their perceptions of Seniorcize and perceptions of their counterparts who partake in Seniorcize. The discussion also focused on the reasons behind their decisions to not participate in Seniorcize.

3.7.2 Data Analysis

To identify themes from the two focus groups, the evaluator reviewed the transcripts to examine any themes that were evident. As part of this process, comparisons were made between paragraphs and across informants. The framework analysis approach (FA) was used to analyze focus group data (Ritchie & Spencer, 2002). This matrix-based approach is inductive, as themes emerge during the data analysis. If necessary, the FA method also allows for themes to be identified prior to analyzing the data. With FA, events are interpreted within the social settings in which they occur, and the data are often collected using interviews and observations. The FA process contains clearly defined steps, which reduce potential for bias.

The five sequential stages of FA are inter-related but distinct, which allows for theme-based and/or case-based analysis through charts that may be read across (cases) or downward

(themes; Rabiee, 2004). The key stages of FA are familiarizing, identifying a thematic framework, indexing, charting, and mapping and interpretation. The first four stages provide direction for the data management process, and the last stage is used to focus on data analysis. The remainder of this chapter will include descriptions of each stage of framework analysis and a summary of how each stage was conducted in this study. The evaluator was very familiar with the text about FA steps, so all of the stages of the analysis were conducted by hand.

3.7.3 Five Stages of Framework Analysis

3.7.3.1 Stage One: Familiarizing. With FA, maintaining the integrity of respondents' narratives is important. This stage involved listening to audio recordings and re-reading the transcripts/data to get an overall idea of possible key concepts and recurring themes while taking notes. The process of familiarizing the evaluator with the study's materials serves as a foundation for analysis.

There was not an extremely large amount of data, so the evaluator was able to read all of the transcripts to become familiar with it. As the moderator of each of the focus groups and sole interviewer, the evaluator was familiar with the purpose of the Seniorcize program and the content of the focus group transcripts.

3.7.3.2 Stage Two: Identifying a Thematic Framework. The second stage of FA involves identifying key issues, concepts, and themes to filter and classify the data. Themes may be related to settings, definitions, processes, activities, events, strategies, or relationships/structure (Bogdan & Biklen, 1992). This process is not mechanical, so the evaluator made judgments and connections, which required intuitive and logical thinking.

The evaluator focused on settings, definitions, processes, and activities described by the focus group participants when identifying a framework. A list of the top 10 themes was compiled for the focus group that contained Seniorcize participants: safety/injury, convenience, information, alternative exercise programs, walking, alternative exercises, alternative activities, outside/outdoors, staff, and social clubs/programs/publications. The top 10 themes for the focus group of non-Seniorcize participants consisted of the following: equipment or machines, information, alternative exercise programs, pool or water exercises, convenience, alternative activities, level of difficulty, walking, and a three-way tie among safety/injury, alternative exercises, disorder/disease. The themes were derived from the aims and objectives of the study and the views and concerns of the respondents that recur in the data.

3.7.3.3 Stage Three: Indexing. Stage three of FA entailed applying the thematic framework systematically to the data and developing an index based on the identified themes. The themes are applied to the data in textual form by annotating the transcripts with codes from the index, supported by short text descriptors to elaborate the index heading. The codes used for indexing emergent themes, issues, and concepts are listed in Figure 3.2.

ae – alternative exercise sc – social clubs/programs/publications cs – class size st – staff eq – equipment or machines fc – facilities pw – pool or water exercises sl – socialization df – level of difficulty if – information do – disorder/disease sf – safety / injury ht – health sg – strength ap – alternative exercise programs	aa – alternative activities ot – outside/outdoors pn – pain wk – walking cv – convenience my – money/costs ag – age ar – arthritis wt – weight sa – staying active ve – variety of exercises mh – mental health fg – fatigue gr – gender

Figure 3.2. Codebook for Seniorcize Focus Groups

Each section of the data was read in detail, and relationships in the index were determined. Focus group participants' comments or responses were coded to identify themes or issues being raised. This indexing was done for all focus group transcripts. The transcripts were reviewed twice, and the index was revised as new codes were developed. Lastly, following the suggestion of Ritchie and Spencer (2002), one common coding scheme was used for participant focus groups and nonparticipant focus groups instead of devising separate coding schemes for each focus group. Using a common coding scheme allowed the evaluator to discover common and divergent themes.

3.7.3.4 Stage Four: Charting. The final stage of data management includes organizing responses from the transcripts. For this study, an Excel spreadsheet was created to document index counts. The spreadsheet allowed easier data sorting of the themes that were more

frequently discussed by Seniorcize participants or non-Seniorcize participants. For the top five most frequently discussed themes, their percentage relative to other themes was noted. For instance, in the nonparticipant focus group, 16.6% of the coded themes were for equipment/machines.

3.7.3.5 Stage Five: Interpretation. The interpretative process begins with arranging key characteristics of the data and interpreting the data set as a whole. The approaches used in this study were detection, categorization, and classification (Ritchie, Spencer, & O'Connor, 2003). In the detection phase, the evaluator reviewed the matrices and transcript notes and compared and contrasted participants' responses. The categorization phase included refining the themes and re-sorting them into more descriptive subcategories. Then, the subcategories were assigned to one of four final themes. Lastly, the evaluator examined the second aim of this study by systematically checking for associations among attitudes, behaviors, motivations, etc. Each focus group was analyzed as one unit. Within-group and between-group associations were noted. Associations were made explicitly by respondents or created from implicit connections.

4.0 QUANTITATIVE RESULTS

4.1 DESCRIPTIVE ANALYSES

For the outcomes evaluation, data were collected for 82 Asbury Heights residents. All participants were over the age of 75 years old; however, individuals' ages were not recorded during this study. All participants were considered healthy and high-functioning by Asbury Heights' clinical staff and resided in independent-living or high-functioning assisted-living quarters. The sample was comprised of 68.3% (56) females and 31.7% (26) males (see Table 4.1). Regarding the independent variable participation in Seniorcize, 45.1% (37) of the sample was non-Seniorcize participants, and 54.9% (45) were Seniorcize participants. Table 4.1 shows the range of the independent variable Seniorcize frequency.

The descriptive characteristics of the dependent variables are also displayed in Table 4.1. The scores on the balance component of the Tinetti Assessment Tool ranged from 4 to 16 (M = 13.46; SD = 3.10). The gait component of the Tinetti Assessment Tool ranged from 5 to 12 (M = 10.4; SD = 1.94). The total scores for the Tinetti Assessment Tool (combines balance and gait scores) ranged from 12 to 28 (M = 23.77; SD = 4.83). Scores on the MFES ranged from 55 to 140 (M = 115.98; SD = 22.82). Lastly, the scores on the GDS ranged from 0 to 7 (M = .51; SD = 1.36).

Table 4.1. Characteristics of Study Participants

Variables	Frequency	Percent	*M*	*SD*	Min	Max
Gender						
Female	56	68.3				
Male	26	31.7				
Seniorcize Frequency (days)						
0	37	45.1				
1	6	7.3				
2	14	17.1				
3	20	24.4				
4	1	1.2				
5	4	4.9				
Balance Score	82		13.5	3.10	4	16
Gait Score	82		10.4	1.94	5	12
Tinetti Total Score	82		23.77	4.83	12	28
Modified Falls Efficacy Scale (MFES)	82		115.98	22.82	55	140
Geriatric Depression Scale (GDS)	82		0.51	1.36	0	7

4.2 PRELIMINARY ANALYSES

Prior to conducting a full analysis of the data, a preliminary analysis was performed to examine relationships among independent variables, relationships between demographic and

independent variables, and relationships among dependent variables. The evaluator used the Mann–Whitney *U* test for the first set of preliminary analyses to determine equivalencies between residents who participated in Seniorcize and residents who did not, as it pertains to Seniorcize frequency. For Seniorcize participants, the mean for participation days was 2.62 (*SD* = 1.061), and the mean for non-Seniorcize participants is zero. Participation in Seniorcize is significantly related to Seniorcize frequency; where naturally, participants who participated in Seniorcize had higher frequencies of participation compared to those who did not.

The second set of preliminary analyses used crosstabulations and chi square tests to describe the relationship between gender and Seniorcize participation. Comparisons revealed no significant relationship, with χ^2 (2) = .366, p = .55. The third set of preliminary analysis involved a Mann–Whitney *U* test, which was used to determined equivalencies between females and males, while being used to examine Seniorcize frequency. The mean for Seniorcize frequency among females was 1.41 days (*SD* = 1.39), and the mean for males was 1.50 days (*SD* = 1.82). The results of the Mann–Whitney *U* test revealed that Seniorcize frequency is not significantly related to gender.

The final set of preliminary analyses used Spearman's correlations to examine the relationships among the dependent variables balance, gait, Tinetti total score, MFES, and GDS. Balance, gait, Tinetti total score, and MFES were significantly related to one another. However, GDS was not significantly related to any of the other dependent variables.

4.3 PRIMARY ANALYSES

4.3.1 Evaluation Question 1

Is there a significant difference between Seniorcize participants and nonparticipants with regard to measures of mobility, FoF, and depression?

$H1_A$: Participants in the Seniorcize program score higher on gait and balance and lower on FoF and depression compared to nonparticipants.

Five independent samples of Mann–Whitney *U* tests were conducted to identify if the distribution of the dependent variables balance, gait, Tinetti total score, MFES, and GDS were different for Seniorcize participants and nonparticipants. The means and standard deviations for the dependent variables (stratified by Seniorcize participation) are listed in Table 4.2.

Table 4.2. Means and Standard Deviations for Balance, Gait, Tinetti Total Score, MFES, and GDS for Seniorcize Participants and Nonparticipants

Participate in Seniorcize		Balance Score	Gait Score	Tinetti Total Score	Modified Falls Efficiency Scale (MFES)	Geriatric Depression Scale (GDS)
Did not participate (n = 37)	*M*	13.56	10.378	23.84	114.89	.51
	SD	3.11	2.190	5.13	23.33	1.54
Did participate (n = 45)	*M*	13.38	10.409	23.71	116.87	.51
	SD	3.11	1.730	4.62	22.62	1.22
Total (n = 82)	*M*	13.46	10.395	23.77	115.98	.51
	SD	3.10	1.941	4.83	22.82	1.36

Balance scores showed a mean of 13.56 (*SD* = 3.11) for non-Seniorcize participants and a mean of 13.38 (*SD* = 3.11) for Seniorcize participants. Gait scores showed a mean of 10.38 (*SD* = 2.19) for non-Seniorcize participants and a mean of 10.41 (*SD* = 1.73) for Seniorcize participants. Tinetti total scores showed a mean of 23.84 (*SD* = 5.13) for non-Seniorcize participants and a mean of 23.71 (*SD* = 4.62) for Seniorcize participants. MFES scores showed a mean of 114.89 (*SD* = 23.328) for non-Seniorcize participants and a mean of 116.87 (*SD* = 22.617) for Seniorcize participants. For GDS-15 scores, the mean was .51 (*SD* = 1.54) for non-Seniorcize participants and was .51 (*SD* = 1.22) for Seniorcize participants. The Mann–Whitney *U* tests did not reveal a significant relationship between Seniorcize participation and any of the dependent variables (see Table 4.3). GDS and MFES *p* values ranged from .060 and .733, respectively.

Table 4.3. Summary of Mann–Whitney *U* Test for Differences in Balance, Gait, Total Tinetti Score, MFES, and GDS Between Seniorcize Participants and Nonparticipants

Null Hypothesis	Test	*p*	Decision
The distribution of Balance Score is the same across categories of Participation in Seniorcize.	Independent-Samples Mann–Whitney *U* Test	.610	Retain the null hypothesis
The distribution of Gait is the same across categories of Participation in Seniorcize.	Independent-Samples Mann–Whitney *U* Test	.650	Retain the null hypothesis
The distribution of Tinetti Total Score is the same across categories of Participation in Seniorcize.	Independent-Samples Mann–Whitney *U* Test	.670	Retain the null hypothesis
The distribution of MFES is the same across categories of Participation in Seniorcize.	Independent-Samples Mann–Whitney *U* Test	.733	Retain the null hypothesis
The distribution of GDS is the same across categories of Participation in Seniorcize.	Independent-Samples Mann–Whitney *U* Test	.060	Retain the null hypothesis

Note. Asymptomatic significances are displayed. The significance level is .05.

4.3.2 Evaluation Question 2

Is there an association between frequency of participation in Seniorcize and measures of mobility, FoF, and depression?

$H2_A$: Higher frequencies of participation in the program can be associated with higher scores for gait and balance and with lower scores for FoF and depression.

Spearman's correlations coefficient was calculated for Seniorcize frequency with each of the variables balance, gait, Tinetti total score, MFES, and GDS (see Table 4.4), from which only the relationship between depression (GDS) and Seniorcize frequency was statistically significant at $p = 0.047$. These findings show that higher scores on the GDS test were weakly associated with higher frequencies of Seniorcize participation.

Table 4.4. Spearman's Correlations for Balance, Gait, Tinetti Total Score, MFES, and GDS with Seniorcize Frequency for Study Participants

Variable	N	Spearman's rho correlation with Seniorcize Frequency	*p*
Balance Score	82	-.002	.987
Gait Score	82	.053	.641
Tinetti Total Score	82	.040	.723
Modified Falls Efficacy Scale (MFES)	82	.133	.232
Geriatric Depression Scale (GDS)	82	.220*	.047

Note. *$p < .05$, **$p < .01$, ***$p < .001$*.

4.3.3 Evaluation Question 3

Is there a significant difference between genders in measures of mobility, FoF, and depression?

$H3_A$: Male participants score higher on gait and balance and score lower on FoF and depression compared to female participants.

Table 4.5 displays the means and standard deviations of male and female for each of the outcome variables. Five independent samples of Mann–Whitney *U* tests were conducted to check if the distribution of the variables balance, gait, Tinetti total score, MFES, and GDS were different for male and female individuals (see Table 4.6). Such a difference was only significant for the MFES, where, on average, male individuals scored higher than females did.

Table 4.5. Means and Standard Deviations for Balance, Gait, Tinetti Total Score, MFES, and GDS by Gender of Study Participants

Gender		Balance Score	Gait Score	Tinetti Total Score	Modified Falls Efficiency Scale (MFES)	Geriatric Depression Scale (GDS)
Female (n = 56)	*M*	13.09	10.164	23.16	111.73	.57
	SD	3.20	1.998	4.99	23.72	1.44
Male (n = 26)	*M*	14.23	10.885	25.08	125.12	.38
	SD	2.76	1.751	4.24	17.94	1.20
Total (n = 82)	*M*	13.46	10.395	23.77	115.98	.51
	SD	3.10	1.941	4.83	22.82	1.36

Table 4.6. Summary of Mann–Whitney U Test for Differences in Balance, Gait, Total Tinetti Score, MFES, and GDS Between Male and Female Participants

Null Hypothesis	Test	*p*	Decision
The distribution of Balance Score is the same across categories of Gender.	Independent-Samples Mann–Whitney *U* Test	.095	Retain the null hypothesis
The distribution of Gait is the same across categories of Gender.	Independent-Samples Mann–Whitney *U* Test	.137	Retain the null hypothesis
The distribution of Tinetti Total Score is the same across categories of Gender.	Independent-Samples Mann–Whitney *U* Test	.091	Retain the null hypothesis
The distribution of MFES is the same across categories of Gender.	Independent-Samples Mann–Whitney *U* Test	.006	Reject the null hypothesis
The distribution of GDS is the same across categories of Gender.	Independent-Samples Mann–Whitney *U* Test	.644	Retain the null hypothesis

Note. Asymptomatic significances are displayed. The significance level is .05.

4.4 CHAPTER SUMMARY

This chapter presented the quantitative outcomes of this study. The quantitative analysis showed a statistically significant difference between participants and nonparticipants (in Seniorcize) for balance, gait, Tinetti total score, FoF, or GDS; however, the relationship to depression did approach closely to a significant level ($p = .60$). The analysis revealed a statistically significant relationship between Seniorcize Frequency and GDS among residents who participated in Seniorcize. Higher scores on the GDS test were weakly associated with higher frequencies of Seniorcize participation ($p = .47$). When considering gender differences, balance, gait, Tinetti total score, and GDS were not significantly different between males and females. However, such

a significant difference was seen for the Modified Falls Efficiency Scale (MFES): males scored higher (p = .006).

5.0 QUALITATIVE RESULTS

5.1 INTRODUCTION

Qualitative data were collected and analyzed to incorporate staff and residents' perspectives into this study. Chapter Five presents these qualitative data, which include themes that emerged from key informant interviews and two focus groups (one with Seniorcize participants and one with nonparticipants).

Managers at Asbury Heights who were associated with the Seniorcize program were interviewed. The purpose of the interviews was to capture participants' experiences and expectations about the program operations, processes, outcomes, and this evaluation study.

To fulfill the second aim of this study, which was to identify the facilitators and barriers of exercise participation at Asbury Heights, focus groups were used to examine the factors that influenced residents' decisions to participate in Seniorcize. All participants in both focus groups were over 75 years old, and all were Caucasian, except for one Asian participant. The focus group of Seniorcize participants consisted of seven females, and the focus group of nonparticipants consisted of five men and one woman. All focus group participants were independent-living residents at Asbury Heights. A sample of residents who met the eligibility criteria were recruited by the Director of Communications and Activities and the Exercise Coordinator.

The two focus groups were conducted on-site at Asbury Heights in the exercise room. Gift certificates for ice cream were provided as incentives to participants, and all participants agreed to be audio taped. One moderator and one note-taker were present during each discussion. The following are the interview guides for focus group questions for the focus group of Seniorcize participants and the focus group of nonparticipants, respectively:

Participants

1. How did you learn about Seniorcize?
2. What are some of the things you do at Seniorcize?
3. Why do you choose to participate?
4. Why do you think others choose to not participate?
5. How do you feel about participating?
6. How has Seniorcize benefited you?
7. How convenient do you find Seniorcize?
8. What exercise do you get outside of Seniorcize?

Nonparticipants

1. What do you know about Seniorcize?
2. How convenient are Seniorcize's offerings?
3. How would you characterize your regular level of activity?
4. What do you think happens at Seniorcize?
5. Why do you choose to not participate?
6. Why do you think others choose to participate?
7. How do you feel about having exercise programs offered?
8. What benefits do you think Seniorcize has for you?

5.2 PERSPECTIVES OF KEY INFORMANTS

5.2.1 What are participants receiving from the program?

When describing Seniorcize, each of the key informants mentioned many offerings and potential benefits to their residents. One informant described the program as "individualized and progressive." When asked about what Seniorcize participants receive, informants replied in the following ways:

- "Group classes, one-on-one sessions, and some just use exercise equipment only." (Informant 1)
- "Not an intense program, rather it's maintenance to help folks stay mobile and to maximize independence, through exercise." (Informant 2)
- "Socialization, better movement and range of motion, strengthening, independence, and less risk of falling." (Informant 3)

Informants were each asked about their perceptions of Seniorcize's effectiveness and efficiency. Each informant discussed that the Seniorcize Program is effective at delivering its interventions. However, there were some differing views regarding efficiency. Two informants found that Seniorcize is efficient right now, but the third informant responded in the following way:

> There would be benefit to adding more staff and more classes. I feel caught in a bind, because residents count on having numerous class offerings and at certain times of the day. Since the program is looking to expand, by offering classes to the external community, additional staff will be necessary to maintain efficiency. The waiting list

isn't ideal either. And, space is inadequate, especially in the Nursing Center. Also, resident transport isn't as efficient, when trying to get residents to classes on time.

5.2.2 How satisfied are participants with Seniorcize's services and personnel?

All key informants stated that Seniorcize participants are highly satisfied with the program's personnel. In fact, one informant added that

> Residents love [the Exercise Coordinator and the ex-Assistant Exercise Coordinator]. Some residents are also critical of the type of replacement to come in to fill the vacant Assistant Exercise Coordinator role. They want the person to be just as charismatic and engaging.

Each informant felt that residents are generally satisfied with Seniorcize, but two informants commented that some participants are disenchanted when some Seniorcize personnel use videotapes for exercise instruction. According to one informant, "Video tapes are used as alternatives during staffing shortages, but participants do not like them mainly because it is difficult for them, due to hearing and visual impairments." Additionally, one informant shared that residents do not like videotapes, but they also do not like when personnel reduce the number of class offerings.

5.2.3 How effective is Seniorcize at reaching its target audience?

According to each key informant, Seniorcize is widely publicized throughout the Asbury Heights facility. Information about the program from clinical staff and administrators is shared with residents via publications and via verbal communications, which encourage residents'

participation. All informants stated that the average numbers of program participants are adequate, given the current allocations of facilities and resources; however, the Exercise Coordinator expressed a desire to increase participation from approximately one-third of the number of eligible residents to 50.0% of the eligible residents.

5.2.4 Other

One informant stated that "the company does a good job of meeting the program's needs," but many barriers for program implementation were identified by each of the key informants. Specifically, these barriers related to staffing, equipment, and facilities. Informants did not tend to agree about necessary the level of training/education for Seniorcize personnel.

5.2.4.1 Staffing. The informants agreed that staffing for the Seniorcize program is insufficient. One informant suggested having "smaller classes for the dementia population, due to the attention required to serve these residents." She also stated that "independent-living seniors are very active, and [personnel] should be more proactive in making sure that these types of residents have their needs met."

Informants felt that costs for Seniorcize personnel need to be addressed. In their interviews, they discussed salary and qualifications for the vacant Exercise Assistant position. One informant commented that "the program does not need staff with a high level of education, which could save us money. . . perhaps we can have personal trainers rather than exercise physiologists or physical therapists." Another informant had a different perspective and felt that the salary for the Exercise Assistant position was too low, which makes it difficult to recruit and

retain talent. She recommended revising the job description to add more duties and require a four-year degree, which would justify a more competitive salary.

5.2.4.2 Equipment. Informants generally understood that patient care has a higher priority than does purchasing new exercise equipment. One informant expressed that some of the exercise rooms have too little equipment. Another informant recommended "replacing equipment rather than adding equipment, because there are some modern advances in equipment, which may be more user-friendly for older users." She further commented that "updated cardio equipment would be nice, especially more treadmills, due to steady use of the ones we have now."

5.3 FOCUS GROUP THEME CATEGORIES

A list of the 10 most common themes in the qualitative analysis was compiled for each focus group in order of frequency (see Figure 5.1). The left column represents responses from Seniorcize participants (FG #1), and the right column represents responses from nonparticipants (FG #2).

Seniorcize Participants (FG #1)	Nonparticipants (FG #2)
1. Safety/injury*	1. Equipment or machines
2. Convenience*	2. Information*
3. Information*	3. Alternative exercise programs*
4. Alternative exercise programs*	4. Pool or water exercises
5. Walking*	5. Convenience*
6. Alternative exercises*	6. Alternative activities*
7. Alternative activities*	7. Level of difficulty
8. Outside / outdoors	8. Walking*
9. Staff	9. Safety/injury*; Alternative exercises*; Disorder / disease (3-way tie)
10. Social clubs / programs / publications	

Note. An asterisk (*) indicates a common theme that is concordant with both focus groups.

Figure 5.1. Themes from Focus Groups of Seniorcize Participants and Nonparticipants

5.4 SUBCATEGORIES AND FINAL THEMES

The next step in analyzing the focus group themes consisted of examining the transcripts for patterns or subcategories. To illustrate, the subcategory of physical limitations included alternative exercises, equipment, disorders, and levels of difficulty. Dimensions of perspectives existed within the given categories, so the categories were not exclusively assigned to one final theme. For instance, equipment, difficulty, outdoors, and social clubs/programs/publications are also represented in the final theme of alternatives to Seniorcize. The subcategories distinguish duplicated categories from one another.

The identified subcategories were re-examined to determine overall, or final, themes, which encompassed relevant subcategories. For example, the final theme of safety included subcategories of physical limitations, fear of equipment, environmental hazards, and staff attentiveness. The outcome of this analysis is evidenced in Figure 5.2.

Theme Categories	Subcategories	Final Themes
Alternative exercise programs Alternative activities Disorders/disease Equipment Level of difficulty Outside/outdoors Pool or water exercises Social clubs/programs/publications Walking	Self-perceptions Pre-conceived notions of others Exercise facilities Time constraints	Alternatives
Alternative exercises Equipment Disorders/disease Level of difficulty Outside/outdoors Safety Staff	Physical limitations Fear of equipment Environmental hazards Staff attentiveness	Safety
Convenience Staff	Class offerings Staff availability	Class Hours
Information Social clubs/programs/publications	Information sharing Word of mouth Newsletters	Promotions

Figure 5.2. Identified Theme Categories, Subcategories, and Final Themes from Focus Groups

5.4.1 Theme One: Alternatives

Asbury Heights' residents choose alternative exercises other than Seniorcize for many reasons. Participants in the focus groups indicated personal and clinical reasons. Residents in both focus groups were aware of, and participate in, the on-site and off-site options for exercising (such as Tai Chi) and highlighted the on-site walking options, which are guided by staff or initiated by residents themselves. Two participants from FG #1 discussed these options in the following ways:

- "We really urge the new residents to take that if they could walk because it teaches you the orientation of the buildings and how they relate to one and other." (Female 4)
- "You see a lot of people when the weather's good outside walking." (Female 1)

The Jewish Community Center (JCC) was a significant topic in the focus groups, in which participants praised the aquatic facilities there. As one Seniorcize participant stated,

> I go over to the Jewish Community Center. There's an agreement with Asbury here to take advantage of the arthritis program in the water in the swimming pool there. They go three days a week, some people, but I only go one because I'm in the exercise classes here too. It seems like too hard to go over there and come back and it takes a big part of your middle of your day. But that's a good program too. (Female 4)

A non-Seniorcize participant (Male 3) remarked that "It's easier for [him] because [he has] arthritis. And arthritis, the doctor wants [him] to be in that water and exercise."

Also, participants in FG #1 and FG #2 agreed that it can be difficult to find the time to exercise when there are other activities (e.g., shopping and napping), doctor appointments, and social club meetings/activities to juggle during the daytime hours. When asked about Seniorcize participation, one woman in FG #1 responded

> There is just so many hours in the day, you know. There's something going on in the exercise program all morning and all afternoon. So if you have to go to lectures and you have to go [see] guests that are here and [attend] musical programs, it's a very busy schedule to keep up with everything. And to do something for yourself. You know, you have personal business you have to take care of. (Female 3)

Participants made numerous comments in FG #2 that centered on arthritis and the therapeutic benefits of exercising in the water at JCC. Residents within this focus group rationalized their lack of Seniorcize participation by projecting that they had greater physical capacities than did the residents who attend Seniorcize classes. Respondents in FG #2 described the Seniorcize routines as "light-weight," commented on the frailty of the residents that they observed in the Seniorcize classes, and mentioned an interest in getting free weights placed in the exercise room.

5.4.2 Theme Two: Safety

Data from both focus groups revealed an over-arching concern for safety when residents exercise or do other activities. Numerous focus group participants said that they reduced or stopped Seniorcize participation because they experienced increasing pain and discomfort over time. The respondents identified using a buddy system, which restricted walking to indoor/carpeted areas and caused residents to avoid treadmills to prevent injuries.

Safety was the number one theme for participants in FG #1, but it was number 10 of the top themes for participants in FG #2. The FG #1 respondents shared a common FoF and emphasized the frequency of falling incidences at Asbury Heights. The FoF was not explicitly mentioned in FG #2. The usage and limitations of medical alert buttons were popular topics in FG #1, but these devices were not discussed in the FG #2 discussion.

One respondent shared that she likes the fact that the physical therapist at Asbury Heights follows up on residents who have physical therapy orders from their personal physicians. This respondent stated that the Asbury Heights therapist keeps residents active to maintain the improvements achieved during the residents' off-site physical therapy sessions. Another

respondent appreciates the routine on-site falls screening assessments, which are conducted by the Seniorcize staff. One of the ladies in FG #1 mentioned the exercise variations that the exercise coordinator allows her and others to do to accommodate physical limitations.

Some men in FG #2 felt that Asbury Heights' exercise staff was overly conscious about safety issues, pertaining to exercising. This sentiment was apparent when participants talked about lack of access to exercise equipment after hours of operation. Comments from this focus group included the following:

- "Yeah, but I think we could be trusted not to overdo it." (Male 4)
- "Never be allowed in here by yourself, but have two people and it doesn't have to be one of the instructors. Just so there's two people. If there's a problem, they can get help." (Male 1)
- "Yeah. They could eyeball who's doing it. They should have some faith." (Male 3)
- "I guess that's Nadine's rule. I don't know. They won't let anybody else do that machine. They can do the weight machines, but not the treadmills." (Male 1)

5.4.3 Theme Three: Class Hours

Respondents from FG #1 appreciated the structured and flexible options offered within the fitness facility at Asbury Heights. Morning class hours were favored by most of the ladies in FG #1 because the classes started very close to the time at which the mail arrives. This convenience prevented the need for residents to make additional trips throughout the facility. Consequently, these same residents found it inconvenient to go to a building outside of their housing unit to attend an exercise class.

When asked why others may choose not to participate, several women in FG #1 stated that many residents do not like to wake up early. Two members of FG #2 confirmed that morning classes and sticking to a class schedule is undesirable. One man (Male 3) commented, "I would say the reason for not doing it is the regimentation of it." Another man (Male 1) responded, "Yeah. I don't like the schedules and everything, but when I get time, I go for a walk down to Cedar Boulevard and back up the hill and come around. And I come in and go through the machines."

Seniorcize offers daily opportunities for residents to build strength in arms and legs in a class setting. Other times during the day, residents can use the exercise equipment, such as chest/leg presses and individual stretch work with therapists. Respondents from FG #2 apparently enjoy using equipment throughout the day, but a few mentioned the desire to use equipment during the evening and weekend times, which is prohibited. Despite differing opinions about the convenience of Seniorcize, both focus groups generally agreed that traveling off-site to the JCC was inconvenient.

5.4.4 Theme Four: Promotions

Participants in FG #1 believed that residents are quite aware of the Seniorcize Program as an amenity offered by Asbury Heights. They also confirmed that Seniorcize is consistently publicized in the Asbury Heights newsletter. New residents are introduced to the program during their site orientation; however, the majority of the FG #1 respondents were not able to state when Seniorcize began, even though they lived at Asbury Heights at the time.

Most participants in the focus groups agreed that residents do not understand which of the physical activity offerings were considered Seniorcize exercise. Some individuals referenced

components such as chair aerobics, Joint Benders, and use of exercise machines, but no one spoke of Seniorcize as a comprehensive, defined program. During FG #2, participants illustrated misperceptions of the program. Some of the comments included the following:

- "I mean this is for the really, really old people that can't get around to do anything else." (Male 1)
- "[It's for those that] got arthritis." (Male 2)
- "They help people with their balance. Just to keep active." (Male 4)

Males in FG #2 appeared to be judgmental of the female residents. For instance, comments were made about Seniorcize being a necessity due to female residents eating too much and gaining weight. One statement was that "The exercise that the women need to be doing is pushing back away from the table. Have you seen how big some of the gals are around here?" (Male 4).

5.5 CHAPTER SUMMARY

The results in this chapter were based on thorough analyses of the transcripts from key informant interviews and two focus groups with Asbury Heights residents. The findings illustrated several facilitators and barriers of Seniorcize participation. Facilitators are included the accommodating staff, equipment that caters to various levels of ability, multiple class offerings per day, and numerous outlets for publicity about the program. Barriers included negative pre-conceived notions of Seniorcize participants by the nonparticipants, residents' competing priorities, and the limited number of exercise personnel.

6.0 DISCUSSION AND RECOMMENDATIONS

This chapter presents an overview of the study and discussion of the results, as related to the study's aims. The chapter also includes a discussion of limitations and recommendations for future research and program implementation.

6.1 OVERVIEW OF THE STUDY

The evaluator's primary purpose of this study was to examine how exercise participation influences the reduction of falls risk factors (poor mobility, FoF, and depression). The sample population included high-functioning residents at a CCRC called Asbury Heights in Pittsburgh, PA. A secondary purpose of this study was to examine contextual factors that influence exercise participation at the study site.

Previous studies about falls prevention used participants who were either community-dwelling older adults or institutionalized populations. Also, none of these studies targeted healthy older adults, and most of the research included strictly quantitative analyses. This study contributes to the existing literature by conducting a mixed-methods examination of the impact of an on-site multi-factorial exercise program (i.e., Seniorcize), which targets high-functioning older adults within a CCRC setting. The evaluator for this study used quantitative methods to

examine the relationships among the study's independent and dependent variables and used qualitative methods to understand barriers for exercise participation.

The study sample consisted of high-functioning residents who each completed falls risk assessments, depression screenings, and falls-efficacy screenings. The study participants were also asked about how frequently they participated in Seniorcize. Quantitative results from all of the aforementioned measures were compared between a subset of residents who participate in Seniorcize and a subset of residents who do not participate in Seniorcize. Residents who participate in Seniorcize did not score significantly differently from non-Seniorcize residents on any of the three instruments used. Therefore, scores for the three instruments did not predict residents' participation in Seniorcize. For the sample subset of Seniorcize participants, the data illustrated that as residents increase their exercise frequency, their mobility increases significantly and FoF decreases significantly. In the overall study sample, males had less FoF than did females.

To better understand how Seniorcize is implemented and to explore the barriers of program participation, key informant interviews were conducted with staff from Asbury Heights, and two focus groups were conducted with residents of Asbury Heights. One focus group contained Seniorcize participants, and the other focus group contained nonparticipants of Seniorcize. Findings highlighted some misperceptions of the program and some dissatisfaction with the facilities and operations. Generally, female residents found Seniorcize more appealing than did male residents.

6.2 DISCUSSION OF THE RESULTS

6.2.1 Aim One

Assess the effect of exercise participation on balance, gait, geriatric depression, and FoF among high-functioning older adults.

These non-normal distributions may be because the study's sample consisted only of high-functioning individuals who lived independently or with little assistance from the CCRC's staff. Another contributing factor of the non-normal distributions is the small sample size (n = 82). The demographic make-up of the sample of 82 residents lacked some heterogeneity. Two-thirds (68.0%) of the sample was female, but all participants were Caucasian, except for one Asian female. Additionally, this sample contained residents over the age of 75, but many previous studies contained participants 65 years old or older.

The sample's eligibility criteria likely resulted in most participants having favorable scores for each of the outcome variables and the lack of significant difference between the focus groups with Seniorcize participants and the focus group with nonparticipants. The participants may have also been reluctant to report depression symptoms and FoF to their respective survey administrators who were strangers to them, and they might have feared the CCRC becoming concerned with their independent-living arrangement. Also, the 82 participants who volunteered for this study may have been more positive and outgoing than were residents who declined to participate, which may have contributed to the favorable scores on the depression screening.

This study had a cross-sectional design and was used to exclusively investigate high-functioning residents within a CCRC, so comparing and contrasting with existing literature is difficult. Falls prevention research is rare within settings that are considered CCRCs, and

previous studies often included community-dwelling participants or participants receiving services at hospitals or assisted-living facilities. High-functioning CCRC residents who maintain independence similar to community-dwelling residents and who have the stability and support services similar to assisted-living residents may be expected to have outcomes that are distinctly different from current research on falls prevention strategies.

6.2.1.1 Evaluation Question 1. Is there a significant difference between Seniorcize participants and nonparticipants with regard to measures of mobility, FoF, and depression?

This study's quantitative analysis was used to find that Seniorcize participation does not significantly influence the measures of mobility, FoF, or depression. Erratically implementing Seniorcize and/or the inconsistent participation in exercising may have led to participants' inabilities to accurately measure outcomes of the program intervention for falls prevention. Residents who attend Seniorcize classes repeatedly are considered "participants" regardless of how often they attended and regardless of the types of classes they attended. In this study, Seniorcize participation was not defined for the sample, and Seniorcize participants self-reported their Seniorcize participation. Also, Seniorcize participants self-reported the average number of days they participate in a week. Individuals were placed in the subsample of Seniorcize participants who may have received very little of the program intervention, so they may be more similar to non-Seniorcize participants for the measures of this study.

6.2.1.2 Evaluation Question 2. Is there an association between frequency of participation in Seniorcize and measures of mobility, FoF, and depression?

For the subsample of participants who engage in Seniorcize, a relationship between frequency of Seniorcize participation and depression was not supported. This finding contradicted the study by Quijano et al. (2007), which showed a reduction in depression symptoms in older adults after increases in physical activity. However, Seniorcize participants who tend to exercise more days than do others were shown to have significantly less FoF and significantly better mobility. This finding supports the study by Cumming et al. (2000), which showed that older adults with a higher FoF tend to have lower physical functioning.

6.2.1.3 Evaluation Question 3. Is there a significant difference between genders with regard to measures of mobility, FoF, and depression?

Although falls incidences were not variables of this study, gender is a significant issue in falls prevention. As discussed previously, women generally have a higher risk for falling than do men. Women are almost twice as likely as are men to experience depression, which often induces a FoF (Depression and Bipolar Support Alliance, 2006).

A Spearman correlation was computed to assess relationships between gender and the outcome variables. No significant differences existed between genders for measures of mobility and depression. On the other hand, a statistically significant positive relationship existed between gender and FoF ($p < .01$). This finding shows that male participants are more confident than are female participants in performing activities of daily living without falling. This finding may also indicate that male participants do not recognize their vulnerability to falling, as discussed in research by Lord, Sherrington, and Menz (2001).

6.2.2 Aim Two

6.2.2.1 Identify the facilitators and barriers of exercise participation at Asbury Heights. A process evaluation was conducted to examine the contextual factors that influence Asbury Heights' residents' decisions to participate in exercise. Methods of data collection included numerous key informant interviews, one focus group with Seniorcize participants, and one focus group with nonparticipants. The focus groups were used to examine the factors that influence residents' decisions to participate or not to participate in Seniorcize.

6.2.2.2 What are participants receiving from the program? Key informants' responses to this question differed but included a perception that Seniorcize is a low-impact way to keep residents active, a perception that the program increases socializing, mobility, confidence, and independence. The focus group of Seniorcize participants generally agreed that the program keeps them active and socializing through either equipment or attending classes, but no other benefits were mentioned. Each resident may have his or her own unique (vast or limited) Seniorcize experience because the Seniorcize class offerings were recently reduced, so personnel have started using films instead of instructors, and residents have limited access to equipment after hours of operation. Having different Seniorcize experiences can lead to inconsistencies in how residents perceive the benefits that different people gain from attending the actual Seniorcize program.

6.2.2.3 How satisfied are participants with Seniorcize's services and personnel? Focus group findings confirmed the key informants' perceptions that Seniorcize participants value and enjoy the exercise staff at Asbury Heights. However, participants expressed their dislike of

when substitute instructors or substitute videos are used. The socialization generated by the staff and the group classes is also valued by the Seniorcize participants from the focus group.

Key informants and Seniorcize participants also agree that there should be an increase in the staffing of exercise instructors and an upgrade in facilities and equipment. However, upper management struggles with making decisions to invest in the program's implementation without better understanding Seniorcize's effectiveness. Upper management may conclude that the vision and strategy for the program are not communicated throughout the organization or have not been developed collaboratively. Additionally, maintaining a likeable and competent exercise staff is apparently critical to increasing Seniorcize participants' satisfaction and participation.

6.2.2.4 Evaluation Question 4. What are the facilitators and barriers of the implementation of Seniorcize?

Key informants in the interviews and participants in the focus groups confirmed that Seniorcize is widely publicized at Asbury Heights, but all residents were not aware of which Asbury Heights' offerings are considered part of Seniorcize. Residents encourage each other to participate in Seniorcize and to walk around the campus. Walking and exercising tends to be done in pairs or small groups for Asbury Heights' residents. Providing social support and opportunities for residents to participate in social activities helps older adults maintain active interactions with others and may influence a decrease in falls risk factors.

Focus group data revealed high regards for Seniorcize among residents who chose to participate in the program but also some stigma among residents who do not participate in the program. The focus group of non-Seniorcize participants perceived the program to be more useful for frail residents because of the low-impact nature of the exercises, and they were not aware of the individualized nature of the program to better meet participant needs. Male

residents tended to view Seniorcize as an exercise program targeted to women. Non-Seniorcize residents also find activities such as walking, bowling, shuffleboard, putt-putt golf, and swimming at the JCC's pool as comparable alternatives to Seniorcize.

Asbury Heights' personnel consider residents who strictly use the exercise equipment (but not attend Seniorcize classes) as potential Seniorcize participants, but residents considered themselves Seniorcize participants only if they attend exercise classes. This finding may pose a problem with self-reported participation in Seniorcize and self-reported frequency of Seniorcize participation, thus contributing to the non-normal distribution of the outcome variables and possible under-reporting of participation. Even though funding and upper management's actions are limited, interviewed informants agreed that Seniorcize's main barriers of success are inadequate staffing, outdated equipment, and unattractive facilities.

Seniorcize participants in the focus group expressed the need to have in-person coaching during exercising, which is difficult with only a 1.5 full-time equivalent (FTE) exercise staff. Residents did not complain about the equipment, but key informants expressed concerns ranging from safety to lack of technology. When asked about facility concerns, residents focused on the lack of a swimming pool, but staff members were concerned about trip hazards and aesthetics. Ultimately, Seniorcize's success could be limited because residents' needs and desires are not being met. If residents are going off-site to use the swimming pool at the JCC, they may be more inclined to participate in other forms of exercise there, too. Also, if facilities are not attractive and modernized, residents may be less inclined to partake in the CCRC's offerings and might prefer other exercise venues in the community. Lastly, older adults often run errands and conduct other activities of daily living during the daytime hours while Seniorcize classes and exercise facilities are operating. This factor may limit residents' participation in this program.

6.3 LIMITATIONS

One limitation of the study was the small sample sizes of the quantitative and qualitative components, which reduced the generalizability to the larger population of high-functioning older adults. A larger sample with more heterogeneity of socio-demographic factors may have revealed greater differences across group means for the dependent variables. Similarly, another limitation was the use of convenience sampling for the outcomes evaluation. The evaluator could not scientifically generalize the total population from this study's sample because it is not representative enough. For example, the evaluator collected the data at a certain time of day on a certain day of the week, so the sample was limited to residents who were present at that given time, which is not representative of other members of the study population. However, if the survey was conducted at different times of the day and several days during the week, outcomes may have been more generalizable.

The small number of focus group participants and the use of purposive sampling methods caused the qualitative findings to not transfer to the larger study population or other contexts. Allowing residents to sign up for focus groups in response to a flyer rather than being recruited by the Asbury Heights staff would have potentially reduced bias. Also, conducting two focus groups with both Seniorcize participants and nonparticipants would have increased the validity of the focus group findings.

The variation in age among participants was narrow. There were no participants in the category known as "young-old," which is represented in people who are 65–75 years old. This may have an influence on physical performance and levels of physical activity. This study did not examine marital status or social supports available to the participants. The variables that were not included could have influenced activity levels, choices of activities, and FoF.

Participants in this study self-reported their experiences with depression and FoF. Even though the instruments were not self-administered, the information may not have been as thorough as possible because of what is known as common method bias. Common method bias, or common method variance, refers to contexts in which respondents could give honest responses, but because of a common method (e.g., social desirability, acquiescence tendency, and mood state), they give different ratings (Burton-Jones & Straub, 2004). The Seniorcize program is loosely designed. The program does not use an evidence-based curriculum, and a clear definition for Seniorcize participation does not exist. Not defining Seniorcize participation may have contributed to the similar outcomes from the intervention group and comparison group.

6.4 RECOMMENDATIONS

6.4.1 Future Research

This study's findings showed that participation in Seniorcize did not affect the improvements of balance and gait, reductions of FoF, or reductions of depression. However, the small sample size (n = 82) and the short period of time for data collection caused the generalization from this study to be limited. This study should be replicated with a larger and randomized sample and within a longitudinal design to ensure a longer follow-up period. Additionally, evaluating the effects of a well-structured intervention with clear definitions for participation might yield findings that are more accurate than the findings of this study. Also, a suggested design would compare high-functioning exercise participants to high-functioning non-

exercisers within three types of settings: community-dwelling, CCRCs, and assisted-living facilities. Studying these settings will provide an opportunity to study variables that may provide better understandings of the benefits associated with the settings in which people live.

6.4.2 Intervention Modification

According to the findings of this study, Seniorcize does not reduce targeted falls risk factors of poor balance, poor gait, FoF, and depression among high-functioning older adults. To improve how the intervention affects older adults in the future, Asbury Heights could modify Seniorcize in the following ways:

6.4.2.1 Education. Add an education component to the intervention, which now has only exercise and risk assessment components. Whether in a one-on-one setting or in a group setting, education about risk factors and prevention strategies may be useful for older adults, families, and caregivers and may also reduce FoF. Changing the beliefs, attitudes, and behaviors of residents is crucial to the success of Seniorcize. For example, Seniorcize is perceived (by some) as being for disabled or frail people. A program that is perceived to impact negatively on self-image might not be attractive to older adults. If residents receive education about how Seniorcize can improve skills or characteristics valued by the residents, participation might increase.

6.4.2.2 Personal training. Some of the non-Seniorcize residents believed that Seniorcize is too low-impact to have a benefit, so Asbury Heights might consider one-on-one personal training options for residents for a fee.

6.4.2.3 Tai Chi. Continue offering Tai Chi. Tai Chi has been well-cited in research as an effective intervention to reduce falls risk factors by improving balance and physical performance. Some evidence-based Tai Chi models include Tai Chi: Moving for Better Balance (Li et al., 2005), the Central Sydney Tai Chi Trial (Voukelatos, Cumming, Lord, & Rissel, 2007), and Simplified Tai Chi (Wolf, Barnhart, Ellison, & Coogler, 1997).

6.4.2.4 Home Modification. Because Seniorcize's target audience is independent-living residents, a home modification component could be added as a benefit to Seniorcize participants. This component could consist of a home hazard assessment by trained occupational therapists, followed by home modifications and recommendations for behavior change. Evidence-based models of home modification interventions include the VIP Trial (Campbell et al., 2005), Home Visits by an Occupational Therapist (Cumming et al., 1999), and Falls-HIT (Home Intervention Team) Program (Nikolaus & Bach, 2003).

6.4.2.5 Re-define. Staff and residents have misperceptions about the intent of Seniorcize. Asbury Heights' administrators may need strategically plan to re-define falls prevention efforts. The re-defined goals, measureable objectives, and strategies should be based on an assessment of the residents' needs and interests, the will of Asbury Heights' leadership, and the identification of the most appropriate community resources and partnerships. Some additional considerations may be gender-specific programming/classes; beginning, intermediate, and advanced level classes; and supervised access to equipment during evening hours.

6.4.2.6 Program Evaluation. A solid plan for program evaluation should be immediately incorporated into the Seniorcize implementation and/or future planning of the program. Program

evaluation should also continue throughout the life of the program. Program evaluation will ensure that Asbury Heights will be able to demonstrate the successes of Seniorcize.

6.4.2.7 Promotions. When offering or publicizing Seniorcize, Asbury Heights should promote positive self-identity. Some residents may not acknowledge falls risks because they fear negative stereotyping, believe that falls are an inevitable and unavoidable consequence of aging, and/or are embarrassed about loss of control. Non-Seniorcize residents may become more engaged by use of personal invitations from management to participate or by peer role models who can serve as real-life examples of someone who is relatable and who is participating in exercise classes.

6.4.2.8 Staffing. Asbury Heights should increase the number of exercise personnel to maximize the opportunities for residents to exercise (including after hours), have a variety of exercises for residents to select, conduct home modifications, and implement gender-specific classes. To hire more staff in a more cost-effective way, certified personal trainers and graduate exercise physiology students can be incorporated into the staffing for Seniorcize.

6.5 CONCLUSION

This mixed-methods evaluation study was used to examine how a fall prevention program (i.e., Seniorcize) influenced the reduction of fall risk factors among high-functioning residents at Asbury Heights, a CCRC, in Pittsburgh, Pennsylavania. This study was also used to study the contextual factors at the study site, which influenced program participation.

Quantitative data were collected and analyzed on dependent variables (i.e., balance, gait, FoF, and depression) for 82 high-functioning Asbury Heights residents. Results from Seniorcize participants were compared with results from nonparticipants. To explore facilitators and barriers of program participation, qualitative data were also collected via interviews with key informants and two focus groups: One contained Seniorcize participants, and one contained nonparticipants.

Quantitative results revealed that the dependent variables were not significantly different between the group of Seniorcize participants and the group of nonparticipants. For residents who participate in Seniorcize, the frequency of program participation (number of days per week) was only significantly related to depression. Among the 82 subjects, male participants had significantly less fear of falling than did females. Qualitative findings showed that the facilitators to program participation pertained to staff, equipment, class offerings, and publicity. Barriers to participation included pre-conceived notions of Seniorcize participants, competing priorities, and limited personnel.

To improve the impact of the Seniorcize program, it was recommended that Asbury Heights' staff enhances the intervention by adding exercise variety, home modifications, and education about fall risk factors. Additionally, it was suggested that Asbury Heights' staff redesigns the Seniorcize program to become more evaluable and customizes promotions to peak interest of nonparticipants.

APPENDIX A

TINETTI ASSESSMENT TOOL

Tinetti Assessment Tool: Balance

Patient's Name: _____ **Date:** _____

Location: _____ **Rater:** _____

Initial Instructions: Subject is seated in a hard, armless chair. The following maneuvers are tested.

Task	Description of Balance	Possible	Score
1. Sitting Balance	Leans or slides in chair Steady, safe	= 0 = 1	
2. Arises	Unable without help Able, uses arms to help Able without using arms	= 0 = 1 = 2	
3. Attempts to arise	Unable without help Able, requires > 1 attempt Able to rise, 1 attempt	= 0 = 1 = 2	
4. Immediate standing balance (first 5 seconds)	Unsteady (swaggers, moves feet, trunk sway) Steady but uses walker or other support Steady without walker or other support	= 0 = 1 = 2	
5. Standing Balance	Unsteady Steady but wide stance (medial heels > 4 inches apart) and uses cane or other support Narrow stance without support	= 0 = 1 = 2	
6. Nudged (subject at max position with feet as close together as possible, examiner pushes lightly on subject's sternum with palm of hand 3 times.	Begins to fall Staggers, grabs, catches self Steady	= 0 = 1 = 2	
7. Eyes closed (at maximum position #6)	Unsteady Steady	= 0 = 1	
8. Turning 360 degrees	Discontinuous steps Continuous steps Unsteady (grabs, swaggers) Steady	= 0 = 1 = 0 = 1	
9. Sitting Down	Unsafe (misjudged distance, falls into chair) Uses arms or not a smooth motion Safe, smooth motion	= 0 = 1 = 2	
		Balance Score:	

Tinetti Assessment Tool: Gait

Patient's Name: _____ **Date:** _____

Location: _____ **Rater:** _____

Initial Instructions: Subject stands with examiner, walks down hallway or across the room, first at "usual" pace, then back at "rapid, but safe" pace (using usual walking aids).

Task	Description of Gait	Possible	Score
10. Initiation of gait (immediately after told to "go")	Any hesitancy or multiple attempts to start No hesitancy	= 0 = 1	
11. Step length and height	a. Right swing foot does not pass left stance foot with step b. Right foot passes left stance foot c. Right foot does not clear floor completely with step d. Right foot completely clears floor e. Left swing foot does not pass right stance foot with step f. Left foot passes right stance foot g. Left foot does not clear floor completely with step h. Left foot completely clears floor	= 0 = 1 = 0 = 1 = 0 = 1 = 0 = 1	
12. Step Symmetry	Right and left step length not equal (estimate) Right and left step appear equal	= 0 = 1	
13. Step Continuity	Stopping or discontinuity between steps Steps appear continuous	= 0 = 1	
14. Path (estimated in relation to floor tiles, 12-inch diameter; observe excursion of 1 foot over about 10 feet of the course).	Marked deviation Mild/moderate deviation or uses walking aid Straight without walking aid	= 0 = 1 = 2	
15. Trunk	Marked sway or uses walking aid No sway but flexion of knees or back, or spreads arms out while walking No sway, no flexion, no use of arms, and no use of walking aid	= 0 = 1 = 2	
16. Walking Stance	Heels apart Heels almost touching while walking	= 0 = 1	
	Gait Score:		
	Balance + Gait Score:		

APPENDIX B

MODIFIED FALLS EFFICACY SCALE

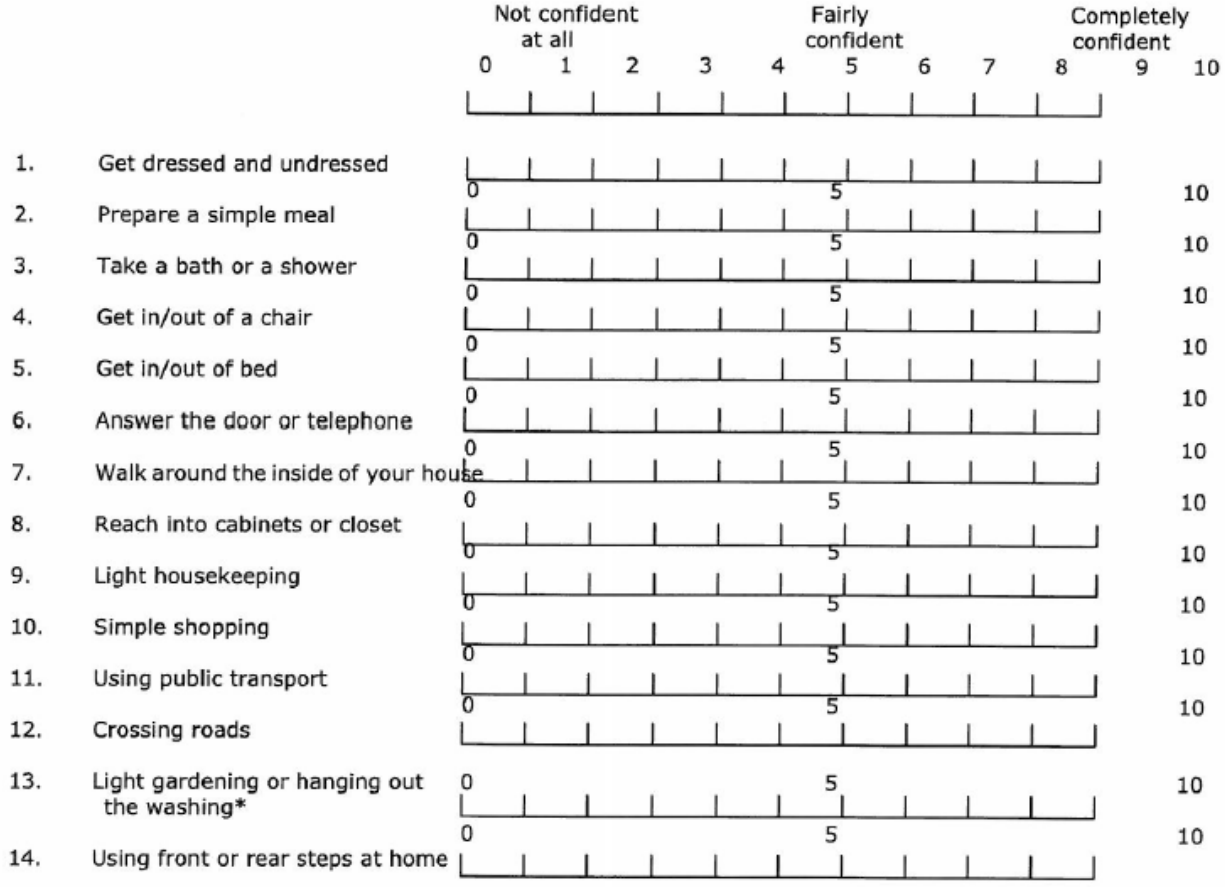
The Modified Falls Efficacy Scale

Adapted from Tinetti et al, 1990; Hill et al, 1996

On a scale of 0 to 10, how confident are you that you can do each of these activities without falling, with 0 meaning "not confident/not sure at all", 5 being "fairly confident/fairly sure", and 10 being "completely confident/completely sure"?

NOTE:

- If you have stopped doing the activity at least partly because of being afraid of falling, score a 0;
- If you have stopped an activity purely because of a physical problem, leave that item blank (these items are not included in the calculation of the average MFES score).
- If you do not currently do the activity for other reasons, please rate that item based on how you perceive you would rate if you had to do the activity today.



* rate most commonly performed of these activities

Average score/item rated = .../.....

= .....

1. Hill K, Schwarz J, et al. Fear of falling revisited. Archives Phys Med Rehabil 1996; 77:1025-1029.
2. Tinetti M, Richman D, Powell L. Falls efficacy as a measure of fear of falling. J Gerontology 1990; 45:P239-43.

APPENDIX C

GERIATRIC DEPRESSION SCALE-15

Resident's Name: _____ Record #: _____

The GDS-5/15 Geriatric Depression Scale			
Circle resident's response to questions. Each answer indicated by an asterisk (*) counts as 1 point.			
GDS-5			
1.	Are you basically satisfied with your life?	YES	**NO***
2.	Do you often get bored?	**YES***	NO
3.	Do you often feel helpless?	**YES***	NO
4.	Do you prefer to stay home rather than going out and doing new things?	**YES***	NO
5.	Do you feel pretty worthless the way you are now?	**YES***	NO
	GDS-5 Score		
If the GDS-5 score is 1 or less, you may stop here. If the GDS-5 score is 2 or more, continue with the remaining 10 questions. A GDS-5 score of **2 or more indicates possible depression**.			
6.	Have you dropped many of your activities and interests?	**YES***	NO
7.	Do you feel that your life is empty?	**YES***	NO
8.	Are you in good spirits most of the time?	YES	**NO***
9.	Are you afraid that something bad is going to happen to you?	**YES***	NO
10.	Do you feel happy most of the time?	YES	**NO***
11.	Do you feel you have more problems with memory than most?	**YES***	NO
12.	Do you think it is wonderful to be alive now?	YES	**NO***
13.	Do you feel full of energy?	YES	**NO***
14.	Do you feel your situation is hopeless?	**YES***	NO
15.	Do you think that most people are better off than you are?	**YES***	NO
	GDS-15 Score		
A GDS-15 score: **5-9 indicates possible depression; above 9 usually indicates depression.**			
References: Weeks SK, McGann PE, Michaels TK, & Penninx, BW. Comparing various short-form geriatric depression scales leads to the GDS-5/15. Journal of Nursing Scholarship 2003;2:133-7. Goring, H, Baldwin, R, Marriott, A, Pratt, H, & Roberts, C. Validation of short screening tests for depression and cognitive impairment in older medically ill inpatients. International Journal of Geriatric Psychiatry 2004;19:465-71.			

_____ _____

Signature of person completing form Date

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