Physical Performance and Balance Confidence

Among Community-Dwelling Older Adult Men:

The Priest Study

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ABSTRACT

Purpose: Studies examining physical performance among older adult men remain limited. The purpose of this study was to examine gait, balance ability, and balance confidence within two cohorts of Roman Catholic priests (age 60-74 years of age and 75+ years) and to analyze predictive markers of physical performance.

Participants: Subjects included 131 community-dwelling Roman Catholic priests over 60 ($\bar{x} = 76.1$; $SD = 9.0$; range: 60-97 years) living in rectories, senior housing, or religious communities in 10 states.

Materials/Methods: Subjects completed a basic demographic profile, the Berg Balance Scale (BBS), Timed Up and Go (TUG) Test, the Dynamic Gait Index (DGI), and the Activities-specific Balance Confidence (ABC) Scale. Additional assessments included BMI, blood pressure, grip strength, and the Physical Activity Scale for the Elderly (PASE). Data were analyzed using descriptive statistics, independent T tests with Bonferroni correction, MANCOVA analysis, and stepwise regression modeling.

Results: Demographic profiles revealed that 46 subjects (35%) had fallen over the past year. Eighty-six subjects (65%) were taking four or more medications. Younger priests (60—74 years) demonstrated a significantly higher ABC score than the older cohort (75 and above years) of priests (89.1 $\pm$ 12.6 vs. 78.4 $\pm$ 13.9). Significant differences ($p < 0.001$) in physical performance between the younger and older age cohorts were noted on the BBS (53.4 $\pm$ 4.8 vs. 45.5 $\pm$ 7.5), TUG (10.4 sec. $\pm$ 2.3 vs. 13.4 sec. $\pm$ 4.2), and DGI (22.6 $\pm$ 2.6 vs. 19.0 $\pm$ 4.2) respectively. Stepwise regression analysis demonstrated that age, balance confidence, a fall in the past three months, and diastolic blood pressure predicted 60% of the variance in the BBS, 61% of the variance on the DGI, and 49% of
the variance on the TUG (all $p < 0.001$).

**Conclusions:** Data findings suggest that both physiologic and psychosocial factors impact the functional profile of the older adult priest. Common tests of physical performance may be incorporated with modifiable variables to establish target interventions for balance, gait, and functional mobility.
ACKNOWLEDGEMENTS

A project of this magnitude could not have been completed without the assistance of key resources throughout the duration. Contact persons at both diocesan and religious offices helped “pave the way” for me to bring my project to fruition and subsequently test clergy at rectories, religious communities, and monasteries. I most gratefully thank Helen Johnson, Carol Hubba, John Dusendorf, Deacon Don Quigley, Father Earl, Pat Ashburn, Brother John, Father Sal Livigni, Abbot Placid, Monsignor Dombrow, Alenka Hocevar, Father McIlhenny, and David George for their assistance. These individuals arranged testing areas, provided meals, and gave me a place to sleep during the data collection phase of the project. All without cost. My friends Laura Prosser and Kerstin Polemarbo offered me inveterate moral support. Dave Kietrys gave me his spare room for overnight Philly visits. I thank my committee who, month after month, gently (and sometimes not so gently) inquired how “things were going” and helped me to establish a lifelong research agenda. I gratefully thank Chairperson Dr. Roberta Newton, whom I would meet up with at two crucial points in my physical therapy career.

And finally, to the 167 dedicated Catholic clergy who afforded me the opportunity to study their lifestyle…. Nastrowia.
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CHAPTER 1: INTRODUCTION

Demographic Perspectives

It is expected that 20% of the population will be 65 or older by the year 2020. With the rising number of baby boomers in society and a concomitant increase in life expectancy, a pivotal focus of geriatric research has become physical performance of older adults and related correlates: physical activity, body mass index, and mental well-being. While studies have targeted the interplay between these variables in older adults (Singh, Paw, Bosscher, & van Mechelen, 2006), there is a paucity of studies related specifically to older adult men.

The increase in the number of men living longer, in consideration of the quantity of studies primarily using gender-based (female) or mixed gender data, reflects the need to study older adult males. Existing census data document an increase in the elderly in the United States (US) and a concomitant increase in life expectancy in men (U.S. Census, 2008). Currently, older females outnumber older males by nearly 5 million, with both cohorts collectively representing 12.4% of the U.S. population. By the year 2010, over 40 million adults will be 65 or older, and the disproportion between men and women will remain (U.S. Census, 2008). This rising number of older adult males presents a challenge to health care and other services to assist older men in remaining independent in a variety of settings.

The escalated presence of comorbidities and associated medication regimens further necessitate careful appraisal of the many factors that influence physical performance and functional mobility. Older men have unique impairments and are
subject to related sociodemographic variables that may affect physical performance and community or home navigation. For example, recent evidence indicates that a protective response between light alcohol intake and hip fracture exists in older men (Cawthon et al., 2006); in contrast, research has linked heightened fall risk to lower levels of bioavailable testosterone (Orwoll et al., 2006) and decreased BMI (Honeycutt & Ramsey, 2002). Finally, exercise programs aimed at reducing fall risk in older adults may be of insufficient intensity to cause functional mobility changes in older men (Salminen et al., 2008). A gender-specific analysis of physical performance among older adult males is warranted, along with analysis of predictive determinants of age-related performance.

**Physical Performance in Older Men**

Further reasons to study older males are compelling. While the number of older females far exceeds males, greater numbers of older men die from unintentional injuries in the home (Runyan et al., 2005). Reasons for this high mortality are poorly understood, though some postulate that riskier behavior is more prevalent among older males. Current evidence also suggests that the greater numbers of documented falls for women may be in part due to men not reporting their falls or injuries (Fletcher & Hirdes, 2002). The establishment of data regarding age-related physical performance differences in men will afford health care practitioners benchmark comparison values to utilize for subsequent gender-related and demographic analyses. Data will also:

1. Aid in detecting differences associated with the operationalized frailty phenotype, including slow walking speed, grip strength, and low physical activity (Fried et al., 2001).
2. Provide valuable physical performance scores to assist in screening older men at risk for falls, in accordance with established cut-off indices.

3. Establish predictive markers in conjunction with age-related differences.

Physical assessment of older males has become an increasingly important priority in health care. Predictive determinants for late-life longevity in men include regular exercise, whereas smoking and obesity impede physical function (Yates, Djousse, Kurth, Buring, & Gaziano, 2008). Understanding age-related differences in balance and gait will provide insight into the degradation of physical performance in older men and will clarify previous reports of large variations in walking and balance abilities among the very old (von Heideken, Wagert, Gustafson, & Lundin-Olsson, 2009). Finally, current evidence suggests that older men should be screened for falls more thoroughly, since 1 in 3 elderly male veterans who sustains a hip fracture dies within 12 months (Bass, French, Bradham, & Rubenstein, 2007).

The framework of this research project proposed that physical and behavioral variables influence physical performance, or the ability to execute motor tasks to function independently in the home or community. Furthermore, this study hypothesized that there is an age-related decrease in physical performance measures in older men. The sample consisted of a homogenous group of Roman Catholic clergy in order to afford the investigation of physical performance measures by reducing potential confounding variables. Clergy included both diocesan and religious priests. The study analyzed a battery of gait and balance tests to assess physical performance. Multiple gait, balance, and functional tasks were included, since the decline in physical performance may be attributed to the accumulation of deficits in all of these domains (Duncan et al., 1993).
Advantages of the selected test instruments include their relative ease of administration in a variety of domiciles and health care settings.

The data bank established by this study will serve to enhance limited existing normative data related to physical performance in older men. The study used the Berg Balance Scale (BBS) to assess balance, or the ability to maintain the center of mass within the base of support. The BBS is a frequently used quantification of balance ability in older adults and in patients with neurological diagnoses. The test has demonstrated appropriate validity and reliability in the geriatric population (Berg, Wood-Dauphinee, Williams, & Maki, 1992). The study also used the Time Up and Go (TUG) Test and Dynamic Gait Index (DGI) to assess functional mobility and gait, or the coordinated, rhythmic translatory progression of the body through alternating propulsive lower extremity motion. The TUG Test is a timed measure of gait and functional mobility whereby an individual stands, negotiates a 10 ft (3 m) gait course, turns, and returns to the seated position. This test has demonstrated predictive validity for fall risk (Shumway-Cook, Brauer, & Woolacott, 2000; Kristensen, Foss, & Kehlet, 2007). The DGI assesses the subject’s ability to superimpose functional task demands on the gait cycle. This more recently developed instrument has demonstrated concurrent validity with gait velocity on a 6 m gait course (McConvey & Bennett, 2005).

**Balance Confidence: Association with Balance Performance**

This study discerned the extent to which balance confidence and balance performance are linked in an older adult male population. Balance confidence is defined as the level of security an individual has with maintaining the center of mass within the base of support. The study used the Activities-Specific Balance Confidence (ABC) Scale
to measure perceived balance confidence among male subjects (Powell & Myers, 1995). This test has demonstrated sufficient concurrent validity and reliability properties and has been reported to demonstrate less gender bias than other falls efficacy instruments (Myers, Fletcher, Myers, & Sherk, 1998; Powell & Myers, 1995). Examining the association between balance performance and balance confidence shows the strength of the linkage between these two variables and determines whether confidence levels actually parallel performance ability. In addition, findings clarify whether a concomitant fear of falling is associated with lower levels of balance confidence (Legters, 2002). Independent predictors of fear of falling, including anxiety and depression conditions, have already been established (Gagnon, Flint, Naglie, & Devins, 2005).

Since balance and gait impairments noted in older men may also heighten the risk for unintentional injuries and falls, this study also clarifies conflicting analyses regarding physical activity, balance confidence, and fall risk. In an extensive prospective cohort study in conjunction with the Osteoporotic Fractures in Men Study, Chan et al. (2006) established a significant relationship between increased risk of falling and higher levels of self-reported physical activity. This association was maintained even in elderly men with preserved leg power. The study thus refutes past beliefs that only more frail and immobile men demonstrate the greatest risk for falls; however, the study did not address the impact of fear of falling.

**Specific Aims**

Analysis of physical performance in the geriatric population is complex and multi-faceted. Older adults’ physical performance is closely intertwined with an assemblage of sociodemographic, physical health, and affective/mental health factors;
moreover, the nature of the environment itself further impacts physical performance. Few studies have addressed age-related differences associated with physical performance in the older adult male population; furthermore, studies examining physical performance and balance confidence domains have failed to capture large numbers of male subjects. This study examined the age-related differences in physical performance among community-dwelling Roman Catholic priests over the age of 60 years.

Two germane components of physical performance include balance and gait tasks. Balance and gait dysfunction in the elderly is associated with an increase in postural sway, slower reaction times, increased risk of falls, and early admission to long-term care facilities (Lajoie & Gallagher, 2004; Morley, 2002; Woolacott & Tang, 1997). Recent investigations of physical activity, physical performance, and self-reported functional status in men either do not address age-related differences in measures of physical performance or are limited by small sample sizes. This study established key age-related differences in the physical performance of community-dwelling men and provides a data bank for further comparisons. Test batteries used in this project will permit expansion of the research program to other domiciles and health care settings. In addition, this study served as a benchmark in comparing balance ability with balance confidence in older men. Subsequent studies can build upon this foundational analysis to 1) examine physical performance of men residing in a variety of domiciles and 2) enhance prediction of successful aging, as well as identify critical markers for frailty.
Aim 1: Examine the age-related differences in physical performance among community-dwelling men over the age of 60 years.

Research Question 1A (RQ1A): Excluded Subjects. Do subjects excluded from the study demonstrate different demographic and physical performance characteristics than those included?

Research Hypothesis: If there are differences between included and excluded subjects, then excluded subjects will have demonstrated significantly more falls over the past year, lower grip strength, and slower sit to stand performance.

H₀/Null: There are no demographic or physical performance differences among individuals included and excluded in the study.

Research Question 1B (RQ1B): Medication Utilization Covariate. Do subjects over the age of 75 years demonstrate differences in total number of medications taken compared to those between the ages of 60-74 years?

Research Hypothesis: If there are differences in medication utilization between subjects 60-74 years of age and those over 75 years, then those over 75 will be taking significantly more medications.

H₀/Null: No medication utilization differences exist between subjects in the two age cohorts.

Research Question 1C (RQ1C): Age-Related Differences. Do men over the age of 75 years demonstrate differences in balance and gait performance compared to those between the ages of 60-75 years?
**Research Hypothesis:** If there are significant differences in balance and gait performance in community-dwelling men between the two age cohorts, then men over the age of 75 will demonstrate significantly lower physical test performance.

\textbf{H}_0/Null: Men 75 years of age and older will not demonstrate differences in balance and gait performance compared to a younger cohort of men age 60-74 years.

**Research Question 1D (RQ1D): Performance Prediction.** What variables predict physical performance differences among community-dwelling older adult men over the age of 60?

**Research Hypothesis:** If there are differences in age-related physical performance (60-74 years versus 75 and above), then physical activity, BMI, and grip strength will predict differences among community-dwelling men over the age of 60.

\textbf{H}_0/Null: No variables predict physical performance differences in community-dwelling men older adult men.

**Aim 2:** Examine the association between balance ability and balance confidence in community-dwelling men over the age of 60 years.

**Research Question 2: Balance Confidence Prediction.** What variables predict balance confidence in community-dwelling older adult men over the age of 60?

**Research Hypothesis:** If there is a relationship between balance ability and balance confidence in community-dwelling older adult men over 60 years, then balance ability, gait speed, and age will predict balance confidence.
**H_{0/Null}:** No variables predict balance confidence in community-dwelling men over the age of 60.

There is a critical need to address needs of older adult men and explore age-related differences in physical performance and balance confidence. By analyzing the physical performance profile of a well-controlled selected population of older adult men, Roman Catholic priests and brothers, this study will aid in identifying significant age-related differences in physical performance, along with predictive determinants of gait and balance ability. Findings can thus enhance development of interventions and resources to promote independent living throughout the later aging continuum.
CHAPTER 2: LITERATURE REVIEW

Physical performance is defined as the execution of motor tasks requisite to independent home and community navigation (Guralnik & Simonsick, 1993). This study derives its theoretical framework from the premise that the older adult male’s physical performance is closely intertwined with a constellation of both personal and environmental factors (Figure 1). Thus physical performance forms the framework’s nucleus and is:

1. Influenced by both personal factors such as physical health, mental health, and sociodemographic variables.
2. Affected by the nature of the environment itself, including assisted living, nursing home, and private residence facilities.

Key indicators of physical performance include gait and balance variables.

Operationally, balance is defined as the ability to maintain the body’s center of mass within the limits of stability (Woolacott & Tang, 1997). Gait is the coordinated, rhythmic translatory progression of the body through alternating propulsive lower extremity motion, with concomitant functional tasks performed during the cycle (Odasso-Montero et al., 2005).

This review of the literature will focus on two key constructs within the domain of physical performance: balance and gait ability. The chapter will also address select sociodemographic, physical health, and affective and mental health variables. Also discussed in this chapter are special populations of men, such as veterans and clergy, along with tests pertinent to balance, gait, and balance confidence.
Studies pertaining to physical performance in men have traditionally examined cardiovascular and disease-specific domains of physical performance. For example, in their Harvard Men’s Study ($N = 7,337$), Lee, Sesso, Oguma, and Paffenbarger (2007) determined that an inverse relationship exists between perceived level of exertion and coronary heart disease. Furthermore, similar studies with large sample sizes, such as the Osteoporotic Fractures in Men Study ($N = 5,995$), have not captured extensive psychosocial or balance confidence data in conjunction with physical performance tests (Chan et al., 2007). While considerable research has studied balance ability, gait dysfunction and fall risk in older adults (Tinetti, 1986; Tinetti, Richman, & Powell, 1990), research that examines these variables in adult men alone is limited.
Typically, men have represented less than 25% of the sample size in recent studies (Hatch, Gill-Body, & Portney, 2002). For example, in their study of older adults transitioning to frailty, Kressig et al. (2001) analyzed the association between demographic, functional, and behavioral characteristics. Subjects included 287 geriatric clients (mean age = 80.9 yrs + 6.2; range: 70-98) who had fallen at least once over the past year. Individuals who were fearful tended to walk slower, and assistive device use was associated with an increased likelihood of having fear of falling (OR: 4.4; 95% CI = 2.7-7.2/ABC Scale). The sample, however, included only 17 male subjects (6%).

Similarly, in Newton’s (1997) study of physical performance values among 251 inner city community-dwelling adults, only 53 (21%) of the tested subjects were male.

Functional performance studies that examine women to obtain normative data (Isles, Choy, Steer, & Nitz, 2004) outnumber those with male subject counterparts.

Two pertinent studies discerned both age and gender-related differences in physical performance among community-dwelling older adults and compared physical performance across three major decades (Steffen, Hacker, & Mollinger, 2002). Ninety-six subjects between the ages of 61 and 89 years performed the Six-Minute Walk Test (SMWT) (Camarri, Eastwood, Cecins, Thompson, & Jenkins, 2006), the BBS (Berg et al., 1992), and timed comfortable and fast gait speed batteries. Their findings demonstrated a trend of age-related decline in physical performance measures, which was observed in both men and women. Unfortunately, male sample sizes were small and limited in ethnic diversity. In a later study of 83 adults over the age of 50 years, Steffen and Mollinger (2005) expanded the number of performance measures to include the Multi-directional Reach Test (MDRT) (Newton, 1997), the BBS, the ABC Scale (Powell
& Myers, 1995), and Physical Performance Test (PPT) (Guralnik et al., 1994). Age was a significant predictor for test performance and performance measures, and males generally demonstrated a significantly higher level of balance confidence (ABC score) than females. Male sample sizes again remained small and limited in diversity. Findings of these studies confirm earlier analyses that reflect age-related balance performance degradation for females (Isles et al., 2004) and males (Lusardi, Pellechia, & Schulman, 2003).

**Balance**

Several studies have examined balance in older men using both forceplate systems and clinical/research test instruments. Balance impairments have been associated with increased length of in-patient hospital stays (Juneja, Czyny, & Linn, 1998) and greater fall risk (Studenski, Duncan, & Chandler, 1991; Honeycutt & Ramsey, 2002). Existing single leg stance reference values in older men have demonstrated progressive deterioration of unipedal stance time (Jedrychowski, Mroz, Tobiasz-Adamczyk, & Jedrychowska, 1990; Springer, Marin, Cyhan, Roberts, & Gill, 2007). Studies have also demonstrated poorer performance on common clinical balance tests in older male age-related cohorts (Steffen & Mollinger, 2005).

Two additional studies more specifically linked balance deficits with balance confidence decline (Table 1). Binda, Culham, and Brouwer (2003) assessed the inter-relationship between balance control, fear of falling, gait speed, and lower extremity strength among community-dwelling adults. Forty community-dwelling older adults (27 female/13 male; 65-86 years of age) participated. The study measured subjects’ limits of stability on a force platform device and tested muscle strength testing using the Cybex II
system. Results indicated that subjects with fear of falling demonstrated concomitant decreased limits of stability excursion. Those who demonstrated the greatest balance confidence had larger anterior-posterior excursions on the forceplate. There were no significant differences in lower extremity isometric strength between the fearful and non-fearful groups. Of note, only one male subject was in the fear of falling group. Lajoie and Gallagher (2004) performed a similar study that included greater numbers of male subjects. Of 125 older adults in the project, 45 were identified as fallers and 80 were identified as non-fallers based upon their recent fall history. Results of the study demonstrated that fallers tended to oscillate more in their postural sway on the forceplate system. In addition, the faller group had significantly lower ABC and BBS scores, supporting the association between both balance ability and confidence noted by Binda et al. (2003).

In their male subject only trial, Paillard, Lafont, Costes-Salon, Riviere, and Dupui (2004) studied the effects of brisk walking on static and dynamic balance, locomotion, body composition, and aerobic capacity in aging healthy active men. Twenty-one older males between the ages of 63 and 72 years of age who routinely performed at least three hours of physical exercise per week participated. The study randomized subjects into either a control or exercise group. Subjects in the experimental group performed an individualized exercise program tapered to their lactate threshold values, which were obtained during VO\textsubscript{2} maximum testing. Results of the study demonstrated a significant improvement in lateral balance performance in the experimental group participants. Older men in this group demonstrated less sway amplitude on the forceplate system. Results did not note any significant changes in static balance, gait parameters, or bone density. A
brisk walking intervention thus can be considered as a viable intervention for improving
dynamic balance in men, particularly lateral stability. Literature has previously reported
the link between lateral postural instability and falls (Rogers & Mille, 2003).

Table 1

*Focused Balance Performance and Balance Confidence Studies*

<table>
<thead>
<tr>
<th>Study</th>
<th>Subjects</th>
<th>Measures</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Binda, Culham, &amp; Brouwer (2003)</td>
<td>40 Community-dwelling Elderly &gt; 65 yrs <em>(13 males; 27 females; range: 65-86 yrs.)</em> Subjects dichotomized into fear of falling group (mean age: 77.1 ± 0.9) and control group (mean age: 72.5 ± 1.0)</td>
<td>Limits of stability-Force Platform Isometric Muscle Strength Testing-Cybex II Gait Speeds ABC Scale BBS</td>
<td>Control group displayed greater COP excursions Significant Spearman correlations between ABC scores and ant/post. COP excursions (rho = .65; p &lt; .001) No significant diff. in strength between fearful:/non-fearful groups (p &lt; 0.05)</td>
</tr>
<tr>
<td>Lajoie &amp; Gallagher (2004)</td>
<td>125 Community-dwelling older adults dichotomized into faller (mean age = 75.5 ± 3.14) and non-faller groups (mean age=73.8 ± 2.75) <em>(10 male fallers/29 non-fallers)</em></td>
<td>Demographic and Fall History Questionnaire BBS Postural Sway and Reaction Time</td>
<td>Signif. Correlations: BBS/ABC r = .81 BBS/Reaction Time r = 0.68 p(0.05) Fall Prediction: Variables: Mean Reaction Time ABC #1/Berg #14 Cut-offs for falls: BBS = 46 ABC = 67</td>
</tr>
</tbody>
</table>
Gait

Earlier biomechanical analyses of older male adults’ gait patterns have indicated a slower walking speed, shorter stride length, and longer stance phase (Murray, Kory, & Clarkson, 1969). Older men over the age of 80 years demonstrated greater toeing-out during the gait cycle. Bohannon (1997) and Steffen, Hacker and Mollinger (2002) further documented gait speed reference values for older men between the ages of 60-79 years and noted a progressive increase in timed gait speed from one age cohort to the next. Slow gait velocity (less than 0.7 m/s) among older adults is predictive of falls and the need for caregiver assistance (Odasso-Montero et al., 2005). Benefits of habitual walking among older adults, moreover, are improved physical function and VO\textsubscript{2} maximum in older adults (Wong, Wong, Pang, Azizah, & Dass, 2003).

Few focused studies have extended gait analysis to include its relationship with fear of falling in the elderly. Fear of falling may be defined as the phobic response to an abnormal fall, slip, or trip which ultimately limits performance of daily activities (Legters, 2002). In their analysis of 95 community-dwelling adults (mean age = 74 ± 8.5; range: 60-97 years; 28 males), Chamberlin, Fulwider, Sanders, and Medeiros (2005) analyzed gait variables using the GAITRite computerized electronic walkway system. The study used scores on the Modified Falls Efficacy Scale (MFES) (Jorstad, Hauer, Becker, & Lamb, 2005) to partition the group, e.g. as “fearful” or “fearless.” Gait speed was appreciably slower; however, results noted a significantly longer stride width and prolonged double support time. Five subjects included in the fearful group were men, possibly indicating an inherent reluctance among men to disclose a perceived fear.
Additionally, some items on the MFES are female-biased (e.g. housework), making it difficult for men to respond appropriately.

While the literature suggests a progressive degradation in gait performance with aging, current kinematic findings during additional gait-related tasks have also noted the contrary. For example, Mian, Narici, Minetti, & Baltzopolous (2006) examined movement strategies used by 13 young adult (range: 23-36 years) and 15 healthy community-dwelling elderly men (range: 73-84 years). During negotiation of a three-step staircase, the younger and older men did not display any major differences in center of mass (COM)/center of pressure (COP) separation or peak tri-directional COM velocities.

**Sociodemographic Factors**

**Ethnicity**

Previous research has examined sociodemographic factors related to physical performance in older African-Americans and Hispanic males, as well as in older men living in the Netherlands, Italy, and Finland. These factors include bone mineral density and reduced prevalence of vertebral fractures in men (Tracy et al., 2006), and higher prevalence of fear of fall among African-American older adults (Kressig et al., 2001). International studies have focused on physical performance abilities (Van den Brink et al., 2003) and self-reported disability.

In a longitudinal study, Andresen et al. (2006) examined risk factors for falls, fear of falling, and falls efficacy among 998 late middle-aged community-dwelling African Americans individuals (41.8% men). Subjects completed the Falls Efficacy Scale (FES) and Center for Epidemiologic Studies Depression Scale CES-D Scales. Variables predictive of prospective falls included female gender, a prior history of falls, higher
levels of education, and prominent depressive symptoms. Elevated depression scores were also predictive of fear of falling, a finding consistent with Kressig et al. (2001) and Gagnon et al. (2005). In terms of gender findings, males were less at risk for potential falls.

**Fall Risk**

Fall risk has been a pivotal theme in addressing physical performance in older populations, including older adult males. Falls are the primary cause of nonfatal injuries requiring medical attention in the United States (Schiller, Kramarow, and Dey, 2007). While the literature supports that more women between the ages of 65-85 years sustain falls, fall rates are similar for both genders over 85 years. Schiller et al. (2007) noted that fall rate episodes of men per decade were similar to those of women; that is, men over the age of 80 years sustained more falls per year than those aged 65-69 years, and those over the age of 80 years sustained more recurrent falls. Of note, more older adult men die from injuries occurring during a fall episode. In a specific analysis of community-dwelling men over the age of 60 years, Honeycutt and Ramsey (2002) identified that poor balance, slower gait velocity, and a decreased BMI were significant impairments distinguishing older male fallers from non-fallers. Gait impairments and particularly gait velocity have been identified as major fall risk determinants (Fletcher & Hirdes, 2002, Odasso-Montero et al., 2005; Tiedemann, 2005). Additional fall risk factors in men include: lower bioavailable testosterone levels (Orwell et al., 2006), a history of chronic alcohol intake (Cawthon et al., 2006), and a history of fall episodes (Friedman et al., 2002).
**Physical Factors**

**Comorbidities and Medications**

Older adult men may have comorbidities and polypharmacy issues that affect physical performance, including Osteoporosis, Coronary Heart Disease, and Metabolic Syndrome. Four major drug classes that predispose older men to fall episodes include antidepressants, benzodiazepines, antiepileptic, and antipsychotics (Hartikainen, Lonnroos, & Louhivuori, 2007). In addition, sedative side effects from these medications may alter physical performance. Current evidence suggests that BMI, gait distance in the SMWT, and blood triglycerides were independent predictors of calcaneus bone density among older men over the age of 70 years (Tang et al., 2007). Regarding physical activity for older men, Lee et al. (2007) noted that recommended activity levels equal to or greater than three metabolic equivalents (METS) might not be adequate for older men with limited fitness levels. Furthermore, a reduced physical performance level and subsequent heightened fall risk in older men has been associated with bioavailable testosterone levels (Orwell et al., 2006). The link between these variables is unclear; however, lower circulating testosterone has also been associated with a combined dyslipidemia and insulin resistance disorder, Metabolic Syndrome, in elderly men (Maggio et al., 2006).

**Strength**

Significant isometric, isotonic, and isokinetic strength decline has been reported in men over the age of 60 years in both upper and lower extremity musculature (Runnels,
Bemben, Anderson, & Bemben, 2005). Knee extensor strength loss may reach a critical threshold point (Manini et al., 2007) and result in a significantly diminished gait speed (less than 1.22 m/sec). Previous work has documented muscle mass loss of 25% in men between the ages of 25-55 years (Balagopal, Rooyackers, Adey, Adey, & Nair, 1997). In a longitudinal study of men and women aged 75 to 80 years, Rantanen, Era, and Heikkinen (1997) demonstrated a progressive but variable amount of weakness among upper and lower extremity muscle groups. Decline in grip strength tended to be greater among older females and has been considered as one of the common markers for frailty (Fried et al., 2001) and Alzheimer’s Disease (Buchman, Wilson, Boyle, Bienias, & Bennett, 2007). Intervention strategies for lower extremity strengthening in older men have resulted in improved sit to stand performance, gait, and transfers (Chandler, Duncan, Kochersberger, & Studenski, 1998; Sauvage et al., 1992). Performance times on the Five Times Sit to Stand Test (FTSS) that are longer than established cut-off scores of 11.4 seconds (60-69 years), 12.6 seconds (70-79 years), and 14.8 seconds (80-89 years) suggest significantly slower performance values (Bohannon, 2006).

Studies have examined gender-related physical performance comparisons, including strength analysis, among older persons residing in long-term care facilities. In a cross-sectional study of older adults living in the Netherlands, Singh, Paw, Bosscher, and van Mechelen (2006) analyzed physical fitness and functional performance variables among 226 elderly residents (N = 226; 19% men) of six long term care facilities. Subjects completed the Lasa Physical Activity Questionnaire and Groningen Fitness Test for the Elderly (GFE) (Van Heuvelen, Kempen, Brouwer, & de Greef, 2000). Gender comparisons noted that men demonstrated greater knee and elbow extension strength,
whereas females demonstrated greater flexibility in the Sit and Reach test. Spearman rho correlational analysis ($p < 0.05$) determined that gait velocity in men was strongly associated with both ankle dorsiflexor strength ($r = -0.65$) and picking up a pen ($r = 0.66$); in women, significant correlations were found between gait speed and chair rise performance ($r = 0.61$) and the pen grasp task ($r = -0.61$).

**Physical Activity Restriction and Fear Avoidance**

Fear of falling in the elderly may be associated with substantial physical activity avoidance. In their analysis of data obtained from the Canadian Minimum Data Set for Home Care, Fletcher and Hirdes (2004) studied outcomes obtained from 2,304 seniors (28% men) utilizing home care services. The study specifically targeted areas of fear avoidance and activity restriction. Forty-one percent of clients indicated that they restricted their activity level because of fear of falling, and these findings parallel previous published reports (Li, Fisher, Harmer, McAuley, & Wilson, 2003). A logistic regression model determined that greater needs for informal support (e.g. assistance from family or friends for ADL’s) and being alone for several hours during the day were significant predictors of activity restriction secondary to decreased balance confidence. Lastly, findings revealed that men were less likely to restrict their activity because of an associated fear of falling. Results of the study corroborate their earlier findings (Fletcher and Hirdes, 2002), which demonstrated that males may actually show greater fall risk because of their tendencies to restrict activities less and take greater risks.
Behavioral and Mental Health Factors

Balance Confidence

Balance confidence is defined as the degree of self-efficacy an individual has maintaining balance control while engaged in a specific domain of activities (Powell & Myers, 1995). This self-efficacy reflects the level of security maintaining the center of mass within the base of support. Fear of falling is associated with the negative pole of the balance confidence spectrum; furthermore, this concern among the elderly can inhibit functional performance and activities of daily living. Measurement of balance confidence has expanded from the use of a single dichotomous fear of falling question (Do you have fear of falling?) proposed by Maki, Holiday, and Topper (1991) to more specific quantitative scales such as the FES (Tinetti et al., 1990) and ABC Scale (Powell & Myers, 1995). Although originally designed for community-dwelling older adults, the ABC tool has been extrapolated for use in individuals with stroke (Salbach et al., 2006) and lower extremity amputation (Miller & Deathe, 2004). In their recent systematic review of fear of falling measures, Scheffer, Schuurmans, van Dyk, van der Hooft, and Rooij (2008) noted that the vast number of available measures precludes effective analyses of demographic correlates of and interventions for fear of falling.

Studies examining balance confidence in older males conflict or remain limited by small sample sizes. Independent correlates of fear of falling have generally included female gender, poor reported general health, and fall history (Zijstra et al., 2007). Fletcher and Hirdes (2002) reported that older men were less likely to restrict their activities from fear of falling and admit limitations in balance confidence. This may be, in part, due to their embarrassment or fear in reporting episodic fear of falling. Gender
comparisons in balance confidence have generally indicated higher confidence levels among male subjects (Steffen & Mollinger, 2005; Myers et al., 1996), and no relationship with balance and physical performance. On the other hand, Klima & Newton (2006) found a significant association between balance confidence and all MDRT excursions among 24 older community-dwelling men (r = .60-.72; p < 0.05).

Hatch et al. (2003) studied the relationship between balance confidence and balance performance in older adult subjects using the ABC Scale, BBS, and TUG. Subjects included 50 community-dwelling elderly subjects between the ages of 65 and 90 (mean age = 81.7 ± 6.7 years; 46 female/4 male). Results of a step-wise regression analysis revealed that 57% percent of the variance in balance confidence could be attributed to balance performance. ABC scores were lower for individuals determined to be at fall risk than those who were not (x = 61.9 vs. 86.8). Furthermore, BBS scores demonstrated significant correlations with ABC scores (r = 0.752; p < 0.05) and TUG scores (r = -0.810; p < 0.05). Results of the study support the link between balance confidence and balance performance seen in other studies (Binda et al. 2003; Klima & Newton, 2006). However, overall demographic results mirror trends observed in prior studies: 1) small numbers of male subjects, 2) lack of gender-related comparisons, and 3) minimal data examining physical performance and balance confidence in males over the age of 75 years.

**Depression**

The added dimension of a depression condition can substantially impair participation in virtually all activities of daily living. Depression is a behavioral condition characterized by a persistent disruption in mood with simultaneous interruption in
thoughts. Major depression is defined by the Diagnostic and Statistical Manual of Mental Disorders (1994) as a cascade of five or more major symptoms over a two week period, including feelings of worthlessness, fatigue, loss of energy, and a depressed mood which is sustained throughout the day. Feelings of loneliness and apathy may contribute to and exacerbate the depressed state (Carter, 2006). Recent evidence suggests that older adult men may be susceptible to unique neuropathologic changes associated with depression such as a greater decline in brain frontal matter volume (Lavretsky, Kurbanyan, & Ballmaier, 2004). Analyses of veterans attending VA gait and balance clinics have cited depression rates as high as 23% among male participants (Bishop, Meuleman, Robinson, & Light, 2007). Recognizing the importance of the association of depression with other variables, researchers have examined this behavioral condition in physical performance studies.

In their analysis of older adults transitioning to frailty, Kressig et al. (2001) analyzed the association between select demographic, functional, and behavioral characteristics. Subjects included 287 geriatric clients transitioning to frailty (mean age = 80.9 ± 6.2; range 70-98) who had fallen at least once over the past year. Subjects completed the ABC, FES, and CES-D (Radloff, 1977), as well as a battery of gait and balance tests, which included a functional reach test, timed 360 degree turn, 10 m walk test, single limb stance test, and three chair stands. Seventy-two participants were classified as depressed, and there was a significant correlation between the depression and fear of falling (p < .001). Gagnon et al. (2005) subsequently noted similar findings, in which depression and anxiety disorders were independently associated with fear of falling. Interventions targeting depressed older adult males have included both exercise
Environmental Factors and Physical Performance

The nature of the living environment influences physical performance and functional mobility. The majority of studies related to physical performance use community-dwelling older adults, as evidenced by the preceding review of studies. Seniors who stayed at home alone for several hours daily were more likely to restrict their activities and interaction with the environment (Fletcher & Hirdes, 2004). Furthermore, environmental barriers may further impede community interaction. Filiatrault, Desrosiers, and Trottier (2009) noted that living in a smaller city or rural area were risk factors for developing a fear of falling condition.

In a survey of 902 physical therapists above the age of 60 years, Brown, Kern, and Barr (2003) studied factors affecting community ambulation, specifically prevalent weather, and slippery and uneven floors. Both men and women respondents noted intrinsic and extrinsic causes of decline in functional ambulation. The study analyzed data according to decade-related age cohorts. Major extrinsic factors impeding community ambulation across all groups included concerns regarding tobacco use and, inclement weather. Pain, fear of falling, and physical endurance were the primary intrinsic barriers.

The transition to frailty may require institutional placement due to worsening impairments and functional limitations (Fried, 2001). Research has examined both physical and psychosocial variables of nursing home residents. In a cross-sectional study,
Sieri & Beretta (2004) studied lower extremity isokinetic strength, power, dynamic postural stability, and gait in 40 nursing home residents (13 male, 27 female). Subjects additionally completed quality of life questions. Males who had fallen in the prior year demonstrated significantly decreased knee flexion and ankle plantarflexion torques. Females who had fallen in the prior year showed a decline in knee extension peak torque and a slower walking speed. These findings corroborate previous studies citing gender-related patterns of strength differences among both nursing home and community-dwelling elderly subjects (Rantanen et al. 1997; Singh et al. (2006)). An extension of this study will be the examination of elderly priests residing in nursing homes to confirm performance findings of older adults residing in long-term care institutions.

**Physical Performance Analyses in Select Populations**

**Veterans**

Studies with community-dwelling male veterans have contributed substantially to the body of literature related to the health and physical performance of older males. Recent work by Boeninger, Shiraishi, Aldwin, and Spiro (2009), in the Veterans Affairs Normative Aging Study, determined that older men reported less stress ratings in response to everyday problems. Seminal work by Duncan, Studenski, Chandler and Prescott (1992) established that fall risk increased with diminished Functional Reach Test excursions among 217 elderly male veterans. Brach and VanSwearingen (2002) examined the relationship between physical impairments, disability, and physical performance in their study of 83 community-dwelling older male veterans. Physical performance measures included the Physical Performance Test, while impairment-related measures consisted of an active ankle range of motion flexibility assessment and grip
strength testing. Disability instruments included the Modified Gait Abnormality Rating Scale (GARS-M) (VanSwearingen, Pascal, Bonino, & Yang, 1996) and a timed 6 m gait course. Following a step-wise logistic regression, results demonstrated that gait speed, fall risk, and grip strength contributed independently to the physical performance profile of the older male subjects. This cluster of impairment and disability variables explained 68% of the variance in physical performance. The study omitted, however, psychosocial assessments that might have contributed to physical performance and function.

Means et al. (2003), however, later examined this psychosocial aim in a quasi-experimental study. Studies incorporating experimental and quasi-experimental designs using older male veterans have been sparse. For their analysis of the psychosocial effects of an exercise program in older men, the authors recruited primarily male veterans from a local medical center. The study characterized subjects as “fallers” if they had sustained a fall over the past month and established a non-faller control group to compare with the intervention group data. The study administered four major measures to track outcomes: the Index of Self-Esteem (ISE), Geriatric Depression Scale (GDS), Arthritis Impact Measurement Scale (AIMS), and Functional Obstacle (FOC) Course (Finch, Brooks, Stratford, & Mayo, 2002). Interventions included a comprehensive exercise program of stretching, Theraband strengthening exercises, endurance, and coordination activities. Post-intervention findings of the study demonstrated that the faller group showed significantly improved scores in the ISE, GDS, FOC, and five categories of the AIMS tool.
Clergy

Clergy have afforded researchers well-controlled samples to allow longitudinal follow-up in both larger epidemiological and smaller cohort studies (Wilson, Bienias, Evans, & Bennett, 2004). For example, studies with Roman Catholic nuns have provided greater insight into the overall deterioration and neuropathology involved in both Alzheimer’s Disease (Snowdon, 2001) and parkinsonism (Aggarwal, Wilson, Beck, Bienias, & Bennett, 2006). In their cardiovascular analysis, Shah et al. (2006) demonstrated that Catholic clergy with a systolic blood pressure of 160 mmHg or more demonstrated greater decline in lower extremity function. More recent research found that level of physical activity and lower extremity strength predicted rates of mobility decline among 886 Catholic clergy (Buchman et al., 2007); in addition, the authors found decreased grip strength to be a predictor of Alzheimer’s Disease in this population of clergy (Buchman, Wilson, Boyle, Bienias, & Bennett, 2007).

Physical Performance and Balance Confidence Assessment in Older Adult Men

Comprehensive analysis in both the physical and psychosocial domains requires salient measures to appropriately assess physical performance and balance confidence. Currently, effective analysis of gait and balance ability widely utilizes four major outcomes measures, as outlined below.

Berg Balance Scale (BBS)

Considered a gold standard for assessing balance in the elderly, the BBS (Berg et al., 1992) assesses an individual’s balance performance during a series of tasks, which are graded on a five-point scale (Table 2). Fifty-six total available points are possible on the
14 routinely performed items. Tasks progress from the simple to the complex, beginning with a basic sit to stand activity and advancing to more challenging tandem and single leg balance tests (Tyson and Connell, 2009).

Berg et al. (1992) developed content validity in a three-phase process with involvement of 38 clients and 38 professionals. The instrument has confirmed concurrent validity with the Performance Oriented Mobility Assessment (POMA) (Berg et al. 1992), and has demonstrated predictive validity for assistive device use with scores below 45 (Bogle-Thorbahn & Newton, 1997). Using data from Bogle-Thorbahn & Newton (1996) and Shumway-Cook, Blaswin, Polissar, and Gruber (1997), Riddle and Stratford (1999) further delineated its specificity for identifying non-fallers. Recent cut-off scores of 46 for the BBS and 67 for the ABC have been updated to predict fall risk (Lajoie and Gallagher, 2004). Conradsson et al. (2007) determined absolute reliability of the BBS to be eight points when assessing balance ability over time in older adults living in assisted living centers.

Table 2

The Berg Balance Scale

<table>
<thead>
<tr>
<th>Format</th>
<th>14 Items</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0-4 Likert Scale Responses; 56 Total Points Available</td>
</tr>
</tbody>
</table>

**Validity**

Concurrent: Highly correlated (+.91) with Performance Oriented Mobility Assessment (Berg et al., 1992)

Predictive Validity: Scores below 36 indicate high risk of falling (Shumway-Cook et al., 1997)

**Reliability**

Internal Consistency: .83 for 113 older adults; Interrater: .91; Test-Retest: .92 (Berg et al., 1992)

ICC = .95; Persons with spinal cord injury tested (Wirz, Muller, and Bastiaenen, 2009)

**Responsiveness**

Minimal detectable change: +6 points with 90% confidence in patients with stroke (Stevenson, 2001)
The Performance Oriented Mobility Assessment (POMA)

The POMA, also known as the Tinetti Gait and Balance Test, is a tool that assesses both balance and gait performance. The POMA identifies balance and gait impairments and indicates clients who are at risk for falls. Twelve points are available on the balance portion and a maximum of 16 points on the gait sub-section. The balance section assesses nine categories, including sitting balance, standing balance, and sit to stand transitional activities. The seven gait items include such activities as initiating gait activity and walking a path of 10 ft (3 m). The assessment utilizes a simple ordinal level of measurement and scores items from zero to one or two points, depending on the test item. Strengths of the Tinetti instrument included its wide range of item difficulty and minimal equipment required. Weaknesses include its ambiguity in task category descriptions and potential ceiling effect. Tinetti (1986) noted good interrater reliability with the tool (85% agreement) and demonstrated its predictive validity for falls within the community-dwelling older adult population. Cipriany-Dacko, Innerst, Johannsen, and Rude (1997) found fair to excellent interrater reliability (kappa = .40 to .75) among students performing the balance assessment.

The Multi-Directional Reach Test (MDRT)

The MDRT is an extension of the Functional Reach Test (Duncan et al., 1992) and assesses an individual’s limits of stability in the forward, backward, and lateral directions. Minimal equipment is required for test administration. Using a yardstick mounted to a simple tripod, the test requires subjects to reach with an outstretched arm to their attained maximum limits of stability. In a study of 251 primarily Hispanic and
African-American community-dwelling adults, Newton (1997) established norms for each of the four reach excursions. The MDRT demonstrates strong test-retest reliability and internal consistency (Cronbach alpha = .842), along with concurrent validity with the BBS and TUG instruments (Newton, 2001). Recent research has performed age-related comparisons in healthy community-dwelling older adult men (Steffen & Mollinger, 2005).

**Functional Mobility: The Timed Up and Go Test (TUG)**

The TUG instrument (Podsiadlo & Richardson, 1991) was developed as an extension of the previous “Get-Up and Go Test,” which rated gait performance on a basic 1 to 5 ordinal scale. During the TUG test, subjects are instructed to rise to stand, traverse a 3 m (10 ft) gait course, turn, and subsequently return to a seated position in the chair. The test utilizes an armchair that measures 45 cm from seat to floor. In a recent meta-analysis of TUG studies, Bohannon (2006) described inconsistencies in equipment (e.g. chair height) and in instructions during test administration that prevented study comparisons.

The TUG test has demonstrated appropriate psychometric support in the geriatric population, as well as appropriate concurrent validity with the BBS (Bennie et al., 2003) and stair-climbing (Hughes, Osman, & Woods, 1998). Recent studies have established a designated cut-off score of 15s for fall risk in community-dwelling older adults (Whitney, Lord, & Close, 2005), and 28s for elders who have sustained a hip fracture (Kristensen et al., 2007).
Table 3
Timed Up and Go Test

<table>
<thead>
<tr>
<th>Format</th>
<th>Timed Test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Subjects rise from a standard armchair (46 cm seat to floor height), negotiate a 3 m gait course, and return to chair and sit.</td>
</tr>
</tbody>
</table>

| Validity | Concurrent: BBS, Gait Speed, and Barthel Index: \( r = -0.51 \) to \(-0.72\) (Posiadlo & Richardson, 1991) |
|----------| Predictive: Scores greater than 14s predict fall risk in older adults (Shumway-Cook & Brauer, 2000) |
|          | Scores greater than 24s predict fall risk in elders who have sustained a hip fracture (Kristensen, Foss, & Kehlet, 2007). |

| Reliability | ICC = 0.99 (Posiadlo & Richardson, 1991) |

The Dynamic Gait Index (DGI)

The DGI assesses the subject’s ability to modify gait in conjunction with a series of task demands, which include negotiating obstacles and changing gait speeds (Shumway-Cook et al., 1997). The tool contains eight questions and items that are scored on an ordinal grading scale (Table 4). Twenty-four possible points are available on the DGI. Chiu, Fritz, Light, and Velozo (2006) determined, through fit statistics, that the DGI represented a unidimensional construct with a logical progression of item difficulty. The instrument has demonstrated good interrater reliability (Wang et al., 2006), an inverse correlation with gait speed (McConvey & Bennett, 2005), and concurrent validity with both the TUG (Jonsdottir & Cattaneo, 2007) and BBS (Whitney, Wrisley, & Furman, 2003). Shumway-Cook et al. (1997) determined that older adults with scores below 19 were at risk for falls. Herman et al. (2009) noted that healthy men tended to have slightly higher scores than women.
Table 4
The Dynamic Gait Index

| Format       | 8 Items  
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0-3 Likert Scale Responses</td>
</tr>
<tr>
<td></td>
<td>24 Total Points Available</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Validity</th>
<th>Concurrent: Inverse correlation with gait velocity on a 6.1 m course (McConvey &amp; Bennett, 2005)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Predictive: Scores below 19 indicate high risk of falling (Shumway-Cook, et al., 1997)</td>
</tr>
</tbody>
</table>

| Reliability      | ICC: 0.93 (McConvey & Bennett, 2005)                                                        |

Fear of Falling and Balance Confidence

Research has primarily utilized two measures to identify fear of falling and balance confidence decline in older adults. Researchers have commonly used a single dichotomous question (1QFOF) related to fear of falling to identify and distinguish fearful from non-fearful subjects (Maki et al., 1991), as well as to ascertain fear prevalence (Legters, 2002).

The ABC Scale (Powell & Myers, 1995) has been used to quantify perceived balance confidence during the performance of 16 routine functional home or community-based tasks (Table 5). The instrument quantifies balance confidence on a 0-100 scale for each item; the divided sum of the 16 items gives a final total score of 100 possible points. The scale demonstrates appropriate internal consistency, as well as concurrent validity with the FES (Powell & Myers, 1995). The ABC Scale demonstrates greater responsiveness than other falls efficacy scales and is better able to discern diminished confidence levels (Powell & Myers, 1995) In addition, the battery challenges individuals to assess their balance confidence with a greater range of both indoor and outdoor tasks.
than does the FES. Scores above 80 denote higher-functioning, active elders. Scores below 50 signify lower levels of functional performance (Myers et al., 1998).

Table 5  
*The Activities-Specific Balance Confidence Scale*

| Format | 16 Items 0-100% rating for each item  
| Total Possible Score: 100  
| Item Summation ÷ 16 |

| Validity | Concurrent: Strong correlation with Falls Efficacy Scale (r = 0.84) (Powell & Myers, 1995)  
| Moderate correlation (r = 0.56) with gait speed (Myers et al., 1998) |

| Reliability | Internal Consistency:  
| Cronbach’s Alpha = 0.96  
| Test-Retest: r = 0.92 (Powell & Myers, 1995)  
| Internal Consistency: Crohnbach Alpha .96 |

**Discussion**

The biopsychosocial profile of the geriatric male is enigmatic. While sizable numbers of studies have included males in the design, analyses fall short of making gender-related comparisons or encompassing sufficient male sample sizes for investigation. Contributions by Steffen et al. (2002) and Bohannon (1997) established baseline reference values for balance and functional performance tests in older adult males. Findings should be viewed with caution, however, since performance measures of octogenarians had large confidence intervals and small subject numbers. Their work reflects a pattern of age-related degradation in both balance and physical performance skills, which was reinforced by additional outcomes measures (Steffen & Mollinger,
2005). Recent meta-analyses (Bohannon, 2006), although extensive, have not partitioned
gender-related performance values for the TUG or FTST Tests. Von Heideken et al.
(2009) confirmed that wide variations exist in performance values for men over the age
of 85. Exceptional longevity in men is associated with physical activity, body mass index,
and regular exercise (Yates et al., 2008).

While research has established a link between balance confidence and balance
performance in geriatric individuals, the strength of this link in older males is in question
due to limited male subject numbers and a potential unwillingness to disclose their fear of
falling (Chamberlin et al., 2005; Hatch et al., 2003). A recurring theme from the literature
reflects that while elderly men are hesitant to reveal their fear of falling, they are also less
likely to restrict their activities in spite of it (Fletcher & Hirdes, 2002). However, Brown,
Barr, and Kern (2003) noted that older male physical therapists openly expressed that
barriers such as pain, fear of falling, inclement weather, and physical endurance
limitations precluded their functional community ambulation.

Perspectives related to strength impairments offer insight into those patterns of
strength deficits that occur in the older adult male population. For example, Singh et al.
(2006) strongly associated gait speed with dorsiflexor strength among elderly males in
long-term care facilities, and Sieri and Beretta (2004) described decreased knee flexion
and plantarflexion torque production among older male fallers. Brach and
VanSwearingen (2002) found that grip strength was a predictor of physical performance
in older men, which was consistent with previously established markers for frailty (Fried
et al., 2001).
Cleary, findings from the predominantly male studies have been of great benefit. Brach and VanSwearingen (2002) illustrated that walking speed, fall risk, and grip strength were independent contributors to physical performance. These findings support previous studies which linked impaired mobility to an increase in fall risk among male veterans (Studenski et al., 1994). In a rare experimental study with exclusively healthy older men, Paillard et al. (2004) obtained enhanced dynamic balance and VO$_2$ maximum performance levels from a brisk walking program. Furthermore, Berke (2007) have examined the use of a neighborhood walking program to diminish levels of depression in older men. Studying Roman Catholic clergy has been beneficial in analyzing longitudinal physical and cognitive changes, while controlling for multiple confounding variables (Buchman et al., 2007).

In many ways, the representation of the geriatric male has only been portrayed through assimilation of findings from extracts of multiple studies. A focused study is warranted. There exists no singular study that contextualizes age-related differences in balance and gait ability and examines the relationship between physical performance and balance confidence in one unified analysis.

A study of this magnitude will serve as a benchmark in providing findings that will prove useful to researchers and clinicians working with older male clients in a variety of settings. Measures utilized may prompt health care professionals to consider additional outcomes tools when managing their clients along the patient management model continuum and to assess for potential fall risk. Research has identified current initiatives that promote optimum functional utilization of outcomes measures and that identify or prevent, where possible, the adverse effect of frailty (Ferrucci et al., 2004).
Consequently, researchers will be better able to understand both age-related physical performance differences in a population of older individuals, who have been typically less studied.
CHAPTER 3: METHODS

This study used a cross-sectional design to examine physical performance and balance confidence in older adult men 60 years and older, as well as a stratified sample of convenience to capture subjects in two age-related cohorts, 60-74 years and 75 years and above. Each cohort required 52 subjects in order to yield the required .80 statistical power for medium effect size statistical mean comparisons. A 40% oversampling rate occurred to account for subjects not meeting the inclusion criteria.

All subjects were Roman Catholic male clergy; the reasons for studying clergy were twofold. First, examining a cohort of Roman Catholic priests provided a comparatively homogenous sample of older men who were similar in vocational, educational, and lifestyle backgrounds. Second, an extension of this project could more easily follow clergy longitudinally to assess potential transitions to different living environments. Prior investigations performed with Catholic clergy have assessed age-related coordination changes (Wilson et al., 2004), as well as the incidence of neuropathologic changes from Alzheimer’s Disease (Snowdon, 2001).

Study Design and Subjects

Subject Recruitment

The study initially recruited subjects through contacts with central diocesan offices and religious order centers in the Baltimore, Wilmington, and Philadelphia metropolitan areas. Recruitment extended to several other dioceses and eparchies in the United States (Center for Applied Research in the Apostolate, 2007). The study also recruited potential subjects from religious orders affiliated with local Jesuit, Franciscan,
and Christian Brother high schools and universities. Testing occurred at local rectories, parish centers, religious institutions, and monastic communities.

**Inclusion and Exclusion Criteria**

Table 6 cites specific inclusion and exclusion criteria. The study excluded older men with neuromusculoskeletal or cardiorespiratory impairments, or pathologies that would preclude the individual from completing the battery of tests. Additionally, the study excluded those men who were terminally ill.

<table>
<thead>
<tr>
<th><strong>Inclusion</strong></th>
<th><strong>Exclusion</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Roman Catholic priests aged 60 or older</td>
<td>1. Severe cardiac disease, instability, or decompensation</td>
</tr>
<tr>
<td>2. Ambulation with/without an assistive device independently</td>
<td>2. Substantial pain on weightbearing or severe rheumatic disease</td>
</tr>
<tr>
<td>3. Completion of the Five Times Sit to Stand Test</td>
<td>3. Impaired cognition (3 or more errors on Six Item Screener battery)</td>
</tr>
<tr>
<td>4. Community-dwelling functional status</td>
<td>4. Legal blindness not corrected by glasses</td>
</tr>
<tr>
<td></td>
<td>5. End stage pulmonary disease (e.g. COPD)</td>
</tr>
<tr>
<td></td>
<td>6. Degenerative neuromuscular conditions: Parkinson’s Disease, Multiple Sclerosis, &amp; Amyotrophic Lateral Sclerosis</td>
</tr>
<tr>
<td></td>
<td>7. Lower extremity amputation</td>
</tr>
<tr>
<td></td>
<td>8. Diabetic neuropathy</td>
</tr>
<tr>
<td></td>
<td>9. Recent stroke (&lt;6 months)</td>
</tr>
<tr>
<td></td>
<td>10. Chronic renal failure</td>
</tr>
<tr>
<td></td>
<td>11. Diagnosis of vestibular dysfunction</td>
</tr>
<tr>
<td></td>
<td>12. Wheelchair as primary mode of transportation</td>
</tr>
<tr>
<td></td>
<td>13. Terminal illness resulting in less than 6 months to live</td>
</tr>
</tbody>
</table>
Power Analysis

Each cohort required 52 subjects in order to yield the required .80 statistical power for the statistical comparisons. A weighted mean procedure for ANOVA comparison tests at the .80 power level for medium effect size established the required sample sizes for the two age divisions (60-74 years; 75 years and older). Based on the inclusion and exclusion criteria, and a recent study of 123 older adults with 17% exclusion attrition, a 40% oversampling occurred to enroll sufficient participation (Klima & Newton, 2006).

Procedures

Local churches, universities, and diocesan offices received inquiries regarding potential interest in the study, along with established inclusion and exclusion criteria. Contact persons included parish secretaries and specific diocesan priests, along with the health coordinators for retired priests. Testing occurred at the designated rectory, church hall, or parish center. Subjects first signed the Institutional-approved consent form (Appendix A) and then completed the eligibility screen (Appendix B). The eligibility screen consisted of questions related to the designated inclusion and exclusion criteria, the Six Item Screener for Cognitive Impairment, and the TUG. The screen also utilized the handheld Snelling Eye Chart to discern prohibitive visual deficits (Gupta, Wolffsohn, & Naroo, 2009) and administered both vestibulo-ocular and Dynamic Visual Acuity (DVA) tests to rule out vestibular pathologies (Dannenbaum, Paquet, Hakim-Zadeh, & Feldman, 2005). Finally, the screen examined subjects with the 5.07 gram Semmes-Weinstein monofilament to detect sensory neuropathies in the feet (Olaleye, Perkins, and Bril, 2001).
The Six Item Screener for Cognitive Impairment is a measure that assesses cognitive appropriateness in order to proceed with subsequent research testing (Callahan et al., 2002). Inclusion criteria mandate that the subject score greater than three of a maximum of six points. The Six Item Screener for Cognitive Impairment has demonstrated 88.7% sensitivity and 88% specificity in identifying persons with cognitive impairment. Following this measure, the subject performed the Five Times Sit to Stand Test, which is a functional assessment for mobility and lower extremity strength. The test requires subjects to stand and successfully complete five sit to stand trials. The test has been used to evaluate lower extremity function and predict subsequent disability in older adults (Guralnik et al., 2000).

Subjects meeting all inclusion criteria completed a demographic profile (Appendix C). Symptoms of depression were assessed using the 15 item version of the Geriatric Depression Scale (GDS). This scale is comprised of 15 questions in a “Yes/No” response to assess respondents’ mood state (Yesavage et al., 1983). This version of the GDS demonstrates appropriate internal consistency and test-retest reliability. Scores above five are suggestive of a depressive state.

Subjects then completed the Physical Activity Scale for the Elderly (PASE) (Appendix D) to assess their level of physical activity. This test demonstrates sufficient validity for assessing physical activity in older individuals (Washburn et al., 1999). Subjects finally proceeded with physical performance testing. This sequence of testing varied among subjects to prevent both an order effect and potential threats to internal validity. Subjects had sufficient rest breaks between all tests to avoid fatigue.
Physical Performance

Physical performance is operationally defined as the execution of functional motor skills requisite to independent home and community navigation. These tasks reflect older persons’ abilities to perform activities of daily living and mobility tasks without significant risk of injury (Guralnik & Simonsick, 1993). This study assessed physical performance through a triad of component parts designed to analyze subjects’ balance ability, functional mobility, and dynamic gait performance. The following tests constitute the physical performance battery and were selected because of their strong psychometric properties and ease of administration in a variety of settings.

**Berg Balance Scale (BBS).** This study used the BBS (Berg et al., 1992) to measure balance control, or the ability to maintain the body’s center of mass within the limits of stability. The BBS (Appendix E) assesses an individual’s balance performance during a series of tasks, which are graded on a five-point scale. Fifty-six total available points are possible on the 14 skill categories. Tasks progress from the simple to the complex, beginning with a basic sit to stand activity and advancing to more challenging tandem and single leg balance tests. Single leg standing time alone has demonstrated a significant negative correlation with age in elderly men (Jedrychowski et al., 1990).

Content validity was developed in a three-phase process with involvement by 38 clients and 38 professionals (Berg et al., 1992). The instrument has confirmed concurrent validity with the Performance Oriented Mobility Assessment (Berg et al., 1992), and demonstrates predictive validity for assistive device use with scores below 45 (Bogle-Thorbahn & Newton, 1997). Recent cut-off scores have been updated for fall risk (Lajoie

**Timed Up and Go (TUG).** This study used the TUG to assess functional mobility (Podsiadlo & Richardson, 1991). This test has demonstrated appropriate psychometric support in the geriatric population. According to instruction, subjects rose to standing, traversed a 3 m gait course, turn, and subsequently returned to a seated position in the chair. The test used an armchair with a measurement of 45 cm seat to floor. A recent metaanalysis of TUG studies aided in the development of procedure standardization (Bohannon, 2006). This instrument has demonstrated appropriate concurrent validity with the BBS (Bennie et al., 2003) and stair-climbing (Hughes, Osman, & Woods, 1998). Recent studies have established designated cut-off scores indicating fall risk in both community-dwelling older adults (Whitney et al., 2005), as well as in those who have sustained a hip fracture (Kristensen et al., 2007). These studies, however, have been comprised primarily of female subjects.

**Dynamic Gait Index (DGI).** The DGI analyzed gait performance (Shumway-Cook et al., 1997) and subjects also completed a gait velocity test across a 15 feet trajectory (Tiedeman, Sherrington, & Lord, 2005). The DGI (Appendix F) assesses the subject’s ability to modify gait in conjunction with a series of task demands that includes negotiating obstacles and changing gait speeds. The tool contains eight questions and items are scored through an ordinal grading scale. Twenty-four possible points are available on the DGI (Appendix F). Shumway-Cook et al. (1997) determined that older
adults with scores below 19 were at risk for falls. To date, no age-related comparisons in men have been examined.

**Balance Confidence: The Activities-Specific Balance Confidence Scale (ABC).**

Balance confidence refers to the level of security an individual has maintaining the center of mass within the base of support. Fear of falling, defined as the phobic response to adversely making contact with the ground through a slip, trip, or other means (Legters, 2002), may be associated with persons displaying diminished balance confidence. This study used the ABC Scale (Powell & Myers, 1995) to quantify perceived balance confidence during the performance of 16 routine functional home or community-based tasks (Appendix G). Balance confidence is quantified on a 0-100 scale for each item; moreover, a final total score of 100 possible points is obtained by the divided sum of the 16 items. The scale demonstrates appropriate internal consistency, as well as concurrent validity with the FES (Powell & Myers, 1995). The ABC Scale demonstrates greater responsiveness than other falls efficacy scales and is better able to discern diminished confidence levels (Powell & Myers, 1995). In addition, the battery challenges individuals to assess their balance confidence with a greater range of both indoor and outdoor tasks. Scores above 80 denote higher-functioning, active elders. Scores below 50 signify lower levels of functional performance (Myers et al., 1998)

**Investigator Training**

The primary investigator is a physical therapist with over 24 years of experience in clinical practice, ABPTS certifications in both geriatric and neurologic physical therapy, and teaching responsibilities in clinical balance testing for entry-level physical therapy students. The investigator performed a review of physical performance
videocassette tapes of the BBS and TUG tests to establish reliability (intraclass coefficients >.90) on all physical performance tests. In addition, the investigator conducted pilot testing with community-dwelling older adult men to ensure intrarater reliability.

**Data Management and Analyses**

All data were entered into SPSS v18 SPSS Inc, Chicago, IL). The study ensured data management accuracy through the below data cleaning strategies:

1. Prior to the subject leaving the testing area, all data sheets were reviewed for completeness.
2. Range checks were performed to insure accurate entry of all variables.
3. Ten percent of the data sheets were randomly selected and reviewed for accuracy of data entry by two independent reviewers.
4. Data sheets and consent forms were maintained in separate and secure locations.
5. Data histograms and residual plots were reviewed for outlier identification and adverse impact on descriptive mean values and regression equations, including outliers extending beyond 3 standard deviations.

Statistical procedures used to address the hypotheses associated with each specific aim are included in Table 7.
Table 7
Research Questions and Data Analyses

**Aim #1**: To examine the age-related differences in physical performance and balance confidence among community-dwelling men over the age of 60 years of age.

**Number of Subjects**: 131; 56 (60-74 yrs.) 75 (Age 75 & older)

**Subject Characteristics**: Roman Catholic Clergy

**Alpha Level**: P < 0.05
(Exploratory regression model: p < 1.0)

**Research Question 1A**: Do subjects excluded from the study demonstrate different demographic characteristics than those included?

**Statistical Tests**: Descriptive statistics
Independent T Tests with Bonferroni corrections; Fisher’s Exact Tests; Yates correction for continuity
Variables: Grip strength, TUG Test, Number of falls

**Research Question 1B**: Do subjects over the age of 75 years of age demonstrate different demographic characteristics than those between the ages of 60-74 years?

**Statistical Tests**: Descriptive statistics
Independent T Tests with Bonferroni corrections; Fisher’s Exact Tests; Yates correction for continuity

**Research Question 1C**: Do men over the age of 75 years demonstrate differences in balance and gait performance from those between the ages of 60-75 years?

**Aim #2**: To examine the relationship between balance ability and balance confidence in community-dwelling men over the age of 60 years of age.

**Number of Subjects**: 131; 56 (60-74 yrs.) 75 (Age 75 & older)

**Subject Characteristics**: Roman Catholic Priests

**Alpha Level**: P < 0.05
(Exploratory regression model: p < 1.0)

**Preliminary Analysis**: Balance confidence comparisons: Men over the age of 75 years compared with men 60-75 years of age.

**Statistical Tests**: Independent T Tests

**Preliminary Analysis**: Relationship between balance ability and balance confidence in community-dwelling older adult men.

**Statistical Tests**: Pearson Product and Spearman Rho Correlation Analysis;

**Research Question 2**: Is there a relationship between balance ability and balance confidence in community-dwelling older adult men?
Table 7 (Cont.)

Research Questions and Data Analyses

<table>
<thead>
<tr>
<th>Statistical Tests:</th>
<th>MANCOVA analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measures:</td>
<td>BBS, DGI, TUG Test</td>
</tr>
<tr>
<td>Covariates:</td>
<td>Medications and Comorbidities</td>
</tr>
</tbody>
</table>

**Research Question 1D:** What variables predict physical performance among community-dwelling older adult men?

**Statistical Tests:** Multiple regression analysis with physical activity, BMI, and grip strength independent variables; Stepwise regression

**Measures:** BBS, DGI, TUG Test-Dependent Variables

**Research Hypothesis:** If there is a relationship between balance ability and balance confidence in community-dwelling older adult men over 60 years, then balance ability, gait speed and age will predict balance confidence.

**Statistical Tests:** Multiple Regression Analysis

Independent variables: Age, balance ability, gait speed

Stepwise regression

**Measures:** ABC Scale-Dependent Variable
CHAPTER 4: RESULTS

The study tested a total of 167 Roman Catholic priests between June 2008 and August 2009 in the 10 states cited in Figure 2 below. Included are subject numbers tested in each state. Initial inquiries for participation consisted of 41 mailed explanatory packets, 21 e-mail permission requests, and 121 phone communications with potential sites. The final sample of 167 Roman Catholic priests received testing at multiple locations (Figure 3): rectories (7%), senior retirement centers (47%), and private housing communities (46%). One hundred and thirty-one Roman Catholic clergy met the inclusion criteria. Reasons for exclusion ($n = 36$) are cited in Table 8.
Figure 3. Subject Residence Domiciles

Table 8
Reasons for Subject Exclusion

<table>
<thead>
<tr>
<th>Reasons for Exclusion</th>
<th>Number of Subjects (Total n = 36)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unable to Walk in Community Without Assistance (No, %)</td>
<td>7 (19%)</td>
</tr>
<tr>
<td>Wheelchair as Primary Mode of Ambulation (Yes, %)</td>
<td>5 (14%)</td>
</tr>
<tr>
<td>Unable to Perform Chair Rises (%)</td>
<td>14 (42%)</td>
</tr>
<tr>
<td>Cognitive Impairment (% ≤ 3 Six Item Screener)</td>
<td>5 (14%)</td>
</tr>
<tr>
<td>Parkinson’s Disease (Yes, %)</td>
<td>4 (11%)</td>
</tr>
<tr>
<td>Severe Cardiopulmonary Disease (Yes, %)</td>
<td>2 (6%)</td>
</tr>
<tr>
<td>Multiple Sclerosis, Amyotrophic Lateral Sclerosis (Yes, %)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Peripheral Neuropathy (Yes, %)</td>
<td>8 (22%)</td>
</tr>
<tr>
<td>Severe Dizziness? (Yes, %)</td>
<td>1 (3%)</td>
</tr>
<tr>
<td>Advanced Cancer (Yes, %)</td>
<td>2 (6%)</td>
</tr>
</tbody>
</table>
Table 8 (Continued)

<table>
<thead>
<tr>
<th>Reasons for Exclusion</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Severe Arthritis/Joint Pain</td>
<td>5 (14%)</td>
</tr>
<tr>
<td>(Yes, %)</td>
<td></td>
</tr>
<tr>
<td>Visual Deficits</td>
<td>1 (3%)</td>
</tr>
<tr>
<td>(Yes, %)</td>
<td></td>
</tr>
<tr>
<td>Abnormal VOR/Dynamic Visual Acuity Test</td>
<td>1 (3%)</td>
</tr>
<tr>
<td>Legal Blindness</td>
<td>0 (0%)</td>
</tr>
</tbody>
</table>

Analysis of Primary Aim

Analysis of Excluded Subjects

In general, excluded subjects failed to meet multiple inclusion criteria or had chronic conditions, such as Parkinson’s disease, which precluded participation in the study. Twelve subjects (44%) had medical conditions that prevented requisite multiple sit to stand performance trials; in addition, eight subjects (22%) met two or more exclusion criteria. Eight subjects (22%) had a lower extremity peripheral neuropathy condition and subsequently were unable to identify protective sensation with the 5.07 g monofilament.

Testing site liaisons were responsible for identifying appropriate candidates, as well as for recognizing clergy with obvious chronic neurologic conditions or key sensory impairments that would preclude testing, such as legal blindness and Parkinson’s disease. However, these site coordinators generally scheduled all interested individuals and allowed the primary investigator to discern appropriateness for the study.

A comparison of demographic and physical performance tests between the included and excluded subjects is contained in Table 9. Significant differences were noted in gait speed, TUG time, grip strength, and cognition between included and excluded subjects. Results of the Fisher’s Exact Test demonstrated that more of the
excluded subjects required physical assistance for both community navigation and rising from the chair. Though not statistically significant, greater proportions of excluded subjects were fearful of falling and had sustained more falls over the past 3 and 12 months. Included subjects’ BMI approached and excluded subjects’ BMI reached the accepted cut-off score for Class I obesity designation. In summary, excluded subjects’ slower TUG time and decreased grip strength support the Research Question 1A alternative hypothesis, though there were no significant differences in the number of falls over the past year.

Table 9
Demographics of Included and Excluded Subjects

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Subjects Meeting Inclusion Criteria (n=131)</th>
<th>Excluded Subjects (n=36)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (Yrs./x, sd)</td>
<td>76.1 (8.9)</td>
<td>79.0 (8.4)</td>
</tr>
<tr>
<td>Cognitive Score</td>
<td>5.5 (0.73)</td>
<td>4.8 (1.15)*</td>
</tr>
<tr>
<td>(Max: 6 points/x, sd)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMI (kg/m^2)</td>
<td>29.5 (5.5)</td>
<td>30.3 (6.1)</td>
</tr>
<tr>
<td>Grip Strength (lbs/x, sd)</td>
<td>63.5 (17.9)</td>
<td>46.7 (16.9)*</td>
</tr>
<tr>
<td>TUG Score (secs/x, sd)</td>
<td>12.1 (3.8)</td>
<td>21.3 (11.9)*</td>
</tr>
<tr>
<td>Gait Velocity (m/sec/x, sd)</td>
<td>1.2 (2.9)</td>
<td>0.80 (0.30)*</td>
</tr>
<tr>
<td>Chair Rise Performance</td>
<td>131 (100%)</td>
<td>14 (40%)*</td>
</tr>
<tr>
<td>Yes (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Walk in Community Without Physical Assistance</td>
<td>131 (100%)</td>
<td>28 (80%)*</td>
</tr>
<tr>
<td>Yes (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fear of Falling?</td>
<td>39 (30%)</td>
<td>13 (37%)</td>
</tr>
<tr>
<td>Yes (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall in Past 3 Months?</td>
<td>21 (16%)</td>
<td>7 (19%)</td>
</tr>
<tr>
<td>Yes (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall in Past Year?</td>
<td>46 (35%)</td>
<td>15 (43%)</td>
</tr>
<tr>
<td>Yes (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Systolic BP (mg./x, sd)</td>
<td>128.7 (12.0)</td>
<td>126.5 (13.7)</td>
</tr>
<tr>
<td>Diastolic BP (mg./x, sd)</td>
<td>77.3 (9.4)</td>
<td>77.3 (10.2)</td>
</tr>
</tbody>
</table>

Note. *Signif: p < .001
Demographics and Health Status of the Sample (RQ1B)

The majority of subjects in all age cohorts reported perceived health status in the good to excellent range. The majority of subjects were well-educated and had obtained either a Master’s or doctoral degree. Most ambulated independently without the use of an assistive device. Major prevailing comorbidities included prostate problems and diabetes.

The study obtained demographic and health status analyses to assess differences between the younger (60-74 years) and older cohorts (75 and above) of Roman Catholic priests (Tables 10-12). There were significant between group differences for BMI, though no significant differences in overall numbers of medications taken (Figure 5); however, Chi square analysis examining four or more medications revealed that a significantly greater proportion of the older group took four or more medications, which thus supports the alternative hypothesis of Research Question 1B.

*Figure 4. Subject Educational Status*

*Figure 5. Medications*
Table 10
*Characteristics of Age Cohorts*

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Entire Sample of Men</th>
<th>Men 60-74 yrs</th>
<th>Men ≥ 75 yrs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(n = 131)</td>
<td>(n = 56)</td>
<td>(n = 75)</td>
</tr>
<tr>
<td>Age (yrs; x, sd)</td>
<td>76.1 (9.0)</td>
<td>67.3 (4.4)</td>
<td>82.6 (5.1)†</td>
</tr>
<tr>
<td></td>
<td>(Range: 60-97)</td>
<td>(Range: 60-74)</td>
<td>(Range: 75-97)</td>
</tr>
<tr>
<td>Caucasian (n, %)</td>
<td>1 (&lt;1%)</td>
<td>1 (2%)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Cognition (Max 6; x, sd)</td>
<td>5.5 (0.73)</td>
<td>5.8 (.41)</td>
<td>5.4 (8.5)</td>
</tr>
<tr>
<td>BMI (kg/m²; x, sd)</td>
<td>29.5 (5.5)</td>
<td>31.6 (6.2)</td>
<td>27.9 (4.3)†</td>
</tr>
<tr>
<td></td>
<td>(Range: 21-53)</td>
<td>(Range: 21.8-52.6)</td>
<td>(Range: 21-46.3)</td>
</tr>
<tr>
<td>Height (cm; x, sd)</td>
<td>172.3 (8.4)</td>
<td>175.3 (6.9)</td>
<td>170.0 (8.8)†</td>
</tr>
<tr>
<td></td>
<td>(Range: 130.2-193.5)</td>
<td>(Range: 158.5-193.5)</td>
<td>(Range: 130.2-187.0)</td>
</tr>
<tr>
<td>Weight (kg; x, sd)</td>
<td>87.5 (17.5)</td>
<td>97.0 (19.0)</td>
<td>80.4 (12.1)†</td>
</tr>
<tr>
<td></td>
<td>(Range: 52.8-152.3)</td>
<td>(Range: 70.6-152.3)</td>
<td>(Range: 52.8-109.7)</td>
</tr>
<tr>
<td>Systolic Blood Pressure mm Hg (x; sd)</td>
<td>128.9 (12.1)</td>
<td>128.6 (12.4)</td>
<td>128.9 (10.9)</td>
</tr>
<tr>
<td>Diastolic Blood Pressure mm Hg (x; sd)</td>
<td>77.3 (9.4)</td>
<td>80.0 (9.1)</td>
<td>75.1 (9.0)*</td>
</tr>
<tr>
<td>Are you retired? (Yes, %)</td>
<td>71 (54%)</td>
<td>12 (21%)</td>
<td>59 (80%)†</td>
</tr>
<tr>
<td>Number of years since ordination(x, sd)</td>
<td>48 (12.6)</td>
<td>38.1 (11.0)</td>
<td>55.1 (8.3)†</td>
</tr>
<tr>
<td>Education (Yes, %):</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PhD?</td>
<td>25 (19%)</td>
<td>10 (18%)</td>
<td>15 (20%)</td>
</tr>
<tr>
<td>Master’s Degree?</td>
<td>78 (60%)</td>
<td>33 (60%)</td>
<td>45 (60%)</td>
</tr>
<tr>
<td>Batchelor’s Degree?</td>
<td>17 (13%)</td>
<td>6 (11%)</td>
<td>10 (13%)</td>
</tr>
<tr>
<td>Less/Other?</td>
<td>11 (8%)</td>
<td>6 (11%)</td>
<td>7 (7)</td>
</tr>
<tr>
<td>Do you live alone (Yes, %)</td>
<td>126 (96%)</td>
<td>51 (93%)</td>
<td>74 (99%)</td>
</tr>
<tr>
<td>Do you smoke (Yes, %)</td>
<td>6 (5%)</td>
<td>5 (9%)</td>
<td>1 (1%)</td>
</tr>
<tr>
<td>Packs per week (x, sd)</td>
<td>.06 (.3)</td>
<td>.1 (.4)</td>
<td>.1 (.2)</td>
</tr>
<tr>
<td>Do you consume alcohol? (Yes, %)</td>
<td>63 (48%)</td>
<td>28 (50%)</td>
<td>35 (47%)</td>
</tr>
<tr>
<td>Drinks per week (x, %)</td>
<td>2.4 (2.9)</td>
<td>2.1 (2.6)</td>
<td>2.6 (5.1)</td>
</tr>
</tbody>
</table>
Table 10 (Cont.)

*Characteristics of Age Cohorts*

Do you walk with an:

<table>
<thead>
<tr>
<th>Assistive device (Yes %)</th>
<th>Walker? (Yes, %)</th>
<th>Quad Cane? (Yes, %)</th>
<th>Straight Cane (Yes, %)</th>
<th>Other? (Yes, %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>22 (17%)</td>
<td>1 (1%)</td>
<td>1 (1%)</td>
<td>19 (14%)</td>
<td>1 (1%)</td>
</tr>
</tbody>
</table>

*Signif. P < .005  † Signif. P < .001

Table 11

*Mood and Perceived Health*

<table>
<thead>
<tr>
<th>Profile</th>
<th>Entire Sample of Men (n=131)</th>
<th>Men 60-74 yrs (n=56)</th>
<th>Men ≥ 75 yrs (n=75)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geriatric Depression Scale</td>
<td>1.4 (1.5)</td>
<td>1.0 (1.6)</td>
<td>1.6 (1.5)</td>
</tr>
<tr>
<td>(15 pts. Max, x, sd, range)</td>
<td>(Range: 0-9)</td>
<td>(Range: 0-9.0)</td>
<td>(Range: 0-6)</td>
</tr>
<tr>
<td>Describe General Health</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excellent/Good</td>
<td>106 (84%)</td>
<td>48 (86%)</td>
<td>61 (82%)</td>
</tr>
<tr>
<td>Fair/Poor</td>
<td>21 (16%)</td>
<td>8 (14%)</td>
<td>13 (18%)</td>
</tr>
</tbody>
</table>

Table 12

*Comorbidity Profile of Age Cohorts*

<table>
<thead>
<tr>
<th>Medical Condition/ Medications</th>
<th>Entire Sample of Men (N=131)</th>
<th>Men 60-74 yrs (n=56)</th>
<th>Men ≥ 75 yrs (N=75)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you have Heart problems? (Yes, %)</td>
<td>52 (39%)</td>
<td>24 (43%)</td>
<td>28 (37%)</td>
</tr>
<tr>
<td>Have you ever had a stroke? (Yes, %)</td>
<td>8 (6%)</td>
<td>3 (5%)</td>
<td>5 (7%)</td>
</tr>
<tr>
<td>Do you have Parkinson’s Disease? (Yes, %)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
</tr>
</tbody>
</table>
Table 12 (Cont)

**Comorbidity Profile of Age Cohorts**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Group 1 (N=74)</th>
<th>Group 2 (N=29)</th>
<th>Group 3 (N=45)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you have Rheumatoid or Osteoarthritis? (Yes, %)</td>
<td>74 (56%)</td>
<td>29 (52%)</td>
<td>45 (60%)</td>
</tr>
<tr>
<td>Do you have Osteoporosis? (Yes, %)</td>
<td>4 (4%)</td>
<td>3 (5%)</td>
<td>2 (3%)</td>
</tr>
<tr>
<td>Do you have Diabetes? (Yes, %)</td>
<td>22 (17%)</td>
<td>13 (24%)</td>
<td>8 (11%)</td>
</tr>
<tr>
<td>Do you have Depression? (Yes, %)</td>
<td>10 (8%)</td>
<td>4 (7%)</td>
<td>6 (8%)</td>
</tr>
<tr>
<td>Prostate problems? (Yes, %)</td>
<td>51 (39%)</td>
<td>15 (27%)</td>
<td>36 (48%)*</td>
</tr>
<tr>
<td>Vertigo/Dizziness? (Yes, %)</td>
<td>24 (18%)</td>
<td>6 (11%)</td>
<td>18 (24%)</td>
</tr>
<tr>
<td>Joint replacement? (Yes, %)</td>
<td>13 (10%)</td>
<td>0 (0%)</td>
<td>13 (17%)†</td>
</tr>
<tr>
<td>Cancer? (Yes, %)</td>
<td>27 (21%)</td>
<td>12 (21%)</td>
<td>15 (20%)</td>
</tr>
<tr>
<td>G-I Problems? (Yes, %)</td>
<td>25 (19%)</td>
<td>12 (21%)</td>
<td>13 (17%)</td>
</tr>
<tr>
<td>Leg fracture in past 6 months? (Yes, %)</td>
<td>1 (1%)</td>
<td>1 (2%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Eyesight Problems? (Yes, %)</td>
<td>86 (65%)</td>
<td>29 (52%)</td>
<td>57 (76%)†</td>
</tr>
<tr>
<td>Eyesight problem Corrected by glasses? (Yes, %)</td>
<td>87 (66%)</td>
<td>45 (80%)</td>
<td>42 (56%)†</td>
</tr>
<tr>
<td>4 or more meds (Yes, %)</td>
<td>5.4 (3.8)</td>
<td>4.7 (4.2)</td>
<td>5.9 (3.6)</td>
</tr>
<tr>
<td>Number- Medications Taken (#) (Range: 0-17)</td>
<td>5.4 (3.8)</td>
<td>4.7 (4.2)</td>
<td>5.9 (3.6)</td>
</tr>
<tr>
<td>Blood thinners (Yes, %)</td>
<td>62 (47%)</td>
<td>27 (48%)</td>
<td>35 (47%)</td>
</tr>
<tr>
<td>Insulin/diabetes med. (Yes, %)</td>
<td>17 (13%)</td>
<td>11 (20%)</td>
<td>6 (8%)</td>
</tr>
</tbody>
</table>

*Signif: p < 0.05 †Signif: p < 0.005
Physical Performance (RQ1C)

In comparing physical performance of both age cohorts, there were significant differences in both balance and gait performance on the BBS, DGI, and TUG test batteries (Table 13). There was also a significant difference in both grip strength and gait velocity between the groups (p < 0.001). Falls-related data are presented in Table 14. A significantly greater percentage (p < 0.05) of the older cohort revealed a fear of falling and sustained a fall over the past three months. Significant differences were noted in PASE physical activity levels. Data support the alternative hypothesis for Research Question 1C; older clergy demonstrated significantly lower physical performance scores (MANCOVA; p< 0.001) in gait (DGI), balance (BBS), and functional mobility (TUG).

Medications and comorbid conditions were treated as covariates.

Table 13
Physical Performance Comparisons of Age Cohorts

<table>
<thead>
<tr>
<th>Physical Performance Measure/Question</th>
<th>Entire Sample of Men (n=131)</th>
<th>Men 60-74 yrs (n=56)</th>
<th>Men ≥ 75 yrs (n=75)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berg Balance Scale (Max 56; x, sd)</td>
<td>49.4 (7.3) (Range: 24-56)</td>
<td>53.4 (4.8) (Range: 33-56)</td>
<td>46.5 +/- 7.5* (Range: 24-56)</td>
</tr>
<tr>
<td>Dynamic Gait Index (Max 24; x, sd)</td>
<td>20.6 (4.0) (Range: 8-24)</td>
<td>22.6 (2.6) (Range: 13-24)</td>
<td>19.0 (4.2)* (Range: 8-24)</td>
</tr>
<tr>
<td>Timed Up and Go Test (x, sd)</td>
<td>12.1 (3.8) (Range: 6.4-27.3)</td>
<td>10.4 (2.3) (Range: 6.4-18.7)</td>
<td>13.4 (4.2)* (Range: 8.9-27.2)</td>
</tr>
<tr>
<td>Gait Velocity (m/sec;x, sd)</td>
<td>1.2 (2.9) (Range: 0.5-1.9)</td>
<td>1.3 (2.7) (Range: 0.67-1.9)</td>
<td>1.0 (2.5)* (Range: 0.6-1.5)</td>
</tr>
<tr>
<td>Grip Strength (lbs; x, sd)</td>
<td>63.4 (17.8)</td>
<td>70.9 (15.5)</td>
<td>57.7 (17.4)*</td>
</tr>
</tbody>
</table>
Table 13 (Cont.)

Physical Performance Comparisons Of Age Cohorts

<table>
<thead>
<tr>
<th></th>
<th>Entire Sample of Men (n=131)</th>
<th>Men 60-74 yrs (n=56)</th>
<th>Men ≥ 75 yrs (n=75)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you participate in regular physical activity (Yes, %)</td>
<td>81 (62%)</td>
<td>35 (63%)</td>
<td>46 (61%)</td>
</tr>
<tr>
<td>Physical activity more than 5 times per week?</td>
<td>53 (41%)</td>
<td>21 (38%)</td>
<td>32 (43%)</td>
</tr>
<tr>
<td>Do you participate in structured exercise? (Yes, %)</td>
<td>36 (27%)</td>
<td>15 (27%)</td>
<td>21 (28%)</td>
</tr>
<tr>
<td>Physical Activity Scale for the Elderly (Max score: 500 total)</td>
<td>107.7 (97.8) <em>(Range: 0-392.7)</em></td>
<td>169.4 (109.0) <em>(Range: 5-392.7)</em></td>
<td>64.3 (58.8)* <em>(Range: 0-241.7)</em></td>
</tr>
</tbody>
</table>

Note. *Signif: p < 0.001

Table 14 Falls-Related Data

<table>
<thead>
<tr>
<th>Falls-Related Questions</th>
<th>Entire Sample of Men (n=131)</th>
<th>Men 60-74 yrs (n=56)</th>
<th>Men ≥ 75 yrs (n=75)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fear of Falling (Yes, %)</td>
<td>39 (30%)</td>
<td>8 (14%)</td>
<td>31 (41%)**</td>
</tr>
<tr>
<td>Fear of Falling limits activities? (Yes, %)</td>
<td>17 (13%)</td>
<td>4 (7%)</td>
<td>13 (17%)</td>
</tr>
<tr>
<td>Fall past 3 months (Yes, %)</td>
<td>21 (16%)</td>
<td>5 (9%)</td>
<td>16 (21%)*</td>
</tr>
<tr>
<td>Fall past year (Yes, %)</td>
<td>46 (35%)</td>
<td>18 (33%)</td>
<td>28 (38%)</td>
</tr>
<tr>
<td>ABC Score (Max Score:100%)</td>
<td>83.0 (14.4) <em>(Range: 40.6-100)</em></td>
<td>89.1 (12.6) <em>(Range: 43.1-100)</em></td>
<td>78.4 (13.9) † <em>(Range: 40.6-100)</em></td>
</tr>
</tbody>
</table>

Note. *Signif: p < 0.05; **Signif: p < 0.005 †Signif: p < 0.001

Performance Prediction (RQ1D)

The study used multiple linear modeling to analyze determinants of physical performance as defined by balance (BBS), gait (DGI), and functional mobility (TUG).

Following analysis, multicollinearity statistics were reviewed for tolerance margins and
no violations were noted. Subsequent stepwise models were performed by entering significant demographic and physical performance variables. Model details are cited in Tables 15 through 17. Treating balance ability as a separate dependent variable, BMI, physical activity, and grip strength predicted 32% of the variance in balance ability on the BBS in a multiple regression analysis. A stepwise regression model demonstrated that the subsets of age, balance confidence (ABC), a fall in the past year, and diastolic blood pressure predicted 60% of the variance in balance ability and significantly contributed to the BBS score. Physical activity, grip strength, and BMI frailty indicators similarly predicted 29% of the variance on the DGI and 22% of the variance in TUG performance. A stepwise regression model demonstrated that the subsets of age, balance confidence (ABC), a fall in the past year, and diastolic blood pressure predicted 61% of the variance in DGI performance and significantly contributed to the DGI score. These four variables predicted 49% of the variance in TUG performance. Medication utilization was not a significant predictor of balance ability.

Table 15

**Prediction of Performance on the Berg Balance Scale: All Subjects**

<table>
<thead>
<tr>
<th>Model</th>
<th>Equation</th>
<th>$R^2$</th>
<th>Dependent Variable</th>
<th>Independent Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple</td>
<td>$(F(3,120) = 20.5, p &lt; .001)$</td>
<td>.32</td>
<td>Balance (BBS)</td>
<td>BMI, Physical Activity (PASE), Grip Strength</td>
</tr>
<tr>
<td>Stepwise</td>
<td>$(F(4,116) = 44.6, p &lt; .001)$</td>
<td>.60</td>
<td>Balance (BBS)</td>
<td>Age, Balance Confidence (ABC), Diastolic Blood Pressure, Fall in the past 3 months</td>
</tr>
<tr>
<td></td>
<td>ABC ($\beta=.42$)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Age ($\beta=-.44$)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fall ($\beta=.25$)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>DBP ($\beta=-.12$)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 16
Prediction of Performance on the Dynamic Gait Index (N=131)

<table>
<thead>
<tr>
<th>Model</th>
<th>Equation</th>
<th>$R^2$</th>
<th>Dependent Variable</th>
<th>Independent Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple</td>
<td>$(F(3,120) = 17.9, \ p &lt; .001)$</td>
<td>.29</td>
<td>Gait Performance (DGI)</td>
<td>BMI, Physical Activity (PASE), Grip Strength</td>
</tr>
<tr>
<td>Stepwise</td>
<td>$(F(3,119) = 54.9, \ p &lt; .001)$</td>
<td>.61</td>
<td>Gait Performance (DGI)</td>
<td>Age, Balance Confidence (ABC), Diastolic Blood Pressure, Fall in the Past 3 Months</td>
</tr>
</tbody>
</table>

Table 17
Prediction of Performance on the Timed Up and Go Test (N=131)

<table>
<thead>
<tr>
<th>Model</th>
<th>Equation</th>
<th>$R^2$</th>
<th>Dependent Variable</th>
<th>Independent Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple</td>
<td>$(F(3,120) = 12.7, \ p &lt; .001)$</td>
<td>.22</td>
<td>Functional Mobility (TUG)</td>
<td>BMI, Physical Activity (PASE), Grip Strength</td>
</tr>
<tr>
<td>Stepwise</td>
<td>$(F(4,118) = 23.3, \ p &lt; .001)$</td>
<td>.49</td>
<td>Functional Mobility (TUG)</td>
<td>Age, ABC, Fall in the Past 3 Months, Diastolic Blood Pressure</td>
</tr>
</tbody>
</table>

Analyses of Secondary Aim (RQ 2)

When examining the association between balance ability and balance confidence in community-dwelling men over the age of 60 years, analyses with Spearman Rho
correlations (Table 18) determined a significantly strong association between balance
ability and balance confidence in both the younger and older cohorts of clergy, as well as
the entire group. Balance confidence scores were significantly higher (Figure 6) in the
younger cohort of priests, which indicates greater balance confidence (Table 19).

Table 18
Association between Balance Confidence and Balance Ability

<table>
<thead>
<tr>
<th>Balance Performance:</th>
<th>Correlation Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berg Balance Score</td>
<td></td>
</tr>
<tr>
<td>Entire Sample of Men (N = 131)</td>
<td>Rho = 0.69*</td>
</tr>
<tr>
<td>Men 60-74 yrs. (n = 56)</td>
<td>Rho = 0.50*</td>
</tr>
<tr>
<td>Men &gt; 75 yrs. (n = 75)</td>
<td>Rho = 0.60*</td>
</tr>
</tbody>
</table>

Note. *Spearman Rho Coefficients; \(p < 0.01\)

Table 19
Age-Related Balance Confidence Differences

<table>
<thead>
<tr>
<th>Balance Confidence Profile (n=137)</th>
<th>Entire Sample of Men (n=137)</th>
<th>Men 60-74 yrs (n=56)</th>
<th>Men (\geq 75) yrs (n=75)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABC Score ((x, sd))</td>
<td>83.0 (14.4)</td>
<td>89.1 (12.6)</td>
<td>78.4 (13.9)*</td>
</tr>
</tbody>
</table>

Note. *Signif: Independent T Tests; \(p < 0.001\)
Balance Confidence Prediction

Bivariate correlations noted significant associations (p < 0.01) between balance confidence and: age (-0.47), mood (-0.39), physical activity (0.57), balance (0.69), and gait velocity (0.69). Multiple regression analysis for the entire sample (n = 131) determined that age, gait velocity, and the BBS score determined 45% of the variance in predicting balance confidence scores using a multiple regression model. Findings support the alternative hypothesis for Research Question 2. A significant stepwise model determined that balance (BBS), mood (GDS), assistive device use, and physical activity explained 52% of the variance in balance confidence. Analyses did not identify any multicollinearity infringements. Neither medication nor fall history were significant predictors of balance confidence among all demographic variable entered. Similarly, BMI was not a significant contributor to the model. Subjects’ balance, mood, and physical activity contributed to over half of all composite factors determining balance confidence.

Table 20
Prediction of Balance Confidence

<table>
<thead>
<tr>
<th>Model</th>
<th>Equation</th>
<th>R²</th>
<th>Dependent Variable</th>
<th>Independent Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple</td>
<td>(F(3,123) = 35.1, p &lt; .001)</td>
<td>.45</td>
<td>Balance Confidence (ABC)</td>
<td>Age, Gait Velocity, Balance (BBS)</td>
</tr>
<tr>
<td>Stepwise</td>
<td>(F(4,116) = 33.1, p &lt; .001)</td>
<td>.52</td>
<td>Balance Confidence (ABC)</td>
<td>Balance (BBS), GDS, assistive device use, physical activity</td>
</tr>
</tbody>
</table>
Summary

A total sample of 167 Roman Catholic priests participated in the study. Thirty-six clergy were excluded during the initial testing phase, while remaining subjects (n = 131) performed the entire research protocol. Subjects meeting the designated inclusion criteria were partitioned into two age-related cohorts and compared. Analysis identified significant differences between included and excluded subjects in BMI, TUG time, grip strength, and cognition. A greater proportion of the older cohort of men took four or more medications. In addition, the older cohort had a significantly lower level of physical activity, reported fear of falling, and had sustained a fall in the past three months. Analyses of between group differences demonstrated significantly lower performance scores by the older cohort on the BBS, TUG, and DGI. Frailty markers (BMI, grip strength, and physical activity) significantly contributed to all physical performance dependent variables in multiple regression models. Significant stepwise regression modeling demonstrated that the subset of age, balance confidence, a fall in the past year, and diastolic blood pressure were predictors of balance and gait ability.

Results further noted major differences in balance confidence between the two age cohorts. Within both individual age cohorts and the entire sample, balance confidence significantly correlated with balance ability. Significant predictors of balance confidence included age, gait velocity, and balance. Stepwise modeling identified the additional predictive variables that contributed to balance confidence: mood, assistive device use, and physical activity.
Paper: Fear of Falling and Balance Confidence in Older Men

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Adam Davey, PhD
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Abstract

**OBJECTIVES:** To compare balance confidence in two age cohorts of older adult clergy and identify correlates and predictive determinants of balance confidence in a liturgical research initiative.

**SETTING:** Religious communities in 10 Mid-Atlantic states.

**DESIGN:** Stratified cross-sectional

**PARTICIPANTS:** 131 community-dwelling Roman Catholic priests aged 60-97 years.

**MEASUREMENTS:** Subjects completed a demographic profile, the Physical Activity Scale for the Elderly (PASE), the Berg Balance Scale (BBS), and Timed Up and Go (TUG) Test. Psychosocial assessments included the Activities-specific Balance Confidence Scale (ABC) and 15-item Geriatric Depression Scale (GDS).

**RESULTS:** Fear of falling (FOF) was present in thirty-nine (30%) individuals and 46 (35%) had fallen in the prior year. Subjects demonstrated a mean test value of 83.0+/-14.4 pts. on the ABC tool. Younger priests (60—74 years) demonstrated a significantly higher ABC score than the older cohort (75 and above years) of priests (89.1+ 12.6 vs.78.4 + 13.9). Confidence was significantly correlated with BBS (rho=0.69; p<0.01), TUG (r= -0.58; p<0.01), and GDS (r=-0.39; p<0.01) scores. Stepwise regression modeling analysis demonstrated that balance ability, mood, assistive device use, and physical activity predicted 52% of the variance in balance confidence.

**CONCLUSIONS:** In older men, balance confidence is linked to age, physical performance, and mood. Fear of falling is multifaceted and effective management interventions should consider both physical and psychosocial correlates.

**Key words:** balance confidence, fear of falling, physical performance
Hallmarks for successful aging by community-dwelling older adults include an appropriate gait speed\(^1\) and balance confidence.\(^2\) The negative pole of balance confidence is fear of falling, a major health concern that can limit daily activities, decrease quality of life and lead to early nursing home admission.\(^3\) Fear of falling may be defined as the phobic response to an abnormal fall, slip, or trip which ultimately limits activities of daily living.\(^4\) The condition may develop in individuals who have fallen as well as those older adults who have not experienced a fall. Prevalence rates may range as high as 85% in fallers and 50% in non-fallers.\(^5\) The fear of falling condition is based upon Bandura’s self–efficacy model that an individual’s belief in an activity determines participation in that event.\(^6\) Fearful older adults are more apprehensive about navigating the community where potential environmental challenges are encountered.\(^2\) This may, in turn, result in social isolation or community withdrawal.\(^5\)

Fear of falling has been linked with sociodemographic characteristics (older age, female gender); health related factors (perceived poor health, slower gait speed, impaired balance, fall history, use of an assistive device), and psychosocial factors (declines in cognitive function, anxiety, symptoms of depression; decreased social participation).\(^3,5,7,9\) A significant limitation to studying fear of falling is older adults’ reluctance, for whatever reason, to self-report fear of falling. A lower percentage of men have traditionally reported this condition.\(^9\) This may be due to a reluctance to admit actual fear, or embarrassment due to the stigma related to reporting episodic fear of falling.\(^9\) Furthermore, it is plausible that older men may overinflate their sense of confidence to compensate for deficits in balance and physical performance.\(^10\)
The need to study older adult males is reflected by general demographic disparities and the smaller sample sizes of men in mixed gender studies. United States Census estimates for 2010 indicate over forty million persons will be 65 years or older. The number of females over the age of 65 years outnumbers males by nearly 4 million, with both cohorts collectively representing 12.8 percent of the population. The presence of escalating comorbidities and associated polypharmacy further necessitates careful appraisal of the unique factors which influence functional mobility, fall risk, and balance confidence in men, particularly those over the age of 75 years.

Our approach was to examine balance confidence in older men, specifically Roman Catholic priests. Historically, religious groups have afforded researchers well-controlled samples to study particular disease states and physical performance. For example, studies with Roman Catholic nuns provided greater insight into the overall deterioration and neuropathology associated with both Alzheimer’s Disease and parkinsonism. Shah et al demonstrated that Catholic clergy with a systolic blood pressure of 160 mmHg or more demonstrated a greater decline in lower extremity function.

The purposes of this study were twofold. The first aim was to compare balance confidence in two major age cohorts of older men aged 60-74 years and 75 years and above, and secondly to identify correlates and predictive determinants of balance confidence in older men.
Methods

Design and Participants

A cross-sectional design was used to examine balance confidence and physical performance in older men over the age of 60 years. One hundred and thirty-one Roman Catholic priests were recruited in a large liturgical research initiative aimed at studying physical performance among older adult clergy. A stratified sample of convenience was used to capture subjects in two age-related cohorts: 60 to 74 years (n=56) and 75 years and above (n=75). Prior to participation, all clergy signed informed consent approved by the Institutional Review Board of Temple University.

Procedures

Subjects were recruited through contacts with central diocesan offices and religious order centers in ten states and were tested at their facilities. Inclusion criteria were: community-dwelling clergy, able to rise five times from a chair without physical assistance, and sufficient endurance to walk 10 feet independently. Subjects were excluded if they had chronic neuromusculoskeletal, cardiopulmonary, or renal pathologies which prohibited participation. Additional eligibility screening consisted of a six item cognitive screen\textsuperscript{15}, a vision examination, and vestibular screen. Subjects’ feet were examined (5.07 gram threshold Semmes-Weinstein monofilament) to detect exclusionary sensory neuromas in the feet.\textsuperscript{16}
Sociodemographic Information and Physical Activity

Subjects self-reported the number of medications taken, recent falls, pertinent comorbidities, and use of an assistive device. Weight, height and blood pressure were taken. Subjects completed the Physical Activity Scale for the Elderly (PASE). This test demonstrates sufficient validity\(^1\) for appropriately assessing physical activity in older individuals among leisure, household, and work-related activity domains.

Fear of Falling, Balance Confidence, and Depression Measures

Fear of falling and balance confidence and were assessed using both the single dichotomous fear of falling (FOF) question\(^2\) and the Activities-specific Balance Confidence (ABC) instrument\(^2\), respectively. The single dichotomous FOF question is a useful tool to partition fearful from non-fearful individuals and to identify prevalence estimates.\(^3,19\) The ABC is a reliable and valid instrument to measure perceived balance confidence.\(^2\) Subjects rate their balance confidence on 16 routine home or community-based tasks. Scores above 80% denote higher-functioning, active elders.

Symptoms of depression were assessed using the 15 item version of the Geriatric Depression Scale (GDS). This scale is comprised of 15 questions in a “Yes/No” response to assess respondents’ mood state.\(^19\) This version of the GDS demonstrates appropriate internal consistency and test-retest reliability.\(^20\) Scores above five are suggestive of a depressive state.
Physical Performance Measures

Physical performance is the execution of functional motor skills requisite to independent home and community navigation. Balance was measured by the Berg Balance Scale (BBS) which assesses an individual’s balance ability during performance on 14 routinely performed tasks. Tasks are graded 0-4 point scale for a maximum of 56. The BBS demonstrates predictive validity for assistive device use with scores below 45.

Subjects’ functional mobility was assessed using the Timed Up and Go (TUG). Subjects were instructed to rise to stand, traverse a three meter gait course at their self-selected pace, turn, and return to a seated position in the chair. This instrument has demonstrated appropriate concurrent validity with the Berg Balance Scale and scores slower than 14 seconds are predictive for falls in community-dwelling older adults.

Statistical Analysis

A weighted mean procedure for ANOVA comparison tests was performed at the .80 power level to establish the required sample sizes for the two age divisions (60-74 years; 75 years and older). Descriptive statistics were used to describe the mean or percentages for sociodemographic and health-related characteristics. Independent T tests with Bonferroni correction and chi square frequencies were used to compare select demographic data, balance confidence, and physical performance tests in men aged 60-74 years and 75 years and above. Pearson product moment and Spearman rho coefficients were performed to analyze the association between balance confidence and both physical performance and demographic variables. A stepwise multiple regression model was
constructed based upon those significant bivariate analyses to determine predictive determinants. Significance was set at the 0.05 level. Demographic covariates included BMI, comorbid conditions, and medications. SPSS v18 software was used for all analyses (SPSS Inc., Chicago, IL).

Results

Sample Characteristics

A total of 131 Roman Catholic priests from primarily the Mid-Atlantic region of the United States were tested. Sociodemographic and physical performance profiles are located in Table 1. The majority of subjects were well-educated, had obtained either a Master’s or doctoral degree (79%), and reported perceived health status as good to excellent (84%). Most walked independently without the use of an assistive device. Falls-related data reflect that 39 subjects (30%) indicated having a fear of falling on the single dichotomous question; moreover, 17% of these subjects further indicated that they limited activities because of it. Twenty-one subjects (16%) had fallen during the past three months. Significantly more priests in the older cohort were taking four or more medications, where more subjects in the younger co

Chi square analysis revealed significant differences in FOF frequency and fall history (prior 3 mo.) between the two age cohorts. More men over the age of 75 yrs self-reported FOF activities and more falls (Table 1). Additionally, balance confidence (ABC) was significantly lower in this older group.

Correlation analysis (Table 2) reflected significant associations between balance ability and balance confidence among the clergy. Additional significant correlates
included: age, physical activity, mood, and functional mobility. A stepwise multiple
regression analysis for the entire sample (n=131) determined that balance
(BBS), mood (GDS), assistive device use, and physical activity (PASE) explained 52%
of the variance in balance confidence (Table 3).

Table 21: *Subject Sociodemographic and Physical Performance Profile*

<table>
<thead>
<tr>
<th>Demographic Characteristic of Men</th>
<th>Entire Sample</th>
<th>Men 60-74 yrs.</th>
<th>Men ≥75 yrs.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(n=131)</td>
<td>(n=56)</td>
<td>(n=75)</td>
</tr>
<tr>
<td>Demographic Profile, Anthropometry, and Physical Activity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (Yrs./x, SD, range)</td>
<td>76.1 (9.0)</td>
<td>67.3 (4.4)</td>
<td>82.6 (5.1)†</td>
</tr>
<tr>
<td></td>
<td>(Range:60-97)</td>
<td>(Range:60-74)</td>
<td>(Range:75-97)</td>
</tr>
<tr>
<td>Cognition (Max.6/x,SD)</td>
<td>5.5(0.73)</td>
<td>5.8(0.41)</td>
<td>5.4(8.5)</td>
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<tr>
<td>Education (Yes, %)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PhD</td>
<td>25(19%)</td>
<td>10(18%)</td>
<td>5(20%)</td>
</tr>
<tr>
<td>Master’s Degree</td>
<td>78(60%)</td>
<td>33(60%)</td>
<td>45(60%)</td>
</tr>
<tr>
<td>Bachelor’s Degree</td>
<td>17(13%)</td>
<td>6(11%)</td>
<td>10(13%)</td>
</tr>
<tr>
<td>Less/Other</td>
<td>11(8%)</td>
<td>6(11%)</td>
<td>7(7%)</td>
</tr>
<tr>
<td>BMI (kg/m^2)</td>
<td>29.5 (5.5)</td>
<td>31.6 (6.2)</td>
<td>27.9 (4.3)†</td>
</tr>
<tr>
<td>Number of Medications Taken (#)</td>
<td>5.4(3.8)</td>
<td>4.7(4.2)</td>
<td>5.9(3.6)</td>
</tr>
<tr>
<td>4 or More Medications Taken</td>
<td>86(65)</td>
<td>29(52)</td>
<td>57(76)*</td>
</tr>
<tr>
<td>Describe General Health (Yes, %)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excellent/Good</td>
<td>106(84)</td>
<td>48(86)</td>
<td>61(82)</td>
</tr>
<tr>
<td>Fair/Poor</td>
<td>21(16)</td>
<td>8(14)</td>
<td>13(18)</td>
</tr>
<tr>
<td>Fear of Falling, Balance Confidence, and Depression Measures</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fear of Falling? (Yes,%)</td>
<td>39(30%)</td>
<td>8(14%)</td>
<td>31(41%)*</td>
</tr>
<tr>
<td>Fear of Falling Limit Activities? (Yes,%)</td>
<td>17(13%)</td>
<td>4(7%)</td>
<td>13(17%)</td>
</tr>
<tr>
<td>Fall in Past 3 Months? (Yes,%)</td>
<td>21(16%)</td>
<td>5(9%)</td>
<td>16(21%)*</td>
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<tr>
<td>Balance Confidence (Max. 100/x,SD)</td>
<td>3.0(14.4)</td>
<td>89.1(12.6)</td>
<td>78.4(13.9)†</td>
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<tr>
<td>Geriatric Depression Scale (Max. 15/x,SD)</td>
<td>1.4(1.5)</td>
<td>1.0(1.6)</td>
<td>1.6(1.5)</td>
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<tr>
<td>Physical Activity and Physical Performance</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Physical Activity Scale for the Elderly (s,SD)</td>
<td>107.7(97.8)</td>
<td>169.4(109.0)</td>
<td>64.3(58.8)†</td>
</tr>
<tr>
<td>Assistive Device Use (Yes,%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assistive Device</td>
<td>22(17%)</td>
<td>3(5%)</td>
<td>19(25%)*</td>
</tr>
<tr>
<td>Walker</td>
<td>1(1%)</td>
<td>0(0%)</td>
<td>1(1%)</td>
</tr>
<tr>
<td>Quad Cane</td>
<td>1(1%)</td>
<td>0(0%)</td>
<td>1(1%)</td>
</tr>
</tbody>
</table>
Table 21 (Cont.)

*Subject Sociodemographic and Physical Performance Profile*

<table>
<thead>
<tr>
<th></th>
<th>Straight Cane</th>
<th>Other</th>
<th>Berg Balance Scale (max 56/x,SD)</th>
<th>Timed Up and Go Test (sec./x,SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>19 (14%)</td>
<td>1 (1%)</td>
<td>49.4 (7.3)</td>
<td>12.1 (3.8)</td>
</tr>
<tr>
<td></td>
<td>3 (5%)</td>
<td>0 (0%)</td>
<td>53.4 (4.8)</td>
<td>10.4 (2.3)</td>
</tr>
<tr>
<td></td>
<td>16 (22%)*</td>
<td>1 (1%)</td>
<td>46.5 (7.5)†</td>
<td>13.4 (4.2)†</td>
</tr>
</tbody>
</table>

*Significant: P ≤ .005
†Significant: P ≤ .001

Table 22

*Balance Confidence Association with Performance and Demographic Correlates*

<table>
<thead>
<tr>
<th>Variable (n=131)</th>
<th>Age</th>
<th>Balance (BBS)</th>
<th>Physical Activity (PASE)</th>
<th>Mood (GDS)</th>
<th>Mobility (TUG)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balance Confidence (ABC)</td>
<td>-0.47*</td>
<td>-0.69*</td>
<td>0.57*</td>
<td>-0.39*</td>
<td>-0.57*</td>
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</table>

*Significant: p < 0.01

Table 23

*Prediction of Balance Confidence*

<table>
<thead>
<tr>
<th>Model</th>
<th>Independent Variable</th>
<th>B</th>
<th>T</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stepwise</td>
<td>Balance (BBS)</td>
<td>.42</td>
<td>4.88</td>
<td>.001</td>
</tr>
<tr>
<td></td>
<td>Mood (GDS)</td>
<td>-.21</td>
<td>-3.2</td>
<td>.002</td>
</tr>
<tr>
<td>R²=.52</td>
<td>Assistive Device Use</td>
<td>-1.96</td>
<td>-2.5</td>
<td>.012</td>
</tr>
<tr>
<td></td>
<td>Physical Activity (PASE)</td>
<td>.157</td>
<td>2.0</td>
<td>.04</td>
</tr>
</tbody>
</table>
Discussion

The fear of falling condition has gained recognition in recent years secondary to initiatives aimed at minimizing fall episodes, risk factors, and associated fall-related sequelae. To our knowledge, this is the first study to exclusively examine balance confidence and fear of falling in older adult men. While multiple studies have found that female gender is a significant predictor of the fear of falling condition, analyses describing balance confidence in older men alone remain limited. Findings demonstrated significantly lower balance confidence scores when comparing age cohorts below and above the age of 75. Since age-related comparisons for the ABC have not been recorded in men, we feel this finding is noteworthy with a near 10 point difference between the two age groups.

Our mean score of 83.0 (sd 4.4) on the ABC tool was slightly less (87.5, sd 10.6) than the mean average reported by Lajoie and Gallagher in a mixed gender sample, and considerably less (94.5, sd 8.3) than scores of older men reported by Herman and colleagues. Two potential reasons for score differences prevail. Seventeen percent of the priests in our study used an assistive device (e.g. walker, cane, or otherwise), whereas subjects reported by Herman and colleagues were required to ambulate without the use of any device. In addition, the sociodemographic characteristics may account for some of the differences. Herman et al did not report activity level and included only subjects in the 70-90 year cohort, whereas our study permitted nonagenarians.

Thirty percent of all subjects (n=131) responded that they were fearful of falling on the single dichotomous FOF question. Scheffer and colleagues reported that prevalence has ranged from 20.8% to 85%, however these were gender mixed studies.
Our frequency provides a more accurate estimate given that only men were included in the sample and is higher than previous rates reported\(^2\) for older men. In addition, there was a significantly greater number of clergy who were responded as fearful in the older cohort compared to the younger.

There was a significant negative correlation between age and balance confidence. Conflicting reports in the literature have been cited regarding these two variables. While age has previously been identified\(^5\) as a fear of falling correlate, Kressig et al\(^{28}\) found no association between age and balance confidence. Our data confirm the former authors’ conclusions and illustrate that confidence level is associated with increasing age. One potential explanation for these conflicting findings could be ethnicity and target sample. In their study of 251 inner city older adults, Kressig and colleagues studied more subjects who were African-American and more frail than in our study.

The cluster of variables identified to predict balance confidence deserves discussion. While Scheffer\(^5\) et al identified only one modifiable risk factor for developing fear of falling, our study, on the other hand, identified three modifiable factors: mood, balance ability, and physical activity. These findings have implications for fear of falling interventions, particularly depression. The link between depression and fear of falling has previously been noted in the literature.\(^{29-30}\) This relationship between depression and fear of falling is particularly relevant for older adult men given analyses of veterans attending VA gait and balance clinics have cited depression rates as high as 23% among male participants.\(^31\)

Studies have previously reported associations between balance confidence and balance ability using both the ABC and BBS tools.\(^{26,32}\) Our findings that balance ability
parallels balance confidence are in accordance with these findings, and the strength of this association was robust (rho=0.69). In their study of community-dwelling older adults, Hatch, Gill-Body, and Portney\textsuperscript{32} noted that 50% of the variance in balance ability could be attributed to balance confidence. Similarly, we noted that balance ability, in addition to mood, physical activity, and assistive device used, were predictive determinants of confidence level. Interestingly, Sharaf and Ibrahim\textsuperscript{33} found nearly identical predictors of fear of falling (balance, depression, and assistive device use) in their study of 208 individuals living in assisted living facilities compared with our community-dwelling participants.

Decreased physical activity has been associated with physical decline in older adults,\textsuperscript{34} yet our findings extrapolate this relationship with balance confidence as well. Current studies have indicated that higher levels of physical activity are associated with less recurrent falls and higher bone density in older adult men.\textsuperscript{35,36} Additionally, level of physical activity and lower extremity strength were found to predict rates of mobility decline among Catholic clergy.\textsuperscript{37} The empowering effect of community navigation, volunteerism, and remaining active well into retirement may have influenced subjects’ level of security in maintaining their balance. Conversely, the use of an assistive device because of gait instability during routine tasks may have adversely affected balance confidence.

Only 13% percent of all subjects actually limited their activities because of fear of falling. This frequency is surprisingly low given the fall history and age range of our participants. Our findings are in accordance with Fletcher and Hirdes’ study\textsuperscript{38} of over 2,000 seniors receiving home care services where men were less likely to restrict their
activity because of associated fear of falling. Clergy in our study may have felt compelled to continue with daily work and liturgical duties despite fear of falling, impaired functional mobility, or having sustained a fall.

There has been considerable controversy in the literature regarding tool selection for assessment of fear of falling and balance confidence. Moore and Ellis\textsuperscript{29} reported frequent inappropriate use of assessment instruments due to confusion regarding those underlying constructs of the tools themselves. Additional studies\textsuperscript{5} confirmed difficulty in acknowledging FOF prevalence rates because of inconsistent tool utilization. We chose to administer both the single dichotomous FOF question and ABC tool to capture two perspectives. The single FOF question effectively identified those individuals who were fearful, with follow-up of subsequent activity restriction. Use of the ABC tool provided the opportunity for subjects to quantify their level of confidence during household and community activities commonly performed. Periodically subjects required redirection to discern their specific confidence level and not actual ability to perform the task. A similar approach was taken by Reelick and colleagues when analyzing the influence of fear of falling on gait and balance. The ABC demonstrated appropriate concurrent validity with physical performance tests and both PASE and GDS scores. Similar psychometric support was demonstrated by Talley, Wyman, and Gross\textsuperscript{40} when assessing concurrent validity of the instrument in a cohort of community-dwelling women (n=272) over the age of 70. This psychometric support underscores the continued feasibility of the ABC for older community-dwelling male clergy.

The present study has several strengths. Studying only Roman Catholic priests afforded a unique population of older adult men relatively homogeneous in
educational status, vocation, and living domains. We were able to assess two major constructs, fear of falling and balance confidence, in conjunction with physical performance. In addition, testing error was minimized by having only one tester for the entire sample. Those identified predictive determinants of balance confidence yield potential interventions for current evidence-based strategies aimed at managing the fear of falling condition. Falls-related self-efficacy a successful predictor of outcomes in geriatric rehabilitation.41

Our study examined, however, the only community-dwelling sector of older adult clergy, primarily Caucasian, who were independent in gait and functional mobility and activities of daily living. The unique nature of our sample limits generalizability. In examining fear of falling, we did not delineate community versus home-based fear on the single FOF question. Deshbande et al41 noted that those individuals noting fear of falling on a targeted FOF question exclusively for home-based activities were significantly more impaired in psychosocial and physical characteristics. This warrants additional follow-up for future studies. In conclusion, our findings demonstrate a significant age-related decrease in balance confidence and concomitant increase in FOF among older Roman Catholic priests. Balance confidence is associated with balance ability and functional mobility in this population, and major determinants of confidence level includes balance, mood, physical activity, and assistive device use.
ACKNOWLEDGMENTS

Conflict of Interest: This study was supported in part by the Geriatrics Section Adopt-A-Doc Scholarship of the American Physical Therapy Association. No financial conflicts of interest exist.

Author Contributions: All authors contributed to the study design, methods, and data interpretation. Roberta A. Newton served as Principal Investigator and oversaw the study implementation. Emily A. Keshner provided support for the study design and data interpretation. Dennis W. Klima was responsible for conceptualizing the design framework, data collection, and analysis. Adam Davey provided statistical support for data computation and analyses.
References


Physical Performance Among Older Clergy

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Adam Davey, PhD
Department of Public Health
Temple University
Abstract

**Purpose:** Studies examining physical performance among older adult men remain limited. The purpose of this study was to examine gait, balance, and functional mobility among two cohorts of Roman Catholic priests (age 60-74 years of age and 75+ years) and to analyze predictive markers of physical performance. **Participants:** Subjects included 131 community-dwelling Roman Catholic priests over 60 (x= 76.1; SD=9.0; range:60-97 years) living in rectories, senior housing, or religious communities in ten states.

**Materials/Methods:** Subjects completed a basic demographic profile, the Berg Balance Scale (BBS), Timed Up and Go (TUG) Test, and the Dynamic Gait Index (DGI). Additional assessments included BMI, blood pressure, grip strength, and the Physical Activity Scale for the Elderly (PASE). Data were analyzed using descriptive statistics, independent T tests, and stepwise regression modeling. **Results:** Demographic profiles revealed that 46 subjects (35%) had fallen over the past year. Eight-six (65%) subjects were taking four or more medications. Significant differences (p<0.001) in physical performance between the younger and older age cohorts were noted on the BBS(53.4±4.8 vs. 45.5±7.5), TUG(10.4 sec.+2.3 vs. 13.4 sec.+4.2), and DGI(22.6±2.6 vs. 19.0±4.2) respectively. Stepwise regression analysis demonstrated that age, balance confidence, a fall in the past three months, and diastolic blood pressure predicted 60% of the variance in the BBS, 61% of the variance on the DGI, and 49% of the variance on the TUG(all p<0.001). **Conclusions:** Data findings suggest that both physiologic and psychosocial factors impact the functional profile of the older adult priest. Common tests of physical performance may be incorporated with modifiable predictive determinants to establish target interventions for balance, gait, and functional mobility.
Introduction

Analysis of physical performance in the geriatric population is complex and multi-faceted. Older adults’ physical performance is closely intertwined with an assemblage of sociodemographic, physical health, and affective/mental health factors. The need to study physical performance in older males is reflected by the number of men living longer and current studies are primarily gender-based (female) or mixed gender. Existing census data document an increase in the elderly in the United States (US) and a concomitant increase in life expectancy in men.1 The rising number of older males presents a challenge to health care and other services to assist older men to remain independent in a variety of settings. The presence of escalating comorbidities and associated medication regimens further necessitates careful appraisal of the many factors which influence physical performance and functional mobility. Elderly men have unique impairments and related sociodemographic variables which may affect physical performance and community or home navigation. For example, a protective response between light alcohol intake and hip fracture exists in older men.2 In contrast, heightened fall risk has been linked to lower levels of bioavailable testosterone3 and decreased BMI.4

Falls and fall-related injuries are associated with higher health care costs, decreased quality of life, and psychological consequences including decreased balance confidence and depression.5 Older men are more likely to die from a fall.6 Current evidence suggests that men should be screened for falls more thoroughly; moreover, one in three elderly male veterans who sustains a hip fracture dies within 12 months.7

Studies pertaining to physical performance in men have traditionally taken three approaches. First, analyses of measures such as strength and gait speed have examined 10
year age cohorts. Second, researchers have analyzed disease–specific domains of physical performance in large population–based studies. For example, Lee and colleagues determined that an inverse relationship exists between perceived level of exertion and coronary heart disease in the Harvard Men’s Study. Third, Boeninger, Shiraishi, Aldwin, and Spiro in the Veterans Affairs Normative Aging Study determined that older men reported less stress ratings in response to everyday problems. Purser and colleagues used walking speed to predict health status among frail male veterans.

Our approach was to examine age-related physical performances in a special population of older men, Roman Catholic clergy. Examining a cohort of Roman Catholic priests provides a comparatively homogenous sample of older men similar in vocational, educational, and lifestyle backgrounds. Prior investigations performed with Catholic clergy have explored age-related coordination changes, as well as the incidence of neuropathologic changes from Alzheimer’s Disease. Our first aim was to examine physical performance differences in two cohorts of older clergy: ages 60-74 years and 75 and above. The second aim was to identify predictive determinants of three domains of physical performance: balance ability, functional mobility, and gait performance.

Methods
Study Design, Participants and Recruitment

A cross-sectional design was used to examine physical performance and related psychosocial variables in older adult Roman Catholic priests 60 years and older. A stratified sample of convenience was used to capture subjects in two age-related cohorts: 60 to 74 and 75 years and above. Subjects were recruited through contacts with central diocesan offices and religious order centers in the Mid-Atlantic region. Testing occurred at local rectories, parish centers, and religious institutions. Testing protocol criteria excluded older men with chronic neuromusculoskeletal or cardiorespiratory pathologies that would preclude individuals from performing the battery of tests. Subjects initially completed an eligibility screen related to the designated inclusion and exclusion criteria and responded to the Six Item Screener for Cognitive Impairment. In addition, subjects were required to have at least 20/40 vision with lens correction and no prohibitive vestibular deficits. The Near Vision Chart was used to discern vision deficits, and both vestibulo-ocular and Dynamic Visual Acuity (DVA) tests were employed to rule out vestibular pathology. Subjects were examined with Semmes-Weinstein monofilament testing (5.07 gram threshold) to detect sensory neuropathies in the feet. The study was approved by the Temple University and University of Maryland Eastern Shore IRB.

Demographic Information, Physical Activity, and Balance Confidence

Subjects responded to a demographic questionnaire to capture essential information such as: number of medications taken, falls in the past three months, pertinent comorbidities, and use of an assistive device. Weight and height were measured to calculate body mass index (BMI). Subjects’ blood pressure was also taken during the testing protocol. Subjects completed the Physical Activity Scale for the Elderly (PASE)
to assess subjects’ level of physical activity during routine leisure, household, and work-related activities. The Activities-specific Balance Confidence tool (ABC) was used to quantify perceived balance confidence during the performance of 16 routine functional home or community-based tasks.

Physical Performance

Physical performance is operationally defined as the execution of functional motor skills requisite to independent home and community navigation. These tasks reflect elders’ ability to perform activities of daily living and mobility tasks without significant risk of injury. Physical performance was assessed through a triad of component parts designed to analyze subjects’ balance ability, functional mobility, and dynamic gait performance. The following tests constitute the physical performance battery and were selected because of their strong psychometric properties and ease of administration in a variety of settings. Review of physical performance videocassette tapes was performed to establish intratester reliability (intraclass coefficients >.90) on all physical performance tests.

Berg Balance Scale (BBS).

Balance control was assessed by the Berg Balance Scale. Subjects perform 14 routine tasks arranged in order of difficulty. A five point scale is used and the individual task scores summed for a maximum of 56 points. Time on the single leg standing task is a negative correlation with age in elderly men. The instrument has confirmed concurrent validity with the Performance Oriented Mobility Assessment and demonstrates predictive validity for assistive device use with scores below 45.

Timed Up and Go (TUG) Test
Functional mobility was assessed using the TUG.\textsuperscript{25} Seated subjects rise to stand, traverse a three meter gait course, turn, and subsequently return to a seated position in the chair. An armchair with 46 centimeters seat to floor height was utilized. This instrument has demonstrated appropriate concurrent validity with the BBS\textsuperscript{26} and stair-climbing.\textsuperscript{27} Cut-off scores indicate fall risk for both community-dwelling older adults,\textsuperscript{28} and elders who have sustained a hip fracture.\textsuperscript{29}

Dynamic Gait Index (DGI)

Gait performance was analyzed through the Dynamic Gait Index.\textsuperscript{30} The DGI assesses the subject’s ability to modify gait in conjunction with eight task demands that includes negotiating obstacles and changing gait speeds. Twenty-four possible points are available. Shumway-Cook and colleagues\textsuperscript{30} determined that older adults with scores below 19 were at risk for falls. To date, no age-related comparisons in men have been examined.

Statistical Analyses

Descriptive statistics were used to obtain subjects’ sociodemographic characteristics. Independent T tests and Chi Square analyses were performed to analyze select demographics. A MANCOVA model was used to compare physical performance tests between the two age cohorts to reduce the likelihood of a Type I error from multiple comparison computation. Covariates included medications and comorbidity conditions. Stepwise regression models identified predictive determinants for each of the three physical performance tests. All data were analyzed with SPSS version18 (SPSS Inc,
Chicago, IL) and significance was set at the 0.05 level, with an expanded alpha level (p < 0.1) for exploratory stepwise regression models.

**Results**

A total of 131 Roman Catholic priests met the inclusion criteria and were tested over a 14 month period in the Mid-Atlantic region. Testing sites included rectories (7%), senior retirement centers (47%), and private housing (46%) communities. The majority of subjects reported their perceived health status in the good to excellent range, were well-educated, and had obtained a graduate degree (Table 1). The cognitive screen yielded no significant between group differences, though the older cohort self-reported lower balance confidence. Most walked independently without the use of an assistive device. Significant between group differences were found for age and BMI, and major prevailing comorbidities included prostate problems, diabetes, and joint replacement surgery (Table 2). There was a significantly greater proportion of the older group who took four or more medications and had fallen in the prior three months. In addition, diastolic blood pressure was lower in the older cohort.

Bivariate analyses indicated significant differences in both balance and gait performance. With comorbidities and medications treated as covariates, older clergy demonstrated significantly lower (slower) physical performance scores (Table 3) in gait (DGI), balance (BBS), and functional mobility (TUG). Stepwise regression models were constructed with independent variables entered from sociodemographic differences identified when comparing age cohorts. Stepwise modeling depicted that subjects’ age, ABC score, diastolic blood pressure, and history of a fall in the past 3 months predicted 60% of the performance on the BBS, 49% on the TUG instrument, and 61% on the DGI.
Table 24  Sociodemographic and Performance Profile

<table>
<thead>
<tr>
<th>Demographic Characteristic of Men</th>
<th>Entire Sample</th>
<th>Men 60-74 yrs.</th>
<th>Men ≥75 yrs.</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>(n=131)</td>
<td>(n=56)</td>
<td>(n=75)</td>
</tr>
<tr>
<td><strong>Demographic Profile, Anthropometry, and Physical Activity</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Age (Yrs./x, SD, range)</td>
<td>76.1 (9.0)</td>
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<td>82.6 (5.1)†</td>
</tr>
<tr>
<td>(Range:60-97)</td>
<td></td>
<td>(Range:60-74)</td>
<td>(Range:75-97)</td>
</tr>
<tr>
<td>Number of Years Since Ordination (x, SD)</td>
<td>48(12.6)</td>
<td>38.1(11.0)</td>
<td>55.1(8.3)</td>
</tr>
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<td>Cognition (Max.6/x,SD)</td>
<td>5.5(0.73)</td>
<td>5.8(0.41)</td>
<td>5.4(8.5)</td>
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<tr>
<td>Education (Yes, %)</td>
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<tr>
<td>PhD</td>
<td>25(19%)</td>
<td>10(18%)</td>
<td>5(20%)</td>
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<td>Master’s Degree</td>
<td>78(60%)</td>
<td>33(60%)</td>
<td>45(60%)</td>
</tr>
<tr>
<td>Bachelor’s Degree</td>
<td>17(13%)</td>
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<td>10(13%)</td>
</tr>
<tr>
<td>Less/Other</td>
<td>11(8%)</td>
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<td>7(7%)</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>29.5 (5.5)</td>
<td>31.6 (6.2)</td>
<td>27.9 (4.3)†</td>
</tr>
<tr>
<td>Systolic Blood Pressure (mm Hg; x, SD)</td>
<td>128.9(12.1)</td>
<td>128.6(12.4)</td>
<td>128.9(10.9)</td>
</tr>
<tr>
<td>Diastolic Blood Pressure (mmHg; x, SD)</td>
<td>77.3(9.4)</td>
<td>80.9(9.1)</td>
<td>75.1(9.0) *</td>
</tr>
<tr>
<td>Number of Medications Taken (#; x, SD)</td>
<td>5.4(3.8)</td>
<td>4.7(4.2)</td>
<td>5.9(3.6)</td>
</tr>
<tr>
<td>4 or More Medications? (Yes, %)</td>
<td>86(65%)</td>
<td>29(52%)</td>
<td>57(76%)*</td>
</tr>
<tr>
<td>Describe General Health (Yes, %)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excellent/Good</td>
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<td>Fear of Falling? (Yes,%)</td>
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</tr>
<tr>
<td>Fall in Past 3 Months? (Yes,%)</td>
<td>21(16%)</td>
<td>5(9%)</td>
<td>16(21%)*</td>
</tr>
<tr>
<td>Fall in Past Year? (Yes, %)</td>
<td>46(35%)</td>
<td>18(33%)</td>
<td>28(38%)</td>
</tr>
<tr>
<td>Balance Confidence (Max. 100/x,SD)</td>
<td>3.0(14.4)</td>
<td>89.1(12.6)</td>
<td>78.4(13.9)†</td>
</tr>
<tr>
<td>Physical Activity and Physical Performance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical Activity Scale for the Elderly(#,SD)</td>
<td>107.7(97.8)</td>
<td>169.4(109.0)</td>
<td>64.3(58.8)†</td>
</tr>
<tr>
<td>Assistive Device Use (Yes,%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assistive Device</td>
<td>22(17%)</td>
<td>3(5%)</td>
<td>19(25%)†</td>
</tr>
<tr>
<td>Walker</td>
<td>1(1%)</td>
<td>0(0%)</td>
<td>1(1%)</td>
</tr>
<tr>
<td>Quad Cane</td>
<td>1(1%)</td>
<td>0(0%)</td>
<td>1(1%)</td>
</tr>
<tr>
<td>Straight Cane</td>
<td>19(14%)</td>
<td>3(5%)</td>
<td>16(22%)†</td>
</tr>
</tbody>
</table>
Table 24 (Cont.)
Sociodemographic and Physical Performance Profile

| Other (Rollator) | 1(1%) | 0(0%) | 1(1%) |

*Significant: P< .05
†Significant: P ≤ .001

Table 25
Comorbidity Profile of Age Cohorts

<table>
<thead>
<tr>
<th>Medical Condition/ Medications</th>
<th>Entire Sample of Men (N=131)</th>
<th>Men 60-74 yrs (n=56)</th>
<th>Men ≥ 75 yrs (N=75)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you have heart problems? (Yes, %)</td>
<td>52(39%)</td>
<td>24(43%)</td>
<td>28 (37%)</td>
</tr>
<tr>
<td>Do you have Diabetes? (Yes, %)</td>
<td>22(17%)</td>
<td>13(24%)</td>
<td>8 (11%)</td>
</tr>
<tr>
<td>Do you have prostate problems? (Yes, %)</td>
<td>51(39%)</td>
<td>15(27%)</td>
<td>36(48%)*</td>
</tr>
<tr>
<td>Do you have Depression? (Yes, %)</td>
<td>10(8%)</td>
<td>4(7%)</td>
<td>6 (8%)</td>
</tr>
<tr>
<td>Do you have a joint replacement? (Yes, %)</td>
<td>13(10%)</td>
<td>0(0%)</td>
<td>13(17%)†</td>
</tr>
<tr>
<td>Do you have Osteoporosis? (Yes, %)</td>
<td>4(4%)</td>
<td>3(5%)</td>
<td>2(3%)</td>
</tr>
<tr>
<td>Do you have G-I problems? (Yes, %)</td>
<td>25(19%)</td>
<td>12(21%)</td>
<td>15(20%)</td>
</tr>
</tbody>
</table>

*Sig: p<0.05 †Sig: p<0.005
Table 26  
*Physical Performance Comparisons*

<table>
<thead>
<tr>
<th>Physical Performance Measure/</th>
<th>Entire Sample of Men (n=131)</th>
<th>Men 60-74 yrs (n=56)</th>
<th>Men ≥ 75 yrs (n=75)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berg Balance Scale (Max 56; x, SD)</td>
<td>49.4(7.3) (Range: 24-56)</td>
<td>53.4(4.8) (Range: 33-56)</td>
<td>46.5+/−7.5* (Range:24-56)</td>
</tr>
<tr>
<td>Dynamic Gait Index (Max 24; x, SD)</td>
<td>20.6 (4.0) (Range:8-24)</td>
<td>22.6(2.6) (Range:13-24)</td>
<td>19.0( 4.2)* (Range: 8-24)</td>
</tr>
<tr>
<td>Timed Up and Go Test (x, SD)</td>
<td>12.1( 3.8) (Range:6.4-27.3)</td>
<td>10.4( 2.3) (Range:6.4-18.7)</td>
<td>13.4( 4.2)* (Range:8.9-27.2)</td>
</tr>
</tbody>
</table>

Note. *Sig:  MANCOVA; Wilk’s Lambda p< 0.001*
Discussion

This is the first study to examine three widely used constructs of physical performance in a focused population of older men, Roman Catholic priests. Studies among the clergy, particularly male clergy, remain limited. We are aware of only one age-related comparison study, that of Ploysangngam and colleagues,\textsuperscript{31} which compared dentition attributes among analogous age cohorts of older priests. Most recently, Proeschold-Bell and Legrand\textsuperscript{32} noted that interventions targeting obesity and chronic diseases among clergy should be considered a priority due to high prevalence rates. Our partition at age 75 yrs. was based upon recent studies similarly analyzing pain, sleep patterns, and metabolic syndrome in similar age cohorts.\textsuperscript{33-35} As older adults live longer, we believe this is a prudent option to compare physical performance between the younger old and older old.

Significant differences were noted in the physical performance measures between the two age groups and performance for the entire group was consistently lower than published values. The TUG is widely used to assess functional mobility in older adults.\textsuperscript{25-27} The mean value of 12.1 (±3.8 SD) seconds is slower than reported previously in men\textsuperscript{36} or in older females.\textsuperscript{37} Reasons for discrepant values may be related to procedural differences or specific age cohorts examined. In our testing protocol, we instructed subjects to walk at a self-selected, comfortable pace and not as quickly as possible. Based upon Bohannon’s metanalysis of studies using the TUG, we chose to use a standard arm chair with 46 cm. seat to floor height compared to other chair dimensions. In addition, our values may have been slower than age-norm reference values because we chose to
separate our subject groups into larger age cohorts divided at age 75 yrs rather than traditional 10 year clusters.

The BBS is considered a gold standard for clinical balance testing. Our findings contribute to those existing studies by illustrating men’s performance values and are in line with reference values obtained by von Heideken Wagert and colleagues, who tested men and women over the age of 85 years. Mean values for each of the age cohorts and group overall exceeded the accepted threshold for fall risk. This cut-off score for falls, however, has become a point of debate. While the score of 45 has been proposed as an accepted marker for fall risk, Berg and colleagues advocated that fall risk should be determined through likelihood ratios rather than as a dichotomous scale. The majority of subjects in our study scored above 45, though 33% of younger and 38% of older priests had fallen over the past year. We concur that determining fall risk by an inveterate cut-off score should be approached with caution.

Of the three primary physical performance measures, less data exist which depicts older men’s performance on the Dynamic Gait Index. Unique in its construct, the DGI measures an individual’s ability to superimpose activities during the gait cycle. Our mean values for each of the age cohorts and overall group differ from the near perfect scores reflected by Herman et al. Reasons for these differences are twofold. First, Herman and colleagues included only subjects who ambulated without a walking aid. The priests in our study were permitted to use their routine walker or cane, though scored lower because of categorical deductions for assistive device use. In addition, the authors did not include subjects above the age of 90, whereas several nonagenarians were included in our
older cohort. Our DGI performance findings are in line with Vereek and colleagues,\textsuperscript{41} where subjects in their seventies demonstrated significantly lower DGI scores.

Predictive variables revealed both modifiable (age) and non-modifiable (balance confidence, fall episodes, and diastolic blood) determinants of physical performance, predicting 49\% on the TUG, 60\% on the BBS and 61\% on the DGI. It is particularly noteworthy that two variables are related to falls. The link between balance confidence and balance ability has previously been addressed in the literature,\textsuperscript{42,43} and our data support the premise that balance confidence parallels balance ability.

While the literature supports that more women between the ages of 65 and 85 years sustain falls, fall rates are similar for both genders over 85 years\textsuperscript{6}. In our entire sample, 35\% of participants had sustained a fall over the past year. Our findings that fall history influences physical performance in older men present an opposing dichotomy to previous findings that underscore how, conversely, poor physical performance contributes to episodic falls.\textsuperscript{5} For example, gait impairments and slower velocity have traditionally been regarded as fall risk determinants.\textsuperscript{4-7} A recent fall should thus be regarded as a serious event capable of impacting impending balance and gait performance, particularly among those priests 75 yrs and older. Men in this age group who fall are four to five times more likely to enter a nursing home for a year or longer, with Caucasian men over the age of 75 having the highest fall fatality rate.\textsuperscript{6}

Diastolic blood pressure is a measure of left ventricular function and the force exerted against the arterial walls during cardiac diastole. High diastolic blood pressure has traditionally indicated poor physical activity and obesity; as expected, participants’ diastolic blood pressure was inversely related to all three performance measures.
Interestingly, our findings noted a significant decrease in DBP when comparing our younger cohort with the older group. We hypothesize that this decrease may be due, in part, to the frailty level of the older priests. Low diastolic blood pressure has been aligned with the frailty syndrome in elderly individuals and the fact that our older cohort similarly had a concomitant decrease in BMI, physical activity level, and grip strength supports this premise. While Shah and colleagues noted that elevated systolic blood pressure was associated with decreased lower limb function, to our knowledge, this is the first report of diastolic blood pressure as a determinant of physical performance.

Comparing the younger old with the older old cohorts provided insight into age-related performance using the age of 75 yrs as a dividing marker. A similar paradigm was utilized by McCrae et al, who found that the older old group self-reported worse sleep quality than the young old. Kinsella and colleagues used parallel age cohorts to analyze fracture risk among older women with moderate chronic kidney disease.

There are currently two large initiatives which involve Catholic clergy: the Nun’s Study and the Religious Orders Study. The Nun’s Study is a large epidemiologic project aimed at examining variable domains such as longevity, cognitive impairment, and Alzheimer’s Disease among nuns in the School Sisters of Notre Dame Order. The Religious Orders Study similarly analyzes risk factors for dementing illnesses and age-related disorders, though also includes male Catholic clergy. Our findings compliment these two existing studies, though two major differences prevail. Our approach was to analyze physical performance through gait and balance assessment, with less emphasis on cognitive constraints. Second, our design did not involve brain donation, a key component of both the Nun Study and Religious Order’s Study. Our gait and balance
comparisons present a unique dimension of physical performance related to clergy and the liturgical lifestyle.

Our study has several benefits. A paucity of data exist illustrating age-related performance values in Roman Catholic priests. All subjects were community-dwelling individuals who reflected a variety of fitness levels. These performance values yield beneficial information for those health professionals who screen community-dwelling clergy or monitor their health status. Data also serve as a conduit for potential interventions which may be employed to address those modifiable determinants of physical performance, namely episodic falls, balance confidence, and blood pressure. In addition, all participants were tested by a single physical therapist who established strong preliminary test-retest reliability. Clergy were tested in their own living environment and not influenced by other participants which can commonly occur with community-based testing.

Given the focused nature of sample, our data cannot be generalized to all community-dwelling men. The unique nature of the Catholic clergy lifestyle truncate variation in other daily life routines associated with non-clergy. In addition, the cross-sectional design of the study prevents interpretations based upon temporal causation of data. Priests electing to participate may have included those who were physically active and elected to partake in the study versus those not choosing to disclose health-related imposed limitations.

A direction for future studies would be follow-up tracking of physical performance and physical activity. Studies examining longitudinal changes in elderly men are limited, though most recently Janney and colleagues from the Osteoporotic
Fractures in Men Study determined that older men 65 yrs and older who were in poor health and lived alone demonstrated a higher level of physical activity decline over a mean follow-up of five years. Subsequent follow-up can incorporate measures used in the present study. Use of the BBS recently demonstrated the ability to predict difficulties with activities of daily living over an 18 month trajectory. Longitudinal tracking of priests with diabetes presents another area for follow-up. Arvanitakis et al reported diabetes as a risk factor for parkinsonian gait disturbances among Catholic clergy.

Our goals of this study were to analyze physical performance differences among two age cohorts of Roman Catholic priests. Findings demonstrated significant differences in three constructs of physical performance: gait, balance, and functional mobility. Factors determining physical performance included age, a fall in the past three months, balance confidence, and diastolic blood pressure. Our study provides evidence that both physiologic and psychosocial factors contribute to the physical performance profile of Roman Catholic priests over that age of 60.
References


25. Podsiadlo D & Richardson S. The Timed “Up and Go”: A test of basic functional


ACKNOWLEDGMENTS

Conflict of Interest: This study was supported in part by the Geriatrics Section Adopt-A-Doc Scholarship of the American Physical Therapy Association. No financial conflicts of interest exist.

Author Contributions: All authors contributed to the study design, methods, and data interpretation. Roberta A. Newton served as Principal Investigator and oversaw the study implementation. Emily A. Keshner provided support for the study design and data interpretation. Dennis W. Klima was responsible for conceptualizing the design framework, data collection, and analysis. Adam Davey provided statistical support for data computation and analyses.
CHAPTER 5: DISCUSSION

This is the first study to examine three widely used constructs of physical performance in a focused population of older men, Roman Catholic priests. Studies among the clergy, particularly male clergy, remain limited. There appears to be only one age-related comparison study, that of Ploysangngam, Subhakorn, Pongnarisorn, Jaturanon, and Chaisupamongkollarp (2008), which compared dentition attributes among analogous age cohorts of older priests. Most recently, Proeschold-Bell and Legrand (2010) noted that interventions targeting obesity and chronic diseases among clergy should be considered a priority due to high prevalence rates. This study’s partition of the sample at 75 years was based upon recent studies similarly analyzing pain, sleep patterns, and fracture occurrence in comparable age cohorts (Lihavainen et al., 2010; McCrae et al. 2008; Kinsella, Chavrimootoo, Malloy, & Eustace, 2010). As older adults live longer, this age separation becomes a prudent option to compare physical performance between the younger old and older old.

Review of Aim 1: Physical Performance

Excluded Subjects

Excluded subjects demonstrated significant differences in gait speed, TUG time, grip strength, and cognition. Given the demographic perspectives of the excluded group, reasons for these differences might be related to an increased level of frailty (Fried et al., 2001). Though not statistically significant, a greater percentage of excluded subjects self-reported fear of falling and had fallen over the past years. Reasons for slower gait speeds,
falls, and rising to stand may have been related to those specific disease processes for which subjects were excluded, such as Parkinson’s disease (Carpinella et al., 2007) and peripheral neuropathy (Wrobel & Najafi, 2010).

**Demographic Differences: Medications**

There was a significant difference between the age group cohorts in medication utilization; moreover, more individuals in the older cohort (75+ years of age) were taking four or more medications. Medication utilization was treated as a covariate in the present study. Historically, polypharmacy has been associated with increased risk of falls and adverse drug reactions (Tinetti, 1986; Hartikainen, Lonnroos, & Louhivuori, 2007). More recently, attention has shifted to specific drug classes and their impact on balance, cognition, and mood (Agostini et al., 2007). Future studies stemming from the present initiative may elect to include focused questions related to specific medications.

**Timed Up and Go Test**

Analyses noted significant differences in the physical performance measures between the two age groups, and performance values for the entire group were consistently lower than published values. The TUG test is widely used to assess functional mobility in older adults (Podsiadlo & Richardson, 1991). The mean value of 12.1s (±3.8 SD) is slower than reported previously in men (Bohannon, 2006) or in older females (Isles et al., 2004). Reasons for discrepant values may be related to procedural differences or specific age cohorts examined. In this testing protocol, the investigator
instructed subjects to walk at a self-selected, comfortable pace, rather than as quickly as possible. Based on Bohannon’s meta-analysis (2006) of studies using the TUG, this study used a standard armchair with a measurement of 46 cm seat to floor compared to other chair dimensions. In addition, this study’s values may have been slower than age-norm reference values because the study separated the subject group into larger age cohorts with a single division at 75 years, rather than into traditional clusters of 10 years.

**Berg Balance Scale**

The BBS is considered a gold standard for clinical balance testing. These findings contribute to existing studies by illustrating men’s performance values and are in line with reference values obtained by von Heideken, Wagert, Gustafson, & Lundin-Olsson (2009), who tested men and women over the age of 85 years. Mean values for each of the age cohorts and group overall exceeded the accepted threshold for fall risk. This cut-off score for falls, however, has become a point of debate. While the score of 45 has been proposed as an accepted marker for fall risk, Muir, Berg, Chesworth, & Speechley (2008) proposed that fall risk should be determined through likelihood ratios rather than a dichotomous scale. The majority of subjects in this study scored above 45, though 33% of younger and 38% of older priests had fallen over the past year. The authors concur that determining fall risk by an inveterate cut-off score should be approached with caution.

**Dynamic Gait Index**

Of the three primary physical performance measures, less data exist that depict older men’s performance on the DGI. Unique in its construct, the DGI measures an individual’s ability to superimpose activities during the gait cycle. This study’s mean
values for each of the age cohorts and overall group differ from the near perfect scores reflected by Herman, Inbar-Borovsky, Brozgol, Giladi, and Hausdorff (2009). Reasons for these differences are twofold. First, Herman et al. only included subjects who ambulated without a walking aid. The priests in this study, however, were permitted to use their routine walker or cane, though they scored lower because of categorical deductions for assistive device use. In addition, Herman et al. did not include subjects over the age of 90, whereas this study included several nonagenarians in the older cohort. This study’s DGI performance findings are in line with those of Vereek, Wuyt, Truijen, & Van de Heyning (2008), where subjects between the ages of 70-80 years demonstrated significantly lower DGI scores.

Predictive Determinants of Physical Performance

Predictive variables determined from stepwise modeling revealed both modifiable (age) and non-modifiable (balance confidence, fall episodes, and diastolic blood) determinants of physical performance, predicting 49% on the TUG, 60% on the BBS and 61% on the DGI. It is particularly noteworthy that two variables are related to falls. The link between balance confidence and balance ability has previously been addressed in the literature (Hatch, Gill-Body, & Portney; Lajoie & Gallagher, 2004), and this study’s data support the premise that balance confidence parallels balance ability.

While the literature supports that more women between the ages of 65 and 85 years sustain falls, fall rates are similar for both genders over 85 years (CDC, 2010). In this study’s entire sample, 35% of participants had sustained a fall over the past year. This study’s finding—that fall history influences physical performance in older men—forms a dichotomy with previous findings that underscore how poor physical
performance contributes to episodic falls (Morley, 2002). For example, researchers have traditionally regarded gait impairments and slower velocity as fall risk determinants (Honeycutt & Ramsey, 2002; Morley, 2002). A recent fall should thus be regarded as a serious event capable of impacting impending balance and gait performance, particularly among those priests 75 years and older. Men in this age group who fall are four to five times more likely to enter a nursing home for a year or longer, with Caucasian men over the age of 75 having the highest fall fatality rate (CDC, 2010).

Diastolic blood pressure (DBP) is a measure of left ventricular function and the force exerted against the arterial walls during cardiac diastole. High DBP has traditionally indicated poor physical activity and obesity; as expected, participants’ DBP was inversely related to all three performance measures. Interestingly, these findings noted a significant decrease in DBP when comparing our younger cohort with the older group. The author hypothesizes that this decrease may be due, in part, to the frailty level of the older priests. Low DBP has been aligned with the frailty syndrome in elderly individuals (Busby, Campbell, & Robertson, 1994), which is supported by the fact that the older cohort similarly had a concomitant decrease in BMI, physical activity level, and grip strength. While Shah et al. (2006) noted that elevated systolic blood pressure (SBP) was associated with decreased lower limb function, this study appears to be the first report of DBP as a determinant of physical performance.

Comparison of the younger cohort of older men with the older cohort of older men, which were divided at age 75, provided insight into age-related performance. McCrae et al. (2008), who found that the older cohort self-reported worse sleep quality than the younger cohort. Utilized a similar paradigm, Kinsella, Chavrimootoo, Molloy,
and Eustace (2010) used parallel age cohorts to analyze fracture risk among older women with moderate chronic kidney disease. Consistent with the initial alternative hypothesis, physical activity, BMI, and grip strength were significant predictive determinants of physical performance. The association between physical activity and physical performance has previously been established in the literature (Washburn, McAuley, Katula, Mihalko, & Boileau, 1999); moreover, findings confirm grip strength as an appropriate measure to predict physical performance in men (Brach & VanSwearingen, 2002).

**Comparison with Catholic Clergy Studies**

There are currently two large initiatives involving Catholic clergy: the Nun’s Study and the Religious Orders Study. The Nun’s Study is a large epidemiologic project aimed at examining variable domains such as longevity, cognitive impairment, and Alzheimer’s Disease among nuns in the School Sisters of Notre Dame Order (Snowdon, 2001). The Religious Orders Study similarly analyzes risk factors for dementing illnesses and age-related disorders, though it also includes male Catholic clergy (Wilson, Bienias, Evans, & Bennett, 2004). This study’s findings compliment these two existing studies, though two major differences prevail. The approach here was to analyze physical performance through gait and balance assessment, with less emphasis on cognitive constraints. Second, this study’s design did not involve brain donation, a key component of both the Nun Study and Religious Order’s Study. Gait and balance comparisons thus present a unique dimension of physical performance related to clergy and the liturgical lifestyle.
**Review of Aim 2: Balance Confidence**

Study of the fear of falling condition has gained momentum in recent years, secondary to initiatives aimed at minimizing fall episodes, risk factors, and associated fall-related sequelae. This study appears to be the first to exclusively examine balance confidence and fear of falling in older adult men. While multiple studies have found that female gender is a significant predictor of the fear of falling condition, analyses describing balance confidence in older men alone remain limited. Findings demonstrated significantly lower balance confidence scores when comparing the younger age cohort with the group above the age of 75. While meaningful difference or change scores for the ABC have not been recorded in men, this finding is noteworthy, with a near 10 point degradation between the two age groups.

**Prevalence**

Thirty percent of all subjects (n = 131) responded that they were fearful of falling on the single dichotomous FOF question. Scheffer et al. (2008) reported that prevalence has ranged from 20.8% to 85%; however, these were gender mixed studies. This study’s frequency provides a more accurate estimate, given that only men were included in the sample. In addition, there was a significantly greater number of clergy who reported fearfulness in the older cohort compared to the younger.

The mean score of 83.0 (SD = 14.4) on the ABC tool was slightly less than the mean average reported by Lajoie and Gallagher (2004) in a mixed gender sample, and considerably less than scores of older men reported by Herman et al. (2009). Two potential reasons for score differences prevail. Seventeen percent of the priests in this study used an assistive device (e.g. walker, cane, or otherwise), whereas subjects in the
study of Herman et al. were required to ambulate without the use of any device. In addition, Herman et al. included only subjects aged 70-90, whereas this study permitted nonagenarians.

Only 13% percent of all subjects actually limited their activities because of fear of falling. This frequency is surprisingly low given the fall history and age range of the participants. These findings are in accordance with Fletcher and Hirdes’ study (2004) of over 2,000 seniors receiving home care services, which found that men were less likely to restrict their activity because of associated fear of falling.

Mixed gender studies have previously reported associations between balance confidence and balance ability using both the ABC and BBS tools. Consistent with the established alternative hypothesis, this study’s finding that balance ability parallels balance confidence are in accordance with these studies. In their study of community-dwelling older adults, Hatch, Gill-Body, and Portney (2003) noted that 50% of the variance in balance confidence could be attributed to balance ability. Similarly, this study noted that balance ability, in addition to mood, physical activity, and assistive device used, were predictive determinants of confidence level. Interestingly, as a point of comparison with our community-dwelling priests, Sharaf and Ibrahim (2008) found nearly identical predictors of fear of falling (balance, depression, and assistive device use) in their study of 208 individuals living in assisted living facilities.

**Age, Gait Velocity, and Balance Ability**

There was a significant negative correlation between age and balance confidence. In addition, confidence was associated with gait velocity and balance ability. In support of the initial proposed alternative hypothesis, multiple linear modeling demonstrated that
these three variables predicted 45 percent of the variance in balance confidence (p<0.001). Jorstad, Hauer, Becker, & Lamb (2005) previously determined the link between gait velocity and confidence level; moreover, fearful older adults ambulated slower. While age has previously been identified as a fear of falling correlate (Scheffer, Schuurmans, van Dijk, van der Hoof, & de Rooij, 2009), Kressig et al. (2001) found no association between age and balance confidence. One potential explanation for these conflicting findings could be ethnicity. In their study of 251 inner-city older adults transitioning to frailty, Kressig and colleagues studied more subjects who were African-American than did this study.

**Tool Utilization**

There has been considerable controversy in the literature regarding tool selection for assessment of fear of falling and balance confidence. Moore and Ellis (2008) reported frequent inappropriate use of assessment instruments due to confusion regarding the underlying constructs defining the tools themselves. Additional studies (Scheffer et al., 2008) confirmed difficulty in acknowledging the accuracy of fear of falling prevalence rates because of inconsistent tool utilization. This study administered both the single dichotomous FOF question and ABC tool to capture two perspectives. The single FOF question effectively identified those individuals who were fearful, with follow-up of subsequent activity restriction. Use of the ABC tool provided the opportunity for subjects to quantify their level of confidence during common household and community activities. Periodically, subjects required redirection to discern their specific confidence level rather than their actual ability to perform the task. The ABC tool demonstrated appropriate concurrent validity with physical performance tests and both PASE and GDS scores. This
psychometric support underscores the continued use of the ABC for older community-dwelling male clergy.

**Balance Confidence Prediction**

The cluster of variables this study identified as predictors of balance confidence in stepwise modeling deserves discussion. While Scheffer et al. (2008) identified only one modifiable risk factor for developing fear of falling, this study identified three modifiable factors: mood, balance ability, and physical activity. These findings have implications for fear of falling interventions, particularly depression. The link between depression and fear of falling has previously been noted in the literature (Gagnon et al., 2005). This relationship is particularly relevant for older adult men, given that analysis of veterans attending VA gait and balance clinics have cited depression rates as high as 23% among male participants (Bishop, Meuleman, Robinson, & Light, 2007).

Decreased physical activity has been associated with physical decline in older adults (Fried et al., 2001); this study’s findings extrapolate that relationship by examining balance confidence as well. Current studies have indicated that higher levels of physical activity are associated with less recurrent falls (Peters et al., 2009) and higher bone density (Pye, Devakumar, & Boonen, 2010) in older adult men. Additionally, Buchman et al. (2007) found that level of physical activity and lower extremity strength predicted rates of mobility decline among Catholic clergy. The empowering feeling of navigating the community and performing liturgical duties well into retirement may have influenced subjects’ level of security in maintaining their balance. Conversely, the use of an assistive device during routine tasks because of postural instability may have adversely affected balance confidence.
Benefits of the Study

This study offers several benefits. A paucity of data exist illustrating age-related performance values in Roman Catholic priests. All subjects were community-dwelling individuals who demonstrated a variety of fitness levels. These performance values yield beneficial information for those health professionals who screen community-dwelling clergy or monitor their health status. Data also serve as a conduit for potential interventions seeking to address those modifiable determinants of physical performance—namely, episodic falls, balance confidence, and blood pressure. In addition, all participants were tested by a single physical therapist researcher who established strong preliminary test-retest reliability. Clergy performed tests in their own living environment and were not influenced by other participants, which commonly occurs with community-based testing.

Studying only Roman Catholic priests afforded a unique population of older adult men who were relatively homogeneous in educational status, vocation, and living domains. The investigator was able to assess two major constructs, fear of falling and balance confidence, in conjunction with physical performance. In addition, the use of one tester for the entire sample minimized testing error. Those predictive determinants of balance confidence determined by the study yield potential interventions for current evidence-based strategies aimed at managing the fear of falling condition. Moreover, falls-related self-efficacy is a successful predictor of outcomes in geriatric rehabilitation (Denkinger et al., 2010).
Limitations of the Study

Given the focused nature of sample, this data cannot be generalized to all community-dwelling men. The unique nature of the Catholic clergy lifestyle truncates variation in daily life routines, as opposed to the more varied patterns associated with non-clergy. In addition, the cross-sectional design of the study prevents interpretations based upon temporal causation of data. The participant group may have included those who were physically active and elected to partake in the study versus those who chose not to disclose health-related imposed limitations.

Directions for Future Studies

The present study affords multiple vehicles for subsequent research activity. The number of participants in the present sample can also increase through recruitment of participants from additional religious communities. Three directions for future research direction include longitudinal tracking of physical performance, assessment for diabetic impairments, and falls-related follow-up.

Longitudinal Tracking

Studies examining longitudinal changes in elderly men are limited, though most recently Janney, Cauley, Cawthon, & Kriska (2010), in their Osteoporotic Fractures in Men Study, determined that men 65 years and older who were in poor health and lived alone demonstrated a higher level of physical activity decline over a mean follow-up of 5 years. Subsequent follow-up can incorporate measures used in the present study. Use of the BBS recently demonstrated the ability to predict difficulties with activities of daily living over an 18 month trajectory (Huang, Perera, VanSwearingen, & Studenski, 2010).
Grip strength and physical activity were predictive determinants of physical performance in the present study, and can be used to longitudinally follow clergy for ensuing mobility markers associated with the phenotype of frailty (Fried et al., 2001), along with relevant cognitive and mood changes.

**Diabetes**

Reasons for exclusion from the present study serve as a conduit for continued exploration. One potential area involves those subjects excluded for diabetic neuropathy. Twenty-two percent of excluded subjects were identified as having peripheral neuropathy. The literature has examined the impact of diabetic neuropathy on gait biomechanics (Wrobel & Najafi, 2010); however, to date, there are no studies correlating blood glucose levels, balance performance, and ankle musculature evoked potentials. Furthermore, longitudinal tracking of diabetic clergy would also prove beneficial. Arvanitakis et al. (2005) reported diabetes as a risk factor for parkinsonian gait disturbances among Catholic clergy.

**Falls-Related Demographic Follow-Up**

Fall incidence among the clergy studied was considerable. Given that a fall in the past three months was a significant predictive determinant of physical performance, continued follow-up of individuals who sustained a fall would afford the opportunity to compare both psychosocial and physical variables among fallers versus non-fallers on a longitudinal basis. In addition, fall prevention strategies among the religious communities might be analyzed.
Summary and Conclusions

The goal of this study was to analyze physical performance differences among two age cohorts of Roman Catholic priests. Findings demonstrated significant differences in three constructs of physical performance: gait, balance, and functional mobility. Factors determining physical performance included age, a fall in the past three months, balance confidence, and DBP. The study provides evidence that both physiologic and psychosocial factors contribute to the physical performance profile of Roman Catholic clergy over that age of 60. Findings further demonstrate significantly lower age-related balance confidence with a concomitant increase in fear of falling among older Roman Catholic priests. Balance confidence is associated with balance ability and functional mobility in this population, and major determinants of confidence level include balance, mood, physical activity, and assistive device use.
REFERENCES CITED


Morley, J.E. (2002). A fall is a major event in the life of an older individual. *Journal of Gerontology: Medical Sciences, 57A*(8), M492-M495.


APPENDIX A: INSTITUTIONAL INFORMED CONSENT

Identification of Project
Physical Performance and Balance Confidence in Community-dwelling Men: The Priest Study
IRB # 2008:022

Subject Name: _______________________________   I.D. Number:_________

Investigator: Dennis W. Klima, PT, MS
Faculty-Department of Physical Therapy
University of Maryland Eastern Shore

University Compensation Disclosure
The University of Maryland Eastern Shore is receiving no monetary compensation for performing this study.

Statement of Age of Subject
I state that I am over 18 years of age, in good physical health, and wish to participate in a program of research being conducted by Mr. Dennis Klima, a faculty member in the Department of Physical Therapy at the University of Maryland Eastern Shore and a doctoral student in Physical Therapy at Temple University.

Purpose
The purpose of this research is to study age-related differences in balance, walking, and balance confidence activities in older men that live in the community. You are being asked to participate so that the researcher can learn more about walking and balance changes that occur with normal aging. The project specifically involves priests and brothers because of their unique lifestyle and occupation.

Procedures/Description of the Project
You will be asked to answer survey questions related to your past medical history, daily activities, general mood, and fear of falling. The investigator will then ask you to perform a series of basic walking and balance tests. You also will have your current weight and blood pressure taken. The project will involve only one in-person testing session, and should take no longer than one hour. You will be phoned at a later date and asked about any recent falls or change in living residence.

Confidentiality
All documents and information pertaining to this research study will be kept confidential in accordance with all applicable federal, state, and local laws and regulations. You understand that medical records and data generated by the study may be reviewed by the Institutional Board Reviews of University of Maryland Eastern Shore, Temple University’s Office of Research Quality Improvement, and the Office for Human Subjects Protection. All information collected in this study is confidential, and my name will not be identified at any time.
Risks
The study is not designed to help you personally, but the researcher hopes to learn more about balance and walking differences in older men. You may lose your balance during a specific test, such as standing on one leg, but the researcher will be guarding you closely during all activities.

Benefits
You will be given fall risk prevention pamphlets following the test session. In addition, you will be given information regarding your current weight and blood pressure.

Alternative Procedures/Freedom to Withdraw From and Ask Questions
You are free to ask questions and to withdraw from participation at any time without penalty. You may also refuse to answer specific survey questions.

Compensation Statement
You will receive no compensation for participating in the study.

Termination
The investigator may terminate your involvement in the study if he determines that a health condition is present (such as a high blood pressure reading) which would prevent participation.

Where Medical Care is Available
In the event of physical injury resulting from participation in this study, I understand that the participant’s physician will be notified immediately. However, I understand that the University of Maryland Eastern Shore does not provide any medical or hospitalization insurance coverage for participants in the research study, nor will the University of Maryland Eastern Shore provide any compensation for any injury sustained as a result of participation in this research study except as required by law.

Conclusion
You are making a decision whether or not you will participate in this study. If you sign the consent form, you are agreeing to participate based on your reading and understanding of this form. If you have any questions regarding this study, please ask one of the investigators, or call Mr. Dennis Klima at 410-651-6354. If you have any questions regarding your rights as a research subject, please contact the Chair of the University of Maryland Eastern Shore Institutional Review Board, Dr. Clayton Faubion, by calling 410-651-6379 (Hazel Hall, 1st Floor, Princess Anne, MD 21853)

Signature of Subject__________________________________ Date____________

Signature of Witness__________________________________ Date____________
Appendix B: DATA SHEET PPBC 1 - INCLUSION/EXCLUSION QUESTIONNAIRE

Subject ID Number:
Date: _____ Time
Inquiry Type:
   In Person Interview____
   Phone Interview____

I. Inclusion Criteria:
1. Are you a Roman Catholic priest or brother over the age of 60?
   Yes  No  Age: ___________

2. Do you walk in the community without physical assistance?
   Yes  No

3. Do you have a fear of falling?
   Yes  No

   Six Item Cognitive Screen Assessment:  Correct Response:
   a. What is the month?__________    Yes  No
   b. What is the year? ___________    Yes  No
   c. What is the day of the week?______  Yes  No
   d. Repeat the following terms:
      i. Apple
      ii. Table
      iii. Penny

II. Exclusion Criteria:
4. Do you have severe heart disease or congestive heart failure?
   Yes  No

5. Do you have any substantial joint pain when standing or severe arthritic disease?
   Yes  No

6. Are you legally blind?
   Yes  No

   Subject accurately performs Snelling Chart Visual Test
   Yes  No
7. Do you have advanced pulmonary or kidney disease?
   Yes  No

8. Do you have severe dizziness or have you been diagnosed with a balance, equilibrium, or vestibular disorder?
   Yes  No

   **Subject performs Dynamic Visual Acuity Test-Able to read _____ lines on Lighthouse EDTRS Chart at 2 hz frequency**

   3 or more line decrement?
   Yes  No

   **VOR Test** WNL
   Yes  No

9. Do you have any of the following disorders:
   a. Parkinson’s Disease
   b. Multiple Sclerosis
   c. ALS
   d. Have you had a stroke in the last 6 months?
      Yes  No

10. Is the wheelchair your primary mode of ambulation?
    Yes  No

11. Do you have cancer that is in an advanced stage? If yes, where?________
    Yes  No

**Recall:**

Apple       Yes  No
Table       Yes  No
Penny       Yes  No

**Six Item Screener Score:** /6

12. Do you have any type of leg amputation?
    Yes  No

13. Do you have any sensation change/muscle weakness in your feet related to diabetes?
    Yes  No

   **If Yes, Subject identifies 6 points tested with 5.07 g monofilament**
   Yes  No
Ill. Physical Performance Test:
Instructions: Please stand up completely from the chair as quickly as you can 5 times. BP (taken prior to test): ___/___

Subject performs 5 chair rises
   Yes  No
If “no”---Subject cannot complete trials_______

   Time:__________________

Grip Strength:   Reading 1_____  Reading II_______  Reading III______
    Average_______

D. Subject Meets All Inclusion Criteria?  Yes  No

   Reasons for Exclusion:

   Excluded Subject’s:
       Age________
       Grip Strength_______
       Blood Pressure_______
       FOF________
   Number of falls in the past 3 months________
       Year________
APPENDIX C: DATA SHEET PPBC 2- DEMOGRAPHIC PROFILE

Demographic Profile

Subject ID Number______________
Location__________________ Date_______ Time________

I. **Background Data**

   **Comments**

   a. Age ____________________
   b. Date of Birth ____________
   c. Ethnic Background ____________
   d. Level of Education Completed ___BS____ MS_____ PhD
   e. Number of years since ordination ____________
   f. Are you a religious or diocesan priest? Religious_____ Diocesan_____ Order______________
   g. Are you retired? Yes/No _______
   h. Living Situation: Private Residence____ Senior Housing____
   i. Do you live alone? Yes/No ______
   j. Smoke? Yes/No _____PPD
   k. Consume alcohol? Yes/No _____Amt.
   l. Participate in regular physical activity? Yes/No Frequency ______

II. **Medical History/Physical Health**

   a. How would you generally describe your health?

       Excellent _____ Good _____ Fair _____ Poor_____

   b. Do you ambulate with an assistive device?

       Yes/No ______

       a. Walker       b. Quad Cane   c. Straight Cane   d. Other
c. How far do you walk in a typical day? _____

d. Do you participate in a structured exercise program? 
   Yes/No _____

c. Do you have a history of:
   1. Heart problems or cardiac conditions 
      Yes/No _____
   2. Stroke 
      Yes/No _____
   3. Parkinson’s Disease 
      Yes/No _____
   4. Rheumatoid Arthritis or Osteoarthritis 
      Yes/No _____
   5. Diabetes 
      Yes/No _____
   6. Depression 
      Yes/No _____
   7. Osteoporosis 
      Yes/No _____
   8. Emphysema 
      Yes/No _____
   9. Prostate Problems 
      Yes/No _____
  10. Vertigo/Dizziness 
      Yes/No _____
  11. Joint Replacement 
      Yes/No _____
      Where? ________
  12. Fracture 
      Yes/No _____
      Where? ________
  13. Cancer 
      Yes/No _____
      Where? ________
  14. G-I Problems 
      Yes/No _____
  15. Do you have any problems with your eyesight? 
      Yes/No _____
      a. If yes, is this corrected by glasses? 
         Yes/No _____
  16. Have you sustained any leg fracture in the past six months? 
      Yes/No _____
17. Do you have fear of falling?
   Yes/No

   a. If yes, does this fear limit your activities?
      Yes/No

18. Have you fallen in the past 3 months?
    Yes/No

19. Are you taking 4 or more medications?
    Yes/No
    How many?

20. Are you taking Coumadin or blood thinners?
    Yes/No

21. Are you taking Insulin or any diabetes medication?
    Yes/No

22. Did you feel that everything you did over the past week was an effort?
    Yes/No

23. Did you feel that you could not get going?
    Yes/No
DATA SHEET PPBC 3: ANTHROPOMETRIC DATA/GRIP STRENGTH

Subject ID Number ___________ Location ________________
Date _______ Time _______

I. Anthropometric Data:
   A. Weight ______________
   B. Height ____________ BMI ______________
   C. Blood Pressure _____/______ (Sitting; R/L upper extremity)

II. Grip Strength:
   A. Trial 1 ________ lbs
   B. Trial 2 ________ lbs
   C. Trial 3 ________ lbs

Average Grip Strength: ____________ lbs
APPENDIX D: PHYSICAL ACTIVITY SCALE FOR THE ELDERLY

Sample Questions

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

   * (1-2 DAYS) (3-4 DAYS) (5-7 DAYS)
1b. On average, how many hours per day did you engage in these sitting activities?
   [1.] LESS THAN 1 HOUR [2.] 1 BUT LESS THAN 2 HOURS
   [3.] 2-4 HOURS [4.] MORE THAN 4 HOURS

HOUSEHOLD ACTIVITY
7. During the past 7 days, have you done any light housework, such as dusting or washing dishes?
   [1.] NO [2.] YES

8. During the past 7 days, have you done any heavy housework or chores, such as vacuuming, scrubbing floors, washing windows, or carrying wood?
   [1.] NO [2.] YES

9. During the past 7 days, did you engage in any of the following activities? Please answer YES or NO for each item.
   a. Home repairs like painting, wallpapering, electrical work, etc. 1 2
   b. Lawn work or yard care, including snow or leaf removal, wood chopping, etc. 1 2
   c. Outdoor gardening 1 2
   d. Caring for an other person, such as children, dependent spouse, or an other adult 1 2

WORK-RELATED ACTIVITY
10. During the past 7 days, did you work for pay or as a volunteer?
    [1.] NO [2.] YES
10a. How many hours per week did you work for pay and/or as a volunteer?
    _______________ HOURS
10b. Which of the following categories best describes the amount of physical activity required on your job and/or volunteer work?
    [1] Mainly sitting with slight arm movements.[Examples: office worker, assembly line worker, bus driver]
    [2] Sitting or standing with some walking.[Examples: cashier, general office worker, light tool worker.]
    [3] Walking, with some handling of materials generally weighing less than 50 pounds.
    [Examples: mailman, waiter/waitress, construction worker, heavy tool and machinery worker.]
    [4] Walking and heavy manual work often requiring handling of materials weighing over 50 pounds.[Examples: lumberjack, stone mason, farm laborer.]
## APPENDIX E: BERG BALANCE SCALE

<table>
<thead>
<tr>
<th>#</th>
<th>Task</th>
<th>Score borderline performance lower</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sit to stand</td>
<td>Able to stand independently on hands &amp; stable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Chair with arm rests; Please stand up and try to use your hands for support.)</td>
<td>All able to stand for 2 minutes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Stand unsupported</td>
<td>All able to stand safely for 2 minutes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Chair with arm rests; Please stand for two minutes without leaning on to anything.)</td>
<td>All able to stand safely for 2 minutes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Sit unsupported with feet on floor</td>
<td>Able to sit for 3 minutes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Chair with arm rests; Please sit on two minutes without leaning on to anything.)</td>
<td>Able to sit for 2 minutes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Stand to sit</td>
<td>All able to stand independently &amp; use hands</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Chair with arm rests; Please sit for 2 minutes without leaning on to anything.)</td>
<td>All able to stand independently &amp; use hands</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Transfers</td>
<td>Able to transfer safely, minimum use of hands</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Chair with arm rests; Please move from chair you are sitting in to the other chair and return.)</td>
<td>Able to transfer safely, minimum use of hands</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Stand unsupported with eye closed</td>
<td>All able to stand independently &amp; use hands</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Chair with arm rests; Please close your eyes and stand still for 5 min.)</td>
<td>All able to stand independently &amp; use hands</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Stand unsupported with feet together-eyes open</td>
<td>All able to stand independently &amp; stand 1 minute with supervision</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Chair with arm rests; Please stand with your feet together for 1 minute without holding nothing.)</td>
<td>All able to stand independently &amp; stand 1 minute with supervision</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Reach forward with outstretched arm – 1 time</td>
<td>All able to reach forward 1 time with supervision</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Chair with arm rests; Please reach your arm to shoulder height. Reach as far forward as you can without moving your feet.)</td>
<td>All able to reach forward 1 time with supervision</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Pick up object from the floor</td>
<td>All able to pick up object &amp; safely</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Chair with arm rests; Please pick up the cup.)</td>
<td>All able to pick up object &amp; safely</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Turn to look behind over left &amp; right shoulder</td>
<td>All able to turn to look behind over left &amp; right shoulder.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Chair with arm rests; Please turn and look over your left shoulder. Turn and look over your left shoulder.)</td>
<td>All able to turn to look behind over left &amp; right shoulder.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Turn 360 Degrees</td>
<td>All able to turn 360 degrees safely</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Chair with arm rests; Please turn in a full circle.)</td>
<td>All able to turn 360 degrees safely</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Alternate placing feet on stool</td>
<td>All able to place each foot alternately on the stool for a count of 8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Chair with arm rests; Please place each foot alternately on the stool for a count of 8.)</td>
<td>All able to place each foot alternately on the stool for a count of 8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Stand unsupported heel to toe</td>
<td>All able to stand independently &amp; hold for 30 sec</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Chair with arm rests; Please place one foot forward, a short distance in front of the other as close as possible and hold it.)</td>
<td>All able to stand independently &amp; hold for 30 sec</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Stand on one leg</td>
<td>All able to stand on one leg independently &amp; hold for 30 sec</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Chair with arm rests; Please stand on one leg for as long as you can without holding on to anything.)</td>
<td>All able to stand on one leg independently &amp; hold for 30 sec</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Column Total**

**BBT Total**

---

*Berg Balance Scale Easy-Scoring System (Ahmed Y Barhameen; Roberta A Newton, ©2001)*
APPENDIX F: DYNAMIC GAIT INDEX

### Gait: Level surface

**Instructions:** Walk at your normal speed from here to the next mark (20’)

**Grading:** Mark the lowest category that applies.

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Normal: Walks 20’, no assistive devices, good speed, no evidence for imbalance, normal gait pattern</td>
</tr>
<tr>
<td>1</td>
<td>Moderate Impairment: Walks 20’, slow speed, abnormal gait pattern, evidence for imbalance.</td>
</tr>
<tr>
<td>0</td>
<td>Severe Impairment: Cannot walk 20’ without assistance, severe gait deviations or imbalance.</td>
</tr>
</tbody>
</table>

### Change in gait speed

**Instructions:** Begin walking at your normal pace (for 5’), when I tell you “go,” walk as fast as you can (for 5’). When I tell you “slow,” walk as slowly as you can (for 5’).

**Grading:** Mark the lowest category that applies.

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Normal: Able to smoothly change walking speed without loss of balance or gait deviation. Shows a significant difference in walking speeds between normal, fast and slow speeds.</td>
</tr>
<tr>
<td>2</td>
<td>Mild Impairment: Is able to change speed but demonstrates mild gait deviations, or not gait deviations but unable to achieve a significant change in velocity, or uses an assistive device.</td>
</tr>
<tr>
<td>1</td>
<td>Moderate Impairment: Makes only minor adjustments to walking speed, or accomplishes a change in speed with significant gait deviations, or changes speed but has significant gait deviations, or changes speed but loses balance but is able to recover and continue walking.</td>
</tr>
<tr>
<td>0</td>
<td>Severe Impairment: Cannot change speeds, or loses balance and has to reach for wall or be caught.</td>
</tr>
</tbody>
</table>

### Gait with horizontal head turns

**Instructions:** Begin walking at your normal pace. When I tell you to “look right,” keep walking straight, but turn your head to the right. Keep looking to the right until I tell you, “look left,” then keep walking straight and turn your head to the left. Keep your head to the left until I tell you “look straight,” then keep walking straight, but return your head to the center.

**Grading:** Mark the lowest category that applies.

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Normal: Performs head turns smoothly with no change in gait.</td>
</tr>
<tr>
<td>2</td>
<td>Mild Impairment: Performs head turns smoothly with slight change in gait velocity, i.e., minor disruption to smooth gait path or uses walking aid.</td>
</tr>
<tr>
<td>1</td>
<td>Moderate Impairment: Performs head turns with moderate change in gait velocity, slows down, staggers but recovers, can continue to walk.</td>
</tr>
<tr>
<td>0</td>
<td>Severe Impairment: Performs task with severe disruption of gait, i.e., staggers outside 15” path, loses balance, stops, reaches for wall.</td>
</tr>
</tbody>
</table>

### Gait with vertical head turns

**Instructions:** Begin walking at your normal pace. When I tell you to “look up,” keep walking straight, but tip your head up. Keep looking up until I tell you, “look down,” then keep walking straight and tip your head down. Keep your head down until I tell you “look straight,” then keep walking straight, but return your head to the center.

**Grading:** Mark the lowest category that applies.

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Normal: Performs head turns smoothly with no change in gait.</td>
</tr>
<tr>
<td>2</td>
<td>Mild Impairment: Performs head turns smoothly with slight change in gait velocity, i.e., minor disruption to smooth gait path or uses walking aid.</td>
</tr>
<tr>
<td>1</td>
<td>Moderate Impairment: Performs head turns with moderate change in gait velocity, slows down, staggers but recovers, can continue to walk.</td>
</tr>
<tr>
<td>0</td>
<td>Severe: Performs task with severe disruption of gait, i.e., stops, reaches for wall.</td>
</tr>
</tbody>
</table>
Gait and pivot turn  Score_____
Instructions: Begin walking at your normal pace. When I tell you, “turn and stop,” turn as quickly as you can to face the opposite direction and stop.
Grading: Mark the lowest category that applies.
(3) Normal: Pivot turns safely within 3 seconds and stops quickly with no loss of balance.
(2) Mild Impairment: Pivot turns safely in > 3 seconds and stops with no loss of balance.
(1) Moderate Impairment: Turns slowly, requires verbal cueing, requires several small steps to catch balance following turn and stop.
(0) Severe Impairment: Cannot turn safely, requires assistance to turn and stop.

Step over obstacle  Score ____
Instructions: Begin walking at your normal speed. When you come to the shoebox, step over it, not around it, and keep walking.
Grading: Mark the lowest category that applies.
(3) Normal: Is able to step over the box without changing gait speed, no evidence of imbalance.
(2) Mild Impairment: Is able to step over box, but must slow down and adjust steps to clear box safely.
(1) Moderate Impairment: Is able to step over box but must stop, then step over. May require verbal cueing.
(0) Severe Impairment: Cannot perform without assistance.

Step around obstacles ______
Instructions: Begin walking at normal speed. When you come to the first cone (about 6’ away), walk around the right side of it. When you come to the second cone (6’ past first cone), walk around it to the left.
Grading: Mark the lowest category that applies.
(3) Normal: Is able to walk around cones safely without changing gait speed; no evidence of imbalance.
(2) Mild Impairment: Is able to step around both cones, but must slow down and adjust steps to clear cones.
(1) Moderate Impairment: Is able to clear cones but must significantly slow, speed to accomplish task, or requires verbal cueing.
(0) Severe Impairment: Unable to clear cones, walks into one or both cones, or requires physical assistance.

Steps _____
Instructions: Walk up these stairs as you would at home, i.e., using the railing if necessary. At the top, turn around and walk down.
Grading: Mark the lowest category that applies.
(3) Normal: Alternating feet, no rail.
(2) Mild Impairment: Alternating feet, must use rail.
(1) Moderate Impairment: Two feet to a stair, must use rail.
(0) Severe Impairment: Cannot do safely.

TOTAL SCORE: ____ / 24
APPENDIX G: ACTIVITIES-SPECIFIC BALANCE CONFIDENCE SCALE

**Instructions:** I am going to ask you some questions about how confident you feel when you are doing certain activities. You are to rate your answer on a scale of 0 to 100. A zero means that you are not confident performing the task and 100 means that you are extremely confident performing the activity.

<table>
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<th>0</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>50</th>
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<th>70</th>
<th>80</th>
<th>90</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>__________________________</td>
<td>Completely Confident</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

How confident are you that you will not lose your balance or become unsteady when you........

1. _____ .... walk inside your house.
2. _____ ....walk up and down stairs inside your home.
3. _____ ....bend over and pick up a slipper from the front of a closet floor.
4. _____ ....reach for a small can off a shelf at eye level.
5. _____ ....stand on your tiptoes and reach for something above your head.
6. _____ ....stand on a chair and reach for something.
7. _____ ....sweep the floor.
8. _____ ....walk outside the house to a car parked in the driveway.
9. _____ ....get into or out of a car.
10. _____ ....walk across a parking lot to a mall.
11. _____ ....walk up or down a ramp.
12. _____ ....walk in a crowed mall where people rapidly walk towards you & pass you by
13. _____ ....when people bump into you as you walk through the mall.
14. _____ ....step onto or off of an escalator while holding onto a railing.
15. _____ .... step onto or off an escalator while holding onto parcels such that you cannot hold onto the railing
16. _____ ....walk outside on icy sidewalks.
ABC

**Total Score:** _____%  
**6 Item Subset Score:** _____%