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A comparison of fall-related psychological measures in a community-based setting

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A COMPARISON OF FALL-RELATED PSYCHOLOGICAL MEASURES IN A COMMUNITY-BASED SETTING

A Dissertation

Submitted to the Graduate Faculty of the
Louisiana State University and
Agricultural and Mechanical College
in partial fulfillment of the
requirements for the degree of
Doctor of Philosophy

in

The Department of Kinesiology

by

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FOREWARD

This dissertation consists of a general introduction (chapter 1) and conclusion (chapter 5), as well as a review of literature (chapter 2) and two empirical studies (chapters 3 and 4). The review of literature was recently accepted for publication in *Aging and Mental Health* (March, 2008). The data for this dissertation were collected using funds from the Louisiana State University Faculty Research Grant Program and the American Alliance for Health, Physical Education, Recreation, and Dance (AAHPERD) Research Consortium Graduate Student Grant program.
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ABSTRACT

Falls and the fall-related psychological concerns associated with these events pose a serious public health problem among aging adults. Fall-related psychological instruments can be useful in quantifying important endpoints for fall prevention programs (Jorstad et al., 2005), yet no research currently exists to justify the use of these psychological instruments in a community-based falls risk screening. Therefore, the purpose of this dissertation was to examine the psychometric properties of several fall-related psychological measures in a falls risk screening context by: (a) examining the reliability and validity of the Falls Efficacy Scale-International (FES-I), Activities-specific Balance Confidence (ABC), modified Survey of Activities and Fear of Falling in the Elderly (mSAFFE), and Consequences of Falling (CoF) instruments, and (b) testing the sensitivity of one fall-related psychological instrument over a 12-month period in a sample of independent-living older adults. For study one, participants were 133 independent-living older adults between the ages of 51 and 95 years ($M$ age = 74.4 yr, $SD$ = 9.4) from nine community facilities who participated in a falls risk screening. Results from study one revealed that the FES-I, ABC, mSAFFE, and CoF were significantly moderately to strongly correlated with each other, health-related quality of life, and mobility, and demonstrated adequate internal consistency reliability. Further, results showed that only the ABC and the mSAFFE were moderately correlated with physical activity, and only the ABC could differentiate between fallers and non-fallers. Study one results also revealed that the ABC explained the most variance in total falls risk score as compared to the other measures. For study two, participants were 22 independent-living older adults between the ages of 55 and 92 ($M$ age = 74.2 yr, $SD$ = 11.3) who participated in two falls risk screenings over an approximate 12-month period. Results from study two revealed that the ABC was not sensitive to change in a falls risk screening context, $U = 45.0$, $p = .52$. Collectively, findings from the dissertation studies can be used to help researchers select the appropriate fall-related psychological instrument for use in a community-based falls risk screening context.
CHAPTER 1
GENERAL INTRODUCTION

Falls are a threat to the health and well-being of older adults. Not only do more than one-third of adults over age 65 experience a fall each year (American Geriatrics Society [AGS], 2001), falls are currently the leading cause of injury death among adults over age 65 years in the United States (Centers for Disease Control and Prevention, 2005). Moreover, with the aging baby boomer generation beginning to face retirement the prevalence and associated health care cost of falls and fall-related injuries in the United States is expected to increase rapidly (Englander, Hodson, & Terregrossa, 1996). Falls and their physical consequences are not only costly, they can trigger more serious problems for older adults by compromising their ability to carry out everyday activities and limiting their functional mobility, which can lead to the loss of independence and premature nursing home admission (DeVito et al., 1988; Jette, Branch, & Berlin, 1990; Rubenstein, 2006). Further, falls and their abovementioned physical ramifications are major threats to health-related quality of life (HRQL), which encompasses one’s perception of general health, vitality, social, emotional, cognitive and physical domains of functioning (McHorney, Kosinski, & Ware, 1994). Because it encompasses multiple dimensions of health, poor HRQL can be more devastating than losses in physical functioning alone. Accordingly, the enhancement of HRQL has been identified as an important indicator of the effectiveness of falls prevention programs (Vaapio et al., 2007), and as a major objective of Healthy People 2010 (U.S. Department of Health and Human Services, 2000).

Risk factors for falls can be described as one or more intrinsic, extrinsic, and/or situational factors that interact in a synergistic relationship and increase one’s risk for falling. Intrinsic factors, which are inherent characteristics of an individual that relate to one’s health, functional status and/or physical characteristics, commonly include gender, psychological status (i.e., fear of falling, depression, anxiety), and age-related declines in strength, balance, mobility, physical and/or cognitive functioning. Extrinsic risk factors relate to factors outside of an individual and can include hazards in the physical
environment (e.g., poor lighting, slippery floors, unsafe stairways, uneven surfaces), medication management, use of assistive devices, inappropriate footwear, and participation in activities associated with a high risk of falling (e.g., walking on a slippery floor; AGS, 2001; Steinweg, 1997). Situational factors incorporate an interaction between intrinsic and extrinsic factors while also taking into account the performance of common daily activities (Connell & Wolf, 1997; Tinetti, Doucette, & Claus, 1995). For example, an older adult who has a balance-related disorder (intrinsic factor) may trip over a loose rug in the living room (extrinsic factor) when trying to answer the phone before it stops ringing (situational factor). An alternate classification for fall-related risk factors includes referencing them in terms of whether they are within one’s control or not (i.e., modifiable or nonmodifiable). The objective of falls prevention efforts is to identify and reduce fall-related risk factors that are modifiable.

The most common risk factors for falls among aging adults include muscle weakness, past history of falls, a gait, balance, or visual deficit, use of an assistive device, arthritis, impaired mobility, depression, cognitive impairment, and an age over of 80 years (AGS, 2001). Other common fall-related risk factors include being female (Cesari et al., 2002; Tromp, Smit, Deeg, Bouter, & Lips, 1998), having chronic pathological conditions (Lin & Jane, 2005), and a fear of falling (Cesari et al.; Tinetti, Speechley, & Ginter, 1988). In isolation each of these identified factors places an older adult at risk for falling; however, as the number of risk factors increases, the interaction and synergistic relationship that occurs among multiple risk factors significantly increases risk for falling (AGS, 2001; Tinetti et al.). Additionally, research has shown that physically frail older adults are more likely to experience a fall inside the home, whereas active older adults are more likely to fall outside of the home (Bergland, Jarnlo, & Laake, 2003). Thus, knowing and understanding which factors increase an older adult’s falls risk is essential for preventing future falls and reducing the total number of falls that occur each year.
Psychological Issues Related to Falls

Beyond the physical trauma that can result from a fall, a range of psychological issues including fear of falling, loss of balance-related confidence, fear of social embarrassment, or fear of a loss in independence can be triggered (Jorstad, Hauer, Becker & Lamb, 2005; Yardley & Smith, 2002). Fall-related psychological difficulties are common among older adults, with anywhere from one-third to three-fourths of independent-living older adults experiencing some type of fall-related psychological difficulty (Arfken, Lach, Birge, & Miller, 1994; Cumming, Salkeld, Thomas, & Szonyi, 2000; Friedman, Munoz, West, Rubin, & Fried, 2002; Howland et al., 1998; Lawrence et al., 1998; Murphy, Dubin, & Gill, 2003; Murphy, Williams, & Gill, 2002; Vellas, Wayne, Romero, Baumgartner, & Garry, 1997). Though these fall-related psychological issues are prevalent among fallers and non-fallers (Zijlstra et al., 2007a), prevalence is higher among older women (Arfken et al.; Friedman et al.; Maki, Holliday, & Topper, 1991; McAuley, Mihalko, & Rosengren, 1997; Howland et al.; Vellas et al.) and it increases with age and illness (Arfken et al.; Friedman et al.; Lach, 2002).

Fall-related psychological issues are not always detrimental. In fact, a healthy concern about falling can translate into more cautious and assertive behavior that enables safer navigation in an older adult’s environment. Consequently, fall-related psychological issues become more destructive when a fear of falling and/or a loss of confidence at avoiding a fall leads to a downward spiral of activity restriction, physical frailty, loss of independence, and impaired HRQL. This harmful cycle of functional and psychological deterioration can become a major barrier to leading a physically active lifestyle and can significantly increase the risk of future falls (Howland et al., 1998; Yardley & Smith, 2002). Today, the three best-studied fall-related psychological issues are fear of falling (Tinetti, Richman, & Powell, 1990), fall-related self-efficacy or falls-efficacy (Tinetti et al.), and balance confidence (Powell & Myers, 1995). Other related psychological issues have been identified such as feared consequences of falling (Yardley & Smith) and mobility efficacy (Lusardi & Smith, 1997), but less research is available on these constructs.
Fear of Falling

Fear of falling is a “lasting concern about falling that leads an individual to avoid activities that he/she remains capable of performing” (Tinetti & Powell, 1993, p. 36), and it is the most commonly investigated fall-related psychological construct. Early research operationalized fear of falling using a generic, single-item question with a dichotomous response in which participants were asked if they were afraid of falling (Arfken et al., 1994; Maki et al., 1991; Tinetti et al., 1990; Walker & Howland, 1991). This type of question has been, and still is, useful in research studies when participants are categorized into “afraid of falling” and “not afraid of falling” groups to test the psychological outcomes of falls prevention interventions using experimental and control groups, respectively. Despite this, Tinetti and colleagues posited that measuring fear of falling this way was not effectively capturing the full psychological impact of falls. Following the logic of Bandura and his work on self-efficacy (1982), they argued that self-report global states such as fear are inadequate predictors of actual behavior. In response to the shortcomings in measuring a fear-related construct, Tinetti and colleagues (1990) came up with the term “falls efficacy” based on the self-efficacy theory (SET; Bandura, 1977; 1986), in which they characterized fear of falling as a low fall-related self-efficacy for avoiding falls while performing common daily activities.

Falls Efficacy

Falls-efficacy, which refers to the confidence in one’s capability to perform common daily activities without falling (Tinetti et al., 1990), is a more useful way to quantify the broad range of older adults who, as opposed to being either “afraid” or “not afraid” of falling, rest somewhere on the self-efficacy continuum between these extremes. Although researchers initially assumed that low falls-efficacy and fear of falling were interchangeable, recent research shows that falls-efficacy and fear of falling are related, but the relationship between the two constructs is not straightforward (McAuley et al., 1997; Li et al., 2002). Since Tinetti and colleagues (1990) coined the term, several similar
Balance Confidence

Balance confidence refers to one’s self-assurance in their ability to keep their balance while performing common daily activities. It is a situation specific form of self-efficacy that relates to perceived balance ability (Powell & Myers, 1995). One advantage of using a measure that assesses “balance confidence” versus “falls efficacy” or “fear of falling” is that the terminology difference may be more sensitive to detecting fall-related psychological changes among healthy, active older adults that occasionally lose their balance. Moreover, in addition to serving as outcome measures in falls prevention interventions, balance confidence instruments have been used in a variety of situations and with several types of populations including chronic stroke (Pang, Eng, & Miller, 2007), vestibular disorder (Whitney, Marchetti, & Schade, 2006), Parkinson’s disease (Jacobs, Horak, Van Tran, & Nutt, 2006), and multiple sclerosis (Cattaneo, Regola, & Meotti, 2006) patients.

Other Fall-Related Psychological Constructs

Beyond the three aforementioned psychological constructs, several related constructs have emerged in the literature including, but not limited to, consequences of falling (Yardley & Smith, 2002), gait efficacy (McAuley et al., 1997), mobility efficacy (Lusardi & Smtih, 1997), perceived control over falling (Lawrence et al., 1998), and perceived ability to manage falls (Lawrence et al.). Several of these constructs are situation-specific forms of self-efficacy such as gait efficacy and mobility efficacy, and other constructs are psychological dimensions not included in previous fall-related psychological instruments like fall-related beliefs, social embarrassment, and damage to identity. Researchers have also recently recommended the inclusion of an outcome expectancy measure, such as the Consequences of Falling (CoF) scale, in combination with traditional fall-related
self-efficacy measures (i.e., fear of falling, falls efficacy, and/or balance confidence) for evaluating fall prevention interventions (Lach, 2006).

**Measuring Fall-Related Psychological Issues**

Because researchers have proposed that fall-related psychological constructs can serve as important indicators of the overall effectiveness of fall prevention trials in older adults (Jorstad et al., 2005), it is imperative that these constructs are defined and measured appropriately and consistently. Unfortunately, unlike fall-related physical aspects that are relatively easy to recognize and quantify, fall-related psychological aspects are more ambiguous and challenging to measure. For instance, although fear of falling and falls-efficacy are widely used, there is no standard agreement regarding how they should be measured. As a result, many of the instruments that were designed to measure one construct are used to measure other constructs (Brouwer, Musselman, & Culham, 2004; Davison, Bond, Dawson, Steen, & Kenny, 2005; Li et al., 2002; Tinetti et al., 1990). To make sense of this confusion and because there is currently no agreement upon a gold standard fall-related psychological instrument, there is a need to thoroughly examine the measurement properties of the available fall-related psychological instruments (Jorstad et al.).

The measurement properties of an instrument are commonly assessed by testing whether the instrument performs consistently across repeated observations or measurements (i.e., reliability) and whether it measures what it purports to measure (i.e., validity). Methods used to assess reliability include test-retest, inter-rater, and internal consistency (for more information about reliability methods see to chapter 3), and different “types” of validity include construct, content, concurrent, convergent, and discriminant. Over the last few years, researchers have moved away from using several different “types” of validity and have instead focused efforts on providing evidence for the construct validation of an instrument (American Educational Research Association [AERA], American Psychological Association [APA], & National Council on Measurement in Education [NCME], 1999). Consistent with this shift, this dissertation refers to validity in terms of construct validity evidence (for more
information about construct validity see chapter 3). In addition to reliability and validity, measurement properties can also be assessed by testing the ability of an instrument to detect changes over time within groups (i.e., sensitivity or responsiveness; Middel & van Sonderen, 2002; for more information about sensitivity see chapter 4). Evidence of reliability, validity, and sensitivity are needed to aid in the selection of an instrument to be used in a specific context.

**Measuring Fall-Related Psychological Issues in a Health Screening Context**

Although assessing the measurement properties of instruments in laboratory-based settings is an important first step, researchers must also verify the utility of their instrumentation outside of a controlled environment if that is the setting in which the instrument will be used (Viswanathan et al., 2004) with the population that will likely participate in these programs. Most studies that have tested fall-related psychological instruments have done so in laboratory settings (Lajoie & Gallagher, 2004), in participant homes (Lachman et al., 1998; Powell & Myers, 1995), by postal survey (Yardley et al., 2005), or as part of clinical fall prevention trials (Talley, Wyman, & Gross, 2008; Yardley & Smith, 2002). Further, these studies have typically not included or reported the racial or socioeconomic composition of their participants (Hotchkiss et al., 2004; Powell & Myers, 1995; Yardley et al., 2005; Yardley and Smith, 2002). Little research has focused on assessing the utility of fall-related psychological instruments in a community-based setting with a racially and socioeconomically diverse pool of participants to identify older adults who are at-risk for falls (e.g., falls risk screening). Specifically, few studies have tested the utility of instruments in community-based settings where community organizations and members are actively involved in the research process and data are collected in a convenient and comfortable environment for the participants. In this type of setting, investigators cannot tightly control every aspect of the research process; thus it is imperative to first determine whether the measures employed in these community-based settings are in fact measuring what they were intended to measure for the members of the community utilizing these services. Further, because falls risk screenings are easy, low-cost ways to identify older adults in the community
who are at-risk for falling, it is important that the instrumentation employed in these settings be
sensitive enough to detect older adults who possess fall-related psychological difficulties (Hill &
Schwarz, 2004). Therefore, an investigation of the psychometric properties (i.e., reliability, validity,
and sensitivity) of fall-related psychological instruments is an important first step in determining which
of these instrument(s) is most appropriate and feasible for use in a community-based falls risk-
screening.

One way to identify older adults participating in a community-based screening that are at-risk for
falls is through the use of a falls risk screening instrument (Ellis et al., 2007a, 2007b; Oliver, Britton,
Seed, Martin, & Hopper, 1997). These instruments can be used to identify older adults who are in need
of further assessment, education, and/or intervention. Aside from the identification of older adults in
need of preventative efforts, falls risk screening instruments are also used to validate other tests or
instruments that are typically included in falls risk screenings (i.e., Functional Reach test and Timed
Up and Go Test) as predictors of falls risk (Duncan, Weiner, Chandler, Studenski, 1990; Shumway-
Cook, Brauer, Woollacott, 2000). Traditionally, assessment of falls risk in the community has been
unidimensional in nature, with only one functional risk factor used to predict one’s risk for falls
(Perrell et al., 2001). More recently, falls risk has been quantified using a comprehensive approach that
is based on multiple risk factors using calculations derived from the AGS (2001) risk factor odds ratios
(Ellis et al., 2007a, 2007b). Consequently, using a comprehensive falls risk screening instrument that
assesses a total “overall falls risk” based on multiple risk factors may better capture the synergistic
relationship among multiple falls risk factors. Although fall-related psychological measures are
typically included in falls risk screening contexts, none of these measures have been evaluated as
predictors of falls risk calculated from a comprehensive falls risk screening instrument. This is
important so that older adults in the community who experience fall-related psychological issues can
be identified based on their overall risk for falls and strategies can be developed to reduce the
likelihood of a future fall by improving fall-related psychological difficulties.
Purpose of the Dissertation

Therefore, the overall purpose of this dissertation was to evaluate and compare the psychometric properties of several fall-related psychological measures for use in independent-living older adults in a community-based falls risk screening context. The specific objectives of this dissertation were to: (a) review the published research literature on the measurement of fall-related psychological constructs among independent-living older adults (chapter 2), (b) examine and compare the reliability and validity of four fall-related psychological instruments in a community-based falls risk screening context (chapter 3), and (c) test the sensitivity of one fall-related psychological instrument over a 12-month period in a sample of independent-living older adults in a community-based falls risk screening context (chapter 4).

More specifically, the purpose of study one (chapter 3) was to test and compare the psychometric properties of the Falls Efficacy Scale-International (FES-I; i.e., falls-efficacy), Activities-specific Balance Confidence scale (ABC; i.e., balance confidence), a modified version of the Survey of Activities and Fear of Falling in the Elderly (mSAFFE; i.e., fear of falling and activity avoidance), and the Consequences of Falling scale (CoF; i.e., feared consequences of falling) in a community-based falls risk screening context using a cross-sectional design. In study one, several hypotheses were tested including whether scores derived from the FES-I, ABC, mSAFFE, and CoF would demonstrate (a) moderate to large correlations with each other, and moderate correlations with (b) self-reported physical activity, (c) health-related quality of life (HRQL), and (d) an objective measure of mobility (i.e., Jorstad et al., 2005). It was also hypothesized that scores derived from the FES-I, ABC, mSAFFE, and CoF would: (e) demonstrate evidence for internal reliability with lower confidence limits (LCL) for Cronbach’s alpha coefficients > .70 (Fan & Thompson, 2001; McDowell & Newell, 1996; Streiner & Norman, 1995), and (f) discriminate between fallers and non-fallers with fallers reporting significantly higher scores on the FES-I, mSAFFE, and CoF scales and significantly lower scores on the ABC (Jorstad et al., 2005). A new research question addressed in study one was to determine
whether scores derived from the FES-I, ABC, mSAFFE, and CoF scales would predict the total falls risk score calculated from a comprehensive falls risk screening instrument described by Ellis and colleagues (2007a; 2007b). The analysis for predicting total falls risk score was exploratory, and therefore, it was not hypothesized which instrument(s) would explain the most variance.

Further, the purpose of study two (chapter 4) was to test the sensitivity to change (or responsiveness) of the ABC scale in fallers and non-fallers participating in two community-based falls risk screenings over a 12-month time period using a longitudinal design. It was hypothesized that there would be a significant decrease in ABC scores among the participants who self-reported a fall in the 12 months between the falls risk screenings compared to those participants who did not self-report a fall.

Finally, chapter 5 of the dissertation summarized the findings, discussed the strengths and limitations of the dissertation studies, implications of the findings, and explored possible directions for future research.
CHAPTER 2
MEASUREMENT OF FALL-RELATED PSYCHOLOGICAL CONSTRUCTS: A REVIEW OF THE RESEARCH LITERATURE

Falls constitute a common and serious health problem in aging adults. According to the “standardized” definition recommended by the Prevention of Falls Network Europe (ProFaNE) consensus, a fall is “an unexpected event in which the participants come to rest on the ground, floor, or lower level” (Lamb, Jorstad-Stein, Hauer, & Becker, 2005; World Health Organization, 2006). Specifically, 35% to 40% of adults over age 65 and at least 40% of adults aged 80 years and older fall annually (Cesari, Landi, Torre, Onder, Lattanzio, & Bernabei, 2002; Hausdorff, Rios, & Edelber, 2001; Tinetti & Speechley, 1989; Tinetti, Speechley, & Ginter, 1988). Twenty-eight percent to 35% of community-dwelling older adults aged 65 years and older, and between 40% and 56% of those aged 80 and above fall at least once each year (Blake et al., 1988; Downton, & Andrews, 1991; Stalenhoef, Crebolder, Knottnerus, Van der Horst, 1997). For older adults residing in nursing homes and hospitals, these rates increase almost three fold (American Geriatrics Society [AGS], 2001). Of all older adults that fall, between 10% and 20% fall again within the same year (Bergland, Jarnlo, & Laake, 2003; Fletcher & Hirdes, 2002; Hanlon, Landerman, Fillenbaum, & Studenski, 2002). However, the prevalence of falls is likely underestimated, as only falls that lead to injury or require hospitalization tend to be reported (Tideiksaar, 1988). Regardless, falls are a common threat that can jeopardize the independence and daily functioning of older adults. Therefore, falls and fall-related injuries pose a serious public health problem particularly because the population aged 65 and over is the fastest growing sector of the United States, and it is expected to double by the year 2030 (He, Sengupta, Velkoff, & DeBarros, 2005).

Not only are falls common among older adults, they can lead to physical injury, result in serious complications, and in some cases result in death. For example, of those who fall, 24% sustain a serious injury such as an osteoporotic fracture (e.g., hip, wrist, rib, pelvis, or vertebrae) or traumatic brain injury (Jager, Weiss, Coben, & Pepe, 2000; Stevens & Adekoya, 2001). Of all fall-related injuries, the
most serious is hip fracture, which is the leading cause of morbidity and mortality in older adults (Stevens, 2005). Moreover, at least 95% of hip fractures reported among older adults are caused by falls (Stevens, 2005), and more than 20% of older adults die within a year of sustaining these injuries (Leibson, Tosteson, Gabriel, Ransom, & Melton, 2002). According to statistics from the Centers for Disease Control and Prevention (CDC)’s National Center for Injury Prevention and Control (NCIPC), falls have become the leading cause of injury death among adults aged 65 years and older (CDC, 2005). When not resulting in death, fall-related injuries can pose serious problems for older adults because they can limit functional mobility, compromise the performance of common daily activities, and lead to premature nursing home admission (DeVito et al., 1988; Jette, Branch, & Berlin, 1990; Rubenstein, 2006).

In addition to the individual suffering that falls and fall-related injuries create for the victim, these events are costly in terms of health care service utilization. Fall-related costs can include direct costs (e.g., costs associated with hospital and nursing home care, rehabilitation, home modifications, community-based services, use of medical equipment, medications, professional services, insurance administration) and indirect costs from the long-term consequences of an injury (e.g., disability, productivity, quality of life, independence). The direct health care cost of falls and fall-related injuries in the United States is currently more than 20 billion dollars per year (CDC, 2005; Stevens, Corso, Finkelstein, & Miller, 2006). With the rise of the aging baby boomer generation, fall-related costs are expected to exceed 43.8 billion dollars per year by 2020 (Englander, Hodson, & Terregrossa, 1996).

**Risk Factors for Falls**

Many studies have investigated the epidemiology of falls, and several review articles and guideline papers have examined which risk factors are the most common among aging adults (AGS, 2001; Bloem, Steijns, & Smits-Engelsman, 2003; Cwik, Fried, & Galinsky, 1989-1990; Feder, Cryer, Donovan, & Carter, 2000; Huang, Gau, Lin, & George, 2003; Moreland et al., 2003; Registered Nurses Association of Ontario, 2002; Report to the Australian Government, Department of Health &
Ageing, Injury Prevention Section, 2004; Rubenstein, 2006; Victorian Government Department of Human Services, 2001). Consequently, more than 400 variables have been investigated as potential risk factors for falls (Gillespie et al., 2003) and the consensus is that risks for falling are multifactorial. That is, risks for falling embody a combination of both intrinsic and extrinsic factors.

Intrinsic risk factors for falls, which relate to an individual’s health, functional status and physical characteristics include age-related declines in physical capabilities (e.g., strength, balance, mobility, gait, performing activities of daily living [ADL]), cognitive functioning, visual functioning (e.g., impaired visual acuity or depth perception), and various psychological factors (e.g., depression, anxiety, fear of falling). Intrinsic factors also commonly include medical conditions (i.e., balance-related disorders, peripheral neuropathy, history of stroke, Parkinson’s disease, or other disorders of the central nervous system), hearing problems, foot problems, and postural hypotension. Extrinsic risk factors for falls, which relate to an older person’s interaction with the environment include environmental hazards (e.g., poor lighting, loose carpets, slippery floors, inadequate bathroom support fixtures, unsafe stairways), polypharmacy (e.g., possessing four or more prescription medications or taking psychotropic, antiarrhythmic, digoxin, or diuretic medications), use of assistive devices, and participation in activities associated with a high risk of falling (e.g., walking on a slippery floor or icy sidewalk; AGS, 2001; Steinweg, 1997).

In addition to intrinsic and extrinsic risk factors, several researchers have proposed the inclusion of situational factors to describe the multifactorial nature of falls risk (Connell, & Wolf, 1997; Tinetti, Doucette, & Claus, 1995). Situational factors introduce an additional context into which the performance of normal activities of daily living is considered. For example, an older adult who is physically frail and has poor postural control (intrinsic factors) may slip and lose balance on a wet spot in the kitchen (extrinsic factor) while trying to cook dinner (situational factor). Finally, risk factors for falls can also be classified as modifiable or nonmodifiable. Modifiable risk factors are factors that are within a person’s control such as physical inactivity, muscle weakness, hypotension, or medication
side effects. Alternatively, nonmodifiable risk factors are factors that cannot be controlled such as age, gender, or blindness. The goal of falls prevention efforts lies in identifying modifiable risk factors, and working to reduce or eliminate them using intervention strategies.

Although there is no agreement as to which factors are the most important across studies, several attempts have been made to rank risk factors that increase the likelihood of falling (AGS, 2001; Rubenstein, 2006). According to a recent review article (Rubenstein, 2006), the most common risk factors for falls among aging adults based on odds ratios (OR) include muscle weakness (OR= 4.9), balance deficit (OR= 3.2), gait deficit (OR= 3.0), visual deficit (OR= 2.8), mobility limitation (OR= 2.5), cognitive impairment (OR= 2.4), impaired functional status (OR= 2.0), and postural hypotension (OR= 1.9) as the most important risk factors for falls. Other common risk factors for falling include advanced age (Horak, Shupert, & Mirka, 1989), being female (Cesari et al., 2002; Tromp, Smit, Deeg, Bouter, & Lips, 1998), past history of falls (AGS, 2001), acute or chronic pathological conditions (Lin & Jane, 2005), and fear of falling (Cesari et al., 2002; Tinetti, Speechley, & Ginter, 1998). Even if no other risk factors are present, the risk for falling increases exponentially with age (Samelson, Zhang, Kiel, Hannan, & Felson, 2002). Finally, each of the identified risk factors in isolation are significantly associated with increased falls, but it is also important to understand the interaction and synergistic relationship that occurs among multiple risk factors because risk for falling significantly increases as the number of risk factors increases (AGS, 2001; Tinetti, Speechly, & Ginter, 1988).

Older adults often have multiple identifiable intrinsic, extrinsic, and situational risk factors therefore, the exact cause of a fall can be nearly impossible to pinpoint. Although a cause may be difficult to determine, Rubenstein (2006) identified several of the most common causes for falls among older adults. Among all reported causes for falls, environmental-related accidents, gait or balance disorders or weaknesses, dizziness/vertigo, drop attacks (i.e., sudden falls without loss of consciousness or dizziness), confusion, postural hypotension, visual disorders, and syncope (i.e., sudden loss of consciousness) were the most common (Rubenstein, 2006). Additionally, most falls
occur inside the home for physically frail older adults and outside the home for more active older adults (Bergland et al., 2003). Thus, early identification of persons with potential risk for falling is important to reduce the number of falls occurring each year.

**Psychological Issues Related to Falls**

In addition to the physical and socioeconomic consequences of falls, falls can also be associated with various psychological difficulties that can compromise quality of life (Arfken, Lach, Birge, & Miller, 1994; Lachman, Howland, Tennstedt, Jette, Assmann, & Peterson, 1998; Parry, Steen, Galloway, Kenny, & Bond, 2001; Rai, Kiniorns, & Wientjes, 1995; Suzuki, Ohyama, Yamada, & Kanamori, 2002). Regardless of whether a fall causes physical trauma, falls often create a loss of confidence in mobility in older adults (Tinetti, Mendes de Leon, Doucette, & Baker, 1994; Yardley & Smith, 2002). Moreover, fall-related psychological difficulties can potentially be more debilitating than sustaining a fall (Cumming, Salkeld, Thomas & Szonyi, 2000; Salkeld et al., 2000). Specifically, fall-related psychological issues become problematic when a loss of confidence in mobility leads to self-imposed reductions in physical activity. Activity restriction can further lead to decreased muscle strength, flexibility, coordination, and progressive functional decline that may cause a loss of independence and damage to identity, thereby increasing the risk for future falls (Cumming et al., 2000; Lach, 2002; Quigley, Hann, & Evitt, 2003; Yardely & Smith). Consequently, psychological issues are not only important consequences of falls, but determinants of falls.

Early in the study of psychological issues related to falls, “ptophobia” (Bhala, O'Donnell & Thoppil, 1982) and “post fall syndrome” (Murphy & Isaacs, 1982) were used to describe a loss of confidence, voluntary restriction of activity, and loss of independence that occurred as a result of a fall. More recently, researchers have used terms such as fall-related psychological traumas (Tinetti, Richman, & Powell, 1990), the fear of falling syndrome (Chandler, Duncan, Sanders, & Studenski, 1996), and fall-related psychological morbidities (Buchner et al., 1993). Today, the most common and best-studied fall-related psychological issues are fear of falling (Huang, 2006; Lachman et al., 1998;
Lusardi & Smith, 1997; Velozo & Peterson, 2001; Williams, Hadjistavropoulos, & Asmundson, 2005; Yardley & Smith, 2002), fall-related self-efficacy or falls efficacy (Buchner et al., 1993; Hill, Schwarz, Kalogeropoulos, & Gibson, 1996; Tinetti et al., 1994; Tinetti et al., 1990; Yardley, Beyer, Hauer, Kempen, Piot-Ziegler, & Todd, 2005), and balance confidence (Powell & Myers, 1995; Shumway-Cook, Gruber, Baldwin, & Liao, 1997; Williams et al.). Although these constructs are the most common fall-related psychological issues, other related constructs including feared consequences of falling (Yardley & Smith), perceived control over falling (Lawrence, Tennstedt, Kasten, Shih, Howland, & Jette, 1998), and perceived ability to manage falls (Lawrence et al.) have been identified. Several qualitative investigations have also explored the psychological consequences of falls from the perspective and everyday experiences of the older adult (Huang, 2005; Kong, Lee, Mackenzie, & Lee, 2002; Ward-Griffin et al., 2004). These studies found that several common psychological consequences of falling identified by older adults include powerlessness, lack of control, lack of emotion, self-comforting, and seeking care (Kong et al.).

Fall-related psychological issues are an important endpoint for clinical fall prevention trials in older adults (Jorstad, Hauer, Becker, & Lamb, 2005). Unfortunately, while the physical and socioeconomic consequences of falls are easy to identify and measure, the subsequent psychological effects on confidence and independence are more ambiguous and harder to quantify. Although fear of falling and falls efficacy are the two most commonly investigated fall-related psychological factors, distinguishing these two constructs from each other, as well as from other similar constructs has been problematic. As a result, there is some confusion regarding the best method of defining and measuring fall-related psychological constructs (Jorstad et al.). Consequently, greater attention needs to be devoted to investigating fall-related psychological factors versus fall-related physical factors (Myers et al., 1996).
Purpose Statement

The purpose of this paper was to review the published research literature on the measurement of fall-related psychological constructs among independent-living older adults. Studies were included in the review if they utilized an independent-living older adult population, a fall-related psychological outcome measure, and were published between 1966 and 2006. Electronic literature searches of PubMed, EBSCO, Academic Search Premier, PsycINFO, CINAHL, and the LSU library online catalog were conducted using search terms including “fear of falling”, “falls efficacy”, “fall-related self-efficacy”, “balance confidence”, “fall-related psychological outcome(s)”, “falls”, “psychological”, “consequence of falls”, “community-dwelling”, and “independent-living”, as well as all combinations of these terms. Studies were excluded from the review if they were not published in a scholarly outlet or if they were not written in English. The paper includes a review of the self-efficacy theory (SET), as well as the definitions, prevalence, risk factors, and measurement and evaluation of fall-related psychological constructs. Finally, implications and directions for future research are discussed.

Introduction to Fall-related Psychological Issues

Overview of the Theoretical Framework: The Self-Efficacy Theory

To understand what triggers the development of fall-related psychological issues, researchers have linked fear of falling with the construct of self-efficacy (Cheal & Clemson, 2001; McAuley, Mihalko & Rosengren, 1997; Tinetti & Powell, 1993). Self-efficacy refers to an individual’s belief or confidence in his or her own capabilities to perform a specific activity successfully (Bandura, 1986). According to Bandura, an individual with low self-efficacy would experience poorer outcomes and would be more likely to give up when facing a challenging task, whereas an individual with high self-efficacy would persevere and successfully complete a task in the face of difficulties (Bandura, 2004). Self-efficacy is often described according to the degree of efficacy, ranging from low to high, an
individual possesses while performing a specific activity. Self-efficacy is important for maintaining physical activity levels and preventing functional decline (Myers, Fletcher, Myers, & Sherk, 1998).

Within the fall-related psychological literature, the most frequently used theories are social cognitive theories (Bandura, 1977; 1986), with many fall-related interventions using the social cognitive theory (SCT; Bandura, 1977) or the self-efficacy theory (SET; Bandura, 1986) to reduce incidence and future risks for falls by enhancing self-efficacy and sense of control over falling (Cheal & Clemson, 2001; Tennstedt, Lawrence, & Kasten, 2001; Zijlstra, van Haastregt, van Eijk, & Kempen, 2005). The SCT and the SET, which is a derivation of the SCT, are widely used theoretical approaches for understanding human behavior, behavior change, and motivation. Social cognitive theories, which include three main determinants of behavior, personal factors, and environmental factors, provide a framework for designing and implementing health behavior-change programs including smoking prevention (Langlois, Petosa, & Hallam, 1999), diabetes self-care (Allen, 2004), arthritis rehabilitation (Marks, 2001), cardiac rehabilitation (Jeng & Braun, 1994), and exercise interventions (Keller, Fleury, Gregor-Holt, & Thompson, 1999). According to the SCT, human behavior can be defined in a triadic, dynamic, and reciprocal interaction of the three determinants (Bandura, 1986; 1989). Following this triadic reciprocal interaction, behavior can influence and can be influenced by both internal personal factors and external environmental factors. Environmental factors, which are factors that are physically external to an individual, include social environmental factors, such as family, friends and colleagues, and physical environmental factors. Similarly, personal factors assumed to influence behavior include attitudes, emotions, and self-efficacy beliefs.

The SET, which is characterized by the mediating processes of outcome expectancies and efficacy expectations, has been widely used to investigate fall-related forms of self-efficacy (Tinetti et al., 1990; Powell & Myers, 1995). Outcome expectancies refer to an individuals’ perception as to whether a behavior will result in a specific outcome. For example, an older adult might believe that exercising is the best way to maintain their physical function as they grow older, but they may have low
confidence in their ability to exercise regularly enough to achieve these benefits. As a main component of the SCT, and as the central component of the SET, efficacy expectations can influence the choices people make, offer a foundation for motivation, and provide the basis for human action. Self-efficacy expectations, which are defined as "people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances" (Bandura, 1986; p. 391), can arise from a number of sources. Sources of self-efficacy, in order from the most powerful to the least powerful, include performance experiences, vicarious experiences, verbal persuasion, and emotional arousal or physical feedback (Bandura, 1977). Performance experiences refer to the experience of carrying out a task successfully, vicarious experiences refer to the comparing and contrasting of others behavior with personal behavior by using other’s situation as a reference for a personal situation, verbal persuasion is the influence of others suggestions on efficacy beliefs, and emotional arousal such as anxiety, stress, or mood state, provides information about efficacy beliefs that people can use to gauge their degree of confidence. Efficacy expectations can vary from situation to situation, and are usually measured in terms of their strength (i.e., degree of perceived confidence in the capability to execute the behavior), magnitude (i.e., belief in personal ability to accomplish task), and generality (i.e., the degree to which beliefs transfer to related tasks; Bandura, 1977; 1986). Therefore, a social cognitive perspective suggests that fear of falling is determined by a combination of cognitive, behavioral, and physiological factors (McAuley, Mihalko & Rosengren, 1997), and there is a need to investigate fall-related psychological issues and design interventions that improve older adults’ confidence in their functional abilities by using a social cognitive framework.

Definition of Constructs

The three most common fall-related psychological issues are defined and discussed in the following section. Although other fall-related psychological issues exist, the extent of the research addressing these constructs in an independent-living older adult population is scarce. Therefore, this
review will focus only on fear of falling, falls efficacy, and balance confidence among independent-living older adults.

Fear of Falling. Fear of falling, defined as a “lasting concern about falling that leads to an individual avoiding activities that he/she remains capable of performing” (Tinetti & Powell, 1993, p. 36), is a frequent and potentially serious fall-related psychological problem in older adults. Considered a multidimensional construct that includes a number of partially independent components, fear of falling encompasses several different fall-related factors (i.e., physical, psychological, social). Fear of falling, which is common among both older adult fallers and non-fallers (Chandler et al., 1996; Lawrence et al., 1998; Myers et al., 1996; Tinetti, Speechley, & Ginter, 1988), can range from a healthy concern about avoiding risky situations, such as navigating an icy sidewalk, to a more severe and disabling anxiety about falling that can negatively affect an older adult’s independence (Evitt & Quigley, 2004). This common fall-related psychological problem has also been characterized as a “low perceived self-efficacy at avoiding falls during essential, nonhazardous activities of daily living” (Tinetti et al., 1990), and as a disability that can effectively be treated by health care providers (http://www.sciencedaily.com/releases/2005/05/050509170445.htm).

Possessing some degree of fear of falling can be beneficial, and it can create an increased caution during activity performance that promotes effective coping skills for falls prevention (Lachman et al., 1998). By possessing a healthy concern about avoiding risky situations, older adults can be more accustomed to potential safety hazards and they can pay greater attention to navigating safely in their environment. On the other hand, a more pronounced fear can translate into increased activity restriction (Li, Fisher, Harmer, McAuley, & Wilson, 2003; Tinetti & Powell, 1993), reduced social interaction (Arfken et al., 1994; Howland et al., 1993; Howland et al., 1998), decreased quality of life (Lachman et al., 1998; Li et al., 2003), poor subjective health rating (Howland et al., 1998), generalized anxiety (Lawrence et al., 1998), depression (Delbaere, Crombez, Vanderstraeten, Willems, & Camber, 2004), reduced physical capabilities (i.e., reduced capacity to perform instrumental
activities of daily living (IADL), poor balance, poor functional mobility; Howland et al., 1998; Li et al., 2003), and ultimately, a sedentary lifestyle (Bruce, Devine, & Prince, 2002). In its severest form, fear of falling is as an expression of anxiety (Lachman et al., 1998; Murphy & Isaacs, 1982). It is the latter, more destructive form of fear of falling that is a risk factor for falls (Lachman et al., 1998; Tideiksaar, 1997).

However, many older adults expressing a loss of confidence in their abilities to perform ADL’s without falling do not always consider themselves to be fearful, even when they have felt threatened by the possibility of a fall or have modified their behavior to avoid falling. Alternatively, some older adults may try to conceal their fear to avoid stigmatization or exaggerate it to gain sympathy. Consequently, recent attempts to measure fear of falling have focused on evaluating one’s confidence at avoiding a fall as opposed to their fear, which has led to the operationalization of fear of falling as a falls specific form of self-efficacy (Tinetti et al., 1990).

Falls Efficacy. “Falls efficacy” (i.e., falls self-efficacy) refers to the confidence in ones ability to perform ADL’s without falling (Tinetti et al, 1990). Early research commonly investigated the role of fear of falling as a psychological consequence of falls that could limit function beyond physical trauma alone. It was argued that because self-report global states such as fear, are often poor predictors of actual behavior (Bandura, 1982), fear of falling was not effectively capturing the psychological impact of falls. In response to this criticism, Tinetti and colleagues (1990) coined the term “falls efficacy” based on Bandura’s SET (Bandura, 1977; 1986).

The relationship between fear of falling and falls efficacy has been somewhat confusing (McKee et al., 2002). Originally, fear of falling and falls efficacy were considered isomorphic constructs (Tinetti & Powell, 1993; Tinetti et al., 1990). According to this school of thought, fear of falling could be measured using falls efficacy measures, and consequently a high fear of falling was synonymous with a low falls self-efficacy. In fact, the title of Tinetti and colleagues seminal paper on the Falls Efficacy Scale is titled “Falls-efficacy as a measure of fear of falling” (Tinetti et al., 1990). Later,
Tinetti and colleagues (1994) disproved this theory and found that although there were significant associations between fear of falling and falls efficacy, both measures essentially tapped into different constructs (Tinetti et al., 1994). Other researchers have also supported the notion that fear of falling and falls efficacy are related, but essentially different constructs (Li et al., 2002; McAuley et al., 1997). Furthermore, Li and colleagues found that fall-related self-efficacy plays a mediational role in the relationships between fear of falling and functional outcomes (Li et al., 2002) and fear of falling and exercise (Li, Fisher, Harmer, & McAuley, 2005). Since its inception, several other confidence-related constructs similar to falls efficacy have emerged including gait efficacy (McAuley et al., 1997) and balance confidence (Powell & Myers, 1995).

**Balance Confidence.** “Balance confidence” first appeared when Powell and Myers (1995) developed the Activities-specific Balance Confidence (ABC) Scale. Balance confidence came about as Powell and Myers attempted to address several limitations of the Falls Efficacy Scale (FES; Tinetti et al., 1990). Specifically, because the FES was less sensitive in detecting loss of confidence for higher-functioning individuals (McAuley et al., 1997; Powell & Myers, 1995), the ABC Scale was developed to include functional activities with a wider continuum of activity difficulty (i.e., both inside and outside of the home) than the FES.

The definition of balance confidence as “confidence in one’s ability to maintain balance and remain steady” closely resembles the definition of falls efficacy, and in both cases a situation specific form of self-efficacy that relates to perceived balance ability is being targeted (Powell & Myers, 1995). Hatch and colleagues (2003) also found that fear of falling contributes to the explanation of balance confidence. Their research showed that older adults with impaired balance also exhibited low balance confidence and they were afraid of falling because of their balance limitations (Hatch, Gill-Body, & Portney, 2003).

One advantage of measuring “balance confidence” as compared to “falls efficacy” or “fear of falling” is that the slight difference in wording may be more sensitive to healthy older adults that have
not fallen, but may sometimes lose their balance. Research using the ABC Scale has shown that among community-dwelling older adults, balance confidence is strongly related to balance performance, functional mobility (Hatch et al., 2003), and current behavior (Myers et al., 1996).

Prevalence of Fall-related Psychological Concerns

When compared to all other types of fears, fear of falling ranks first among community-dwelling older adults (Walker & Howland, 1991). Researchers that have investigated the prevalence of fear of falling have delineated three subpopulations of older adults: (a) those who are not afraid of falling, (b) those who are afraid of falling, but do not restrict their activities because of their fear, and (c) those who are afraid of falling and restrict their activity because of their fear (Howland et al., 1998). Additionally, further classifications are made between those who have fallen and those who have not fallen. Between 29% and 77% of independent-living older adults acknowledge experiencing some type of fall-related psychological difficulty (Arfken et al., 1994; Cumming et al., 2000; Friedman, Munoz, West, Rubin, & Fried, 2002; Howland et al., 1998; Lawrence et al., 1998; Murphy, Dubin, & Gill, 2003; Murphy, Williams, & Gill, 2002; Vellas, Wayne, Romero, Baumgartner, & Garry, 1997). Consequently, fear of falling is prevalent among 29% to 92% of older adults who have fallen in the past year and among 12% to 65% of those who have not fallen (Aoyagi, Ross & Davis, 1998; Arfken et al., 1994; Friedman et al., 2002; Lachman et al., 1998; Murphy et al., 2003; Myers et al., 1996; Powell & Myers, 1995; Tinetti et al., 1994; Vellas et al., 1997). Of those who report fear of falling, between 20% and 55% avoid or restrict their activity because they are afraid they will fall (Howland et al., 1998; Murphy et al., 2002), and the highest prevalence of fear of falling is associated with activities such as “going out when it is slippery” (Lachman et al., 1998). Among independent-living older adults, the prevalence of fall-related psychological difficulties is consistently higher in older women than in older men (Arfken et al., 1994; Friedman et al., 2002; Maki, Holliday, & Topper, 1991; McAuley et
Fall-related psychological difficulties are common among active older adults, as well as frail nursing home residents. Although most fear of falling studies have investigated populations of community-dwelling older adults, several studies have focused on the prevalence and/or the risk factors of fear of falling among hospitalized older adults (Gagnon, Flint, Naglie, & Devins, 2005; Murphy & Isaacs, 1982; Petrella, Payne, Myers, Overend, & Chesworth, 2000), nursing home patients (Franzoni, Rozzini, Boffelli, Frisoni, & Trabucchi, 1994), and “young-old” adults (Martin, Hart, Spector, Doyle & Harari, 2005). Samples of community-dwelling participants have included mostly older adults sixty years of age and older, although middle-age African American adults (i.e., adults 49 to 65 years old) have also been studied (Wilson et al., 2005). Additionally, females are disproportionately represented, with very few studies investigating fear of falling among male participants, which might explain why fear of falling is more common among older women than older men. Moreover, at-risk populations including low socio-economic status, low education level, and racial and ethnic minority groups of older adults are also not well represented.

Overall, the occurrence of fall-related psychological difficulties varies. The discrepancy in occurrence could be attributed to inclusion of more than one construct in reported prevalence rates (i.e., fear of falling, falls efficacy, balance confidence), or because different definitions and instruments have been used to describe and measure fall-related psychological constructs across studies. For instance, Arfken, Lach, Birge, and Miller (1994) found that there is a lower incidence of fear of falling when single item questions with a dichotomous response (i.e. “Are you afraid of falling?”) are used to measure fear of falling. Another possibility is that the potential embarrassment accompanied with revealing private information to a researcher could result in underestimation of fear of falling. Finally, it is also highly probable that older adults who experience the greatest fall-related psychological difficulties do not agree to participate in these types of studies (Maki et al., 1991; Myers et al., 1996).
Risk Factors for Fall-related Psychological Issues

Psychological difficulties develop among older adults as a result of a combination of predisposing factors and subsequent fall events (Murphy et al., 2003). Many of the risks associated with fall-related psychological difficulties are also risk factors for falls, and individuals who experience one of these outcomes are at risk for experiencing the other (Friedman et al., 2002). Risk factors for developing fear of falling and having a low falls self-efficacy can be organized into three categories including physical, psychological, and functional factors. Several of the most frequently reported physical and functional factors include a history of falls, fall-related injuries, poor health status, chronic illness(es), and functional decline, frailty, gait or balance dysfunction, and postural problems, respectively. Moreover, frequently reported psychological risk factors include anxiety, depression, low quality of life, and social withdrawal or isolation (Evitt & Quigley, 2004).

Of the identified fall-related psychological risk factors, those that are independently associated with fear of falling in cross-sectional studies include being female (Arfken et al., 1994; Fessel & Nevitt, 1997), an age of 80 years or older (Murphy et al., 2003), a previous history of falls (Arfken et al., 1994; Fessel & Nevitt, 1997; Howland et al., 1998), visual impairment (Arfken et al., 1994), decreased physical function or mobility (Arfken et al., 1994; Fessel & Nevitt, 1997), poor mental health (Arfken et al., 1994), decreased social contacts (Howland et al., 1998), frequent church attendance (i.e., higher church attendance predicted lower fear of falling; Reyes-Ortiz et al., 2006), disability in performing ADL’s (Nourhashemi et al., 2001), and a sedentary lifestyle (Bruce et al., 2002). Patient populations including those with stroke (Hellstrom & Lindmark, 1999), Parkinson’s disease (Adkin, Frank & Jog, 2003), rheumatoid arthritis (Fessel & Nevitt, 1997), hip fracture (McKee et al., 2002; Petrella et al., 2000), lower-extremity amputation (Miller, Speechley & Deathe, 2001), polio (Hill & Stinson, 2004), and chronic dizziness (Burker et al., 1995) also have an increased risk of developing fall-related psychological difficulties.
Interestingly, many of the fall-related psychological risk factors are bidirectional in that they can cultivate the development of fear of falling, or the presence of fear of falling can cause the risk factors to become more prominent. The presence of one or more risk factors can create a “downward spiral of events” by triggering a fall, which can lead to a more intense fear of falling and low falls efficacy, activity restriction, decreased quality of life and/or higher levels of anxiety (Binda, Culham & Brouwer, 2003).

**Measurement and Evaluation of Fall-related Psychological Constructs**

Fall-related psychological issues can be important endpoints for clinical fall prevention trials in older adults (Jorstad et al., 2005); therefore, it is important that they are quantified appropriately. In reviewing the constructs of falls efficacy, fear of falling, and balance confidence, it becomes noticeable that these constructs are quite similar in nature. As a result, researchers use several related constructs interchangeably to measure another construct. For example, the FES, which was designed to measure the construct of falls efficacy, has been used extensively to measure fear of falling (Tinetti et al., 1990), and the ABC Scale, which was designed to measure the construct of balance confidence, has been used to measure fear of falling (Brouwer, Musselman, & Culham, 2004) and fall-related self-efficacy (Davison, Bond, Dawson, Steen, & Kenny, 2005; Li et al., 2002). As a result, there is some confusion regarding the best method of defining and measuring these fall-related psychological constructs. In a 2005 systematic review of the measurement of psychological outcomes of falling, Jorstad and colleagues mirrored the sentiment of confusion, and they noted that researchers must ensure that the construct they are measuring, as well as the instrument used to measure it, are in fact the same as the construct that is being researched (Jorstad et al.).

In their review, Jorstad and colleagues (2005) identified 18 multi-item measures and 8 single item fall-related psychological measures. Although the researchers indicate that a number of measures are available to assess fall-related psychological outcomes, their results highlight that many of these measures are merely variations of the same instrument, but with different response formats or with
several items omitted (i.e., modified FES [mFES], revised FES [rFES], amended FES [aFES], etc.). In
addition, Jorstad and colleagues found that few of these instruments demonstrate acceptable
measurement properties. Furthermore, not all of the instruments identified in the Jorstad et al. review
paper were designed for use in an independent-living older adult population. Since the 2005 review,
several new fall-related psychological instruments have been developed (Huang, 2006; Peretz,
Herman, Hausdorff, & Giladi, 2006; Williams et al., 2005; Yardley et al., 2005). In this section of the
paper, the measurement of fear of falling, falls efficacy, and balance confidence constructs are
reviewed, and the research literature using the most common fall-related psychological instruments is
discussed. Instruments are classified into fear of falling, falls efficacy, and balance confidence
categories following procedures and categorizations used by Jorstad and colleagues (Jorstad et al.).
Instruments not falling under one of the three categories are classified as “other fall-related
psychological instruments”. Instruments reviewed in this paper include only those that were designed
to assess fall-related psychological outcomes among independent-living older adults.

Fear of Falling

Several multi-item measures have been developed to assess fear of falling (see Table 2.1). Unlike
single item measures, multi-item measures can differentiate between varying degrees of fear across a
variety of situations (Hatch et al., 2003; Howland et al., 1993). Several of the instruments used to
measure fear of falling include the Survey of Activities and Fear of Falling in the Elderly (SAFFE;
Lachman et al., 1998), the Modified SAFFE (mSAFFE; Yardley & Smith, 2002), the University of
Illinois at Chicago Fear of Falling Measure (UIC FFM; Velozo & Peterson, 2001), and the Geriatric
Fear of Falling Measure (GFFM; Huang, 2006). In addition to measuring fear of falling, several of
these instruments also measure other constructs. For example, the SAFFE and the mSAFFE also
measure activity restriction. Single-item fear of falling instruments are discussed at the end of the
section.
Table 2.1. Instruments Measuring Fear of Falling for Independent-living and Community-dwelling Elderly

<table>
<thead>
<tr>
<th>Survey Name</th>
<th>Primary Reference</th>
<th>Construct measured</th>
<th>Design</th>
<th>No. of Items</th>
<th>Item Response Scale</th>
<th>Pop.</th>
<th>Reliability</th>
<th>Validation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survey of Activities and Fear of Falling in the Elderly (SAFFE)</td>
<td>Lachman et al. (1998)</td>
<td>Fear of falling; activity restriction</td>
<td>CS</td>
<td>33</td>
<td>4-point Likert (range 0-3); dichotomous (yes/no); 3-point Likert (range 1-3) where 3 → activity restriction</td>
<td>CDE</td>
<td>Cronbach’s α = .91 (1)</td>
<td>Concurrent (1) Convergent (1,3,5) Criterion (1)</td>
</tr>
<tr>
<td>Modified SAFFE (mSAFFE)</td>
<td>Yardley &amp; Smith (2002)</td>
<td>Fear of falling; activity restriction</td>
<td>CS, LG</td>
<td>17</td>
<td>3-point Likert (range 1-3)</td>
<td>CDE</td>
<td>Cronbach’s α = .91-.92 (6) Test-retest† ρ = .75 (6)</td>
<td></td>
</tr>
<tr>
<td>University of Illinois at Chicago Fear of Falling Measure (UIC FFM)</td>
<td>Velozo &amp; Peterson (2001)</td>
<td>Fear of falling</td>
<td>CS</td>
<td>16</td>
<td>3-point Likert (range 1 – 3)</td>
<td>CDE</td>
<td>Cronbach’s α = .93 (2)</td>
<td>Construct (2)</td>
</tr>
<tr>
<td>Geriatric Fear of Falling Measure (GFFM)</td>
<td>Huang (2006)</td>
<td>Fear of falling</td>
<td>CS</td>
<td>41</td>
<td>range (1 - 5)</td>
<td>CDE</td>
<td>Cronbach’s α = .86-.88 (4) Test-retest †ρ = .88 (4)</td>
<td>Concurrent (4) Construct (4)</td>
</tr>
</tbody>
</table>

Note: CDE = community-dwelling elderly; CS = cross-sectional; LG = longitudinal; α = alpha; ρ = Pearson’s correlation coefficient; † = test-retest 6 months; † = 2 weeks; (1) = Lachman et al. (1998); (2) = Velozo & Peterson (2001); (3) = Li, McAuley, Fisher et al. (2002); (4) = Huang (2006); (5) = Hotchkiss et al. (2004); (6) = Yardley & Smith (2002)
Survey of Activities and Fear of Falling in the Elderly (SAFFE). In 1998, Lachman and colleagues developed the SAFFE instrument to assess the role of fear of falling in activity restriction (Lachman et al., 1998). Specifically, the SAFFE was designed to improve upon previous fear of falling measures by providing the capability to distinguish fear of falling that leads to restriction of activity from fear of falling that accompanies activity (Lachman et al.). The SAFFE, also referred to as the SAFE, gathers information regarding subdomains including activity level, fear of falling, and activity restriction, and it was developed using a sample of 270 community-dwelling older adults between the ages of 62 years and 93 years ($M_{age} = 76.16$, $SD = 7.91$; Lachman et al.). The instrument consists of 33 items that encompass three questions (i.e., one for activity level, one for fear of falling, and one for activity restriction) for each of 11 activities (i.e., 3 activities x 11 items).

Activity level is assessed in a dichotomous response format (e.g., “Do you currently…”; 0 = no or nonresponse, 1 = yes) using 11 items including activities such as ADL’s and IADL’s; e.g., taking a bath or shower), mobility (e.g., going out when it is slippery), and social activities (e.g., visiting friends and relatives). A SAFFE total activity level score, computed by summing the total number of ones, can range from 0 to 11, with lower scores reflecting lower activity levels. Fear of falling is assessed using a 4-point Likert response format (e.g., “If you do the activity, when you do it how worried are you that you might fall?”; 0 = not at all worried, 1 = a little worried, 2 = somewhat worried, 3 = very worried). A SAFFE total worry score (a.k.a., fear score), which is calculated by averaging worry scores across the 11 activities, can range from 0 to 3 (Lachman et al., 1998), with higher scores reflecting higher levels of fear. The SAFFE assesses activity restriction using a 3-point Likert format (e.g., “Compared to five years ago would you say that you do the activity…”; 1 = more than you used to, 2 = about the same, or 3 = less than you used to). A total activity restriction score, which can range from 0 to 11, is calculated by summing the total number of responses answered “less than I used to” (Lachman et al.). Higher scores on this index indicate greater levels of activity restriction. The SAFFE also provides the option of assessing the reasons for not carrying out an activity. Three questions are posed for each of
the 11 activities including (a) whether participants do not participate in the activity because they are worried (e.g., 0 = not at all worried, 1 = a little worried, 2 = somewhat worried, 3 = very worried), (b) are there other reasons why they do not participate in the activity if they are worried, and (c) if participants are not worried, what are the reasons why they do not carry out the activity (Lachman et al.). According to Lachman and Howland, this portion of the survey is optional (http://www.brandeis.edu/projects/lifespan/SAFFE.pdf).

Initially, the SAFFE was designed for administration in a face-to-face interview format, but it has since been adapted for use in a self-report format (i.e., mSAFFE; Yardley & Smith, 2002). Although Lachman and colleagues reported mean scores for the activity level scale ($M = 7.98, SD = 2.37$) and the activity restriction scale ($M = 3.98, SD = 3$), many studies utilizing the SAFFE have used and/or validated only the worry scale of this instrument. Mean scores for the worry scale of the SAFFE have ranged from .66 (Lachman et al., 1998) to 1.8 (Li et al., 2003), with those with more fear ($M = 2.15$) exhibiting higher scores than those with lower fear ($M = 1.44$; Li et al., 2003). The investigators have also shown evidence for the validity of the SAFFE worry scale and found it to demonstrate good internal consistency reliability ($\alpha = .91$) and acceptable adjusted item-total correlations ($r = .50-.76$; Lachman et al.).

Evidence of the validity for the SAFFE was shown by correlating the SAFFE fear score with the rFES (Tinetti et al., 1994; $r = -.76$) and a one-item fear of falling question (e.g., “How afraid are you that you might fall?”; Howland et al., 1993; $r = -.59$), and by correlating the SAFFE activity level score ($r = .69$), and the SAFFE activity restriction score ($r = -.59$) with the rFES. Lachman and colleagues also demonstrated that participants with higher fear scores engaged in fewer activities ($r = -.57$) and were more likely to have reduced their activities over the last five years ($r = -.57$). Further, significant differences were found in fear scores between participants who (a) were not afraid of falling, (b) were afraid of falling, but did not restrict activity, and (c) were afraid of falling and limited their activities ($F_{2, 263} = 92.10, p < .001$; Lachman et al., 1998). The SAFFE fear scale has also been validated using
quality of life scores. As expected, the investigators found that a higher fear of falling was correlated with poorer quality of life (i.e., correlations for all SF-36 variables significant at \( p < .05 \); range \( r = -.55 \) to \( .32 \)).

Other investigators have shown evidence for the psychometric properties of the SAFFE (Hotchkiss et al., 2004; Li et al., 2002). In examining whether self-efficacy moderates the relationship between fear of falling and functional ability in a sample of 256 community-dwelling older adults (\( M \) age = 77.5, \( SD = 5.0 \)), Li and colleagues (2002) found the SAFFE fear scale to exhibit adequate internal consistency (\( \alpha = .71 \)). This study also provided further validation of the SAFFE fear scale against three scale scores for the ABC (e.g., scale scores determined by breaking down ABC so that five items were in each scale; \( r = -.24 \) to \( -.33 \), \( p < .001 \)). In a validation study comparing the measurement properties of the FES, ABC, and the fear scale of the SAFFE in 118 community-dwelling adults 60 years of age and older (\( M \) age = 75.8), Hotchkiss and colleagues (2004) found that the SAFFE worry scale was moderately correlated with both the ABC (\( r = .66 \)) and the FES (\( r = .67 \)). Although the SAFFE may be more useful than the FES because it can differentiate fear of falling that leads to activity restriction from fear of falling that accompanies activity (Lachman et al., 1998), researchers have criticized it for being “too long and burdensome” for use in clinical trials (Lamb et al., 2005).

**Modified Version of the Survey of Activities and Fear of Falling in the Elderly (mSAFFE).** In 2002, Yardley and Smith developed a modified version of the Lachman and colleagues’ SAFFE instrument. The newer, modified version of the SAFFE (mSAFFE) was constructed to assess fear of falling and activity avoidance using a self-report format. In modifying the scale, Yardley and Smith omitted several activities from the original instrument to improve the discriminant validity in a higher-functioning sample of community dwelling older adults (Yardley & Smith, 2002). Using a 3-point Likert response format (range 1-3), the mSAFFE requires participants to view a list of 17 activities (i.e., 5 ADL/ IADL, 9 mobility, 3 social) and determine whether they would never avoid, sometimes
avoid, or always avoid the activity because they are afraid they might fall over. The total mSAFFE score, which can range from 17 to 51, is calculated by summing the responses across the 17 items in the scale. Higher mSAFFE scores reflect higher levels of activity restriction. Mean scores for the mSAFFE have ranged from 22.8 (Delbaere et al., 2004) to 24.0 (Yardley & Smith). Yardley and Smith have found that the mSAFFE demonstrates good internal consistency reliability ($\alpha = .91-.92$) and 6-month test-retest reliability ($\rho = .75$). Delbaere and colleagues (2004) found that mSAFFE scores were significantly correlated with general physical frailty ($r = -.49, p < .001$), Functional Reach scores ($r = -.36, p < .001$), history of falls ($r = .33, p < .001$), timed chair stands ($r = -.41, p < .001$), postural control ($r = -.31, p < .001$), and several measures of muscle performance (i.e., hand grip, $r = -.37, p < .001$; knee extensor, $r = -.44, p < .001$; knee flexor, $r = -.34, p < .001$). No other studies have utilized the mSAFFE instrument.

University of Illinois at Chicago Fear of Falling Measure (UIC FFM). The University of Illinois at Chicago Fear of Falling Measure (UIC FFM; Velozo & Peterson, 2001) measures fear of falling among community-dwelling older adults using a face-to-face interview format. The development of the UIC FFM expands on the work of Lusardi and Smith (1997) by using a Rasch analytic approach to create a new fear of falling measure. Specifically, the authors hoped to create a new instrument by “remaining connected to the meaningful descriptions provided by the instrument items” (Velozo & Peterson, 2001, p. 662) because they felt the unitless outcomes of available instruments are meaningless in applied or clinical settings. The authors used focus group interviews to create a list of 19 activities in which participants were concerned about falling (e.g., “step off a curb”, “carry a full plate”, “climb up poorly lit stairs”; Velozo & Peterson). The UIC FFM instrument was initially developed and tested using 19 items scored on a 4-point rating scale (i.e., 1 = “very worried”, 2 = “moderately worried”, 3 = “a little worried”, and 4 = “not at all worried”) in a sample of 106 community-dwelling older adults ($M$ age = 76 years, $SD = 7.8$) that were mostly African-American females (i.e., 61% African-American, 78% female). After using Rasch analysis to examine the
probability of answering in each of the categories of the 4-point rating scale, the authors determined that participants could not discriminate between “moderately worried” from “very worried” or “a little worried”. Therefore, the authors combined the second and third categories to come up with a final version of the UIC FFM, which consists of 16 items scored using a 3-point Likert rating scale (i.e., 1 = “very worried”, 2 = “moderately worried/ a little worried”, 3 = “not worried at all”; Velozo & Peterson). The Rasch analysis converts raw scores to a logit scale (i.e., log-odds metric; range -3 to +3) for interpretation, with lower scores reflecting higher levels of fear. The authors found a mean UIC FFM score of .52 logits in their sample (Velozo & Peterson).

Velozo and Peterson (2001) have shown that the UIC FFM is a reliable fear of falling measure, with a person separation reliability of .93 (person separation reliability is comparable to Cronbach’s alpha) and a person separation index of 3.56. Further, the investigators demonstrated evidence of the validity of the UIC FFM using hierarchic ordering of items, in that higher logit scores reflected items that were expected to produce more fear of falling and lower logit scores reflected items that were expected to evoke less fear (Velozo & Peterson). One of the strengths of the UIC FFM is that the items were developed entirely by older adults. To date, no other studies have validated the UIC FFM, and a comprehensive search of the research literature revealed no other published articles that have used the UIC FFM instrument in an independent-living older adult population.

Geriatric Fear of Falling Measure (GFFM). The Geriatric Fear of Falling Measure (GFFM; Huang, 2006) was designed to be a culturally relevant fear of falling instrument for community-dwelling older adults in Taiwan. More specifically, the GFFM serves as an outcome measure to evaluate research interventions and as a quick (i.e., five minutes) screening tool for health care providers (Huang, 2006). Based on findings from a previous qualitative investigation of how Taiwanese elders manage fear of falling (Huang, 2005), a pool of 46 fear of falling items were identified. After testing the content validity of these items using an index of content validity (CVI; Waltz, Strickland, & Lenz, 1997), several items were omitted from the scale. The final version of the
GFFM contains 15 items with three subscales (i.e., psychosomatic symptoms [PS], adopting an attitude of risk prevention [RP], and modifying behavior [MB]) scored using a 5-point Likert rating scale (e.g., 1 = never, 5 = always; Huang, 2006). The GFFM includes four PS items (e.g., “I don’t sleep well because I worry about falling”), five RP items (e.g., “I need some assistance when going out”), and six MB items (e.g., “I will go out less during rainy days” (Huang, 2006), and it can yield scores from 15 to 75. Higher GFFM scores reflect higher levels of fear of falling.

Using samples of 100 (M age = 73.4 years, SD = 6.7; 55% female) and 384 (M age = 74.4 years, SD = 6.8; 51% female) independent-living Taiwanese older adults, Huang (2006) found that the GFFM demonstrates good internal consistency reliability (α = .89, α = .86, respectively). This study also provided evidence for the test-retest reliability of the GFFM over a 2-week interval (r = .88, p < .0001; Huang, 2006). Evidence of the validity of the GFFM has been demonstrated using confirmatory factor analysis (X² = 266.14; p < .001; X²/df = 3.06, GFI = 0.92, AGFI = 0.89, CFI = 0.90, RMSEA = 0.07), and by correlating GFFM scores with FES scores (r = .29, p = .002; Huang). The author suggests that this instrument is suitable to measure fear of falling among rural, urban, and suburban Taiwanese older adults, but more research is needed to determine the suitability of the GFFM for community-dwelling older adults in other countries. To date, no other research articles have used the GFFM scale in an independent-living older adult population.

One-item Instruments. Perhaps more common than fall-related psychological multi-item measures, single-item measures have been employed extensively (see Table 2.2). Single-item fall-related psychological measures are commonly used as a screening tool to determine whether participants can be categorized into a group depending on if they possess a fear of falling. Early research investigating the construct of fear of falling most commonly utilized a single-item question with a dichotomous response, asking individuals if they were afraid of falling (Arfken et al., 1994; Maki et al., 1991; Tinetti et al., 1990; Walker & Howland, 1991). Consequently, the most commonly used single-item measures include “Are you afraid of falling?” (Tinetti et al., 1990), “How afraid are
Table 2.2. One-item instruments measuring Fear of Falling for Independent-living and Community-dwelling Elderly

<table>
<thead>
<tr>
<th>Item</th>
<th>Primary Reference</th>
<th>Construct measured</th>
<th>Item Response Scale</th>
<th>Pop.</th>
<th>Reliability</th>
<th>Validation</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Are you afraid of falling?”</td>
<td>Tinetti, Richman &amp; Powell (1990)</td>
<td>Fear of falling</td>
<td>Dichotomous yes/no</td>
<td>CDE</td>
<td>Test-retest*</td>
<td>Κ = .66 (1)</td>
</tr>
<tr>
<td>“How afraid are you that you will fall in the coming year?”</td>
<td>Howland, Peterson, Levin et al. (1993)</td>
<td>Fear of falling</td>
<td>4-point numerical rating (range 1-4)</td>
<td>CDE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>“How afraid are you that you will fall and hurt yourself in the next year?”</td>
<td>Lachman, Howland, Tennstedt, Jette, Assmann &amp; Peterson (1998)</td>
<td>Fear of falling</td>
<td>4-point numerical rating (range 1-4)</td>
<td>CDE</td>
<td>Concurrent (2)</td>
<td>Convergent (2)</td>
</tr>
<tr>
<td>“In general, are you afraid of falling over?”</td>
<td>Yardley &amp; Smith (2002)</td>
<td>Fear of falling</td>
<td>4-point Likert</td>
<td>CDE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>“Are you afraid of falling?”</td>
<td>McAuley, Mihalko, &amp; Rosengren (1997)</td>
<td>Fear of falling</td>
<td>5-point Likert</td>
<td>CDE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>“In general, are you afraid of falling over?”</td>
<td>Yardley &amp; Smith (2002)</td>
<td>Fear of falling</td>
<td>4-point Likert</td>
<td>CDE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>“Are you afraid of falling?”</td>
<td>McAuley, Mihalko, &amp; Rosengren (1997)</td>
<td>Fear of falling</td>
<td>5-point Likert</td>
<td>CDE</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: CDE = community-dwelling elderly; Κ = kappa correlation coefficient; * = test-retest 4-7 days; (1) = Tinetti, Richman & Powell (1990); (2) = Lachman et al. (1998)
you that you will fall in the coming year?” (Howland et al., 1993), “How afraid are you that you will fall and hurt yourself in the next year?” (Lachman et al., 1998), and “In general, are you afraid of falling over?” (Yardley & Smith, 2002). Out of the single-item measures identified, only the Lachman and colleagues (1998) single-item measure has been validated (Jorstad et al., 2005). Although single-item measures are widely used, especially in determining the prevalence of fear of falling, these measures have been criticized. Specifically, because fear of falling is considered a multidimensional construct that is made up of a number of partially independent components, operationalizing it in terms of a single item can underestimate the incidence of fear of falling (Howland et al., 1993; Lachman et al.; Yardley, 1998).

**Falls Efficacy**

Several multi-item measures assess falls efficacy (see Table 2.3). Commonly referred to as the “gold standard” (Skelton, 2004), the Falls Efficacy Scale (FES; Tinetti et al., 1990) is the most widely used fall-related psychological instrument. As a result of its widespread use, several researchers have modified it to improve its measurement properties (Buchner et al., 1993; Hill et al., 1996; Tinetti et al., 1994). Most recently, the FES-International was developed (FES-I; Yardley et al., 2005). Most all of these authors assert that their version of the instrument is a “modified version” of the FES, but in an attempt to organize the literature and keep track of several “modified versions” of the FES, Jorstad and colleagues (2005) refer to these instruments with a distinct name for each modified version. For example, one version of the instrument is the Amended FES (amFES; Buchner et al., 1993), another is the Revised FES (rFES; Tinetti et al., 1994), and a third is the Modified FES (mFES; Hill et al., 1996). For the purposes of this review, all modified versions of the FES are discussed using the names identified by Jorstad and colleagues (2005). Jorstad and colleagues also identified an adapted version of the FES (aFES) that was used for comparative purposes in the development of the MES instrument (Lusardi & Smith, 1997). Because Lusardi and Smith did not provide the appropriate reference for the
Table 2.3. Instruments Measuring Falls Efficacy for Independent-living and Community-dwelling Elderly

<table>
<thead>
<tr>
<th>Survey Name</th>
<th>Primary Reference</th>
<th>Construct measured</th>
<th>No. of Items</th>
<th>Design</th>
<th>Item Response Scale</th>
<th>Pop.</th>
<th>Reliability</th>
<th>Validation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Falls Efficacy Scale (FES)</td>
<td>Tinetti, Richman &amp; Powell (1990)</td>
<td>Falls efficacy</td>
<td>10</td>
<td>CS</td>
<td>10-point numerical rating (range 1-10)</td>
<td>CDE</td>
<td>Cronbach’s α = .90 (1) Test-retest* r = .71 (2)</td>
<td>Concurrent (1,6) Convergent (1,6) Construct (1,6)</td>
</tr>
<tr>
<td>Amended FES (amFES)</td>
<td>Buchner, Hornbrook, Kutner et al. (1993)</td>
<td>Falls efficacy</td>
<td>10</td>
<td>DS</td>
<td>4-point Likert scale (range 1-4)</td>
<td>CDE</td>
<td></td>
<td>Convergent (9)</td>
</tr>
<tr>
<td>Revised FES (rFES)</td>
<td>Tinetti, Mendes de Leon, Doucette &amp; Baker (1994)</td>
<td>Falls efficacy</td>
<td>10</td>
<td>CS</td>
<td>11-point numerical rating (range 0-10)</td>
<td>CDE</td>
<td>Cronbach’s α = .95 (3) Test-retest† ICC = .88 (3)</td>
<td>Convergent (4,7,8)</td>
</tr>
<tr>
<td>Modified FES (mFES)</td>
<td>Hill, Schwarz, Kalogeropoulos &amp; Gibson (1996)</td>
<td>Falls efficacy</td>
<td>14</td>
<td>CS</td>
<td>11-point numerical rating (range 0-10)</td>
<td>CDE, OP</td>
<td>Cronbach’s α = .95 (3) Test-retest† ICC = .95 (3)</td>
<td>Discriminant (3)</td>
</tr>
<tr>
<td>FES-International (FES-I)</td>
<td>Yardley, Beyer, Hauer, Kempen, Piot-Ziegler &amp; Todd (2005)</td>
<td>Falls efficacy</td>
<td>16</td>
<td>CS</td>
<td>4-point Likert scale (range 1-4)</td>
<td>CDE</td>
<td>Cronbach’s α = .96 (5) Test-retest ICC = .96 (5)</td>
<td>Discriminant (5)</td>
</tr>
</tbody>
</table>

Note: CS = cross-sectional; DS = descriptive study; CDE = community-dwelling elderly; OP = outpatient; ICC = intraclass correlation coefficient; α = alpha; * = test-retest 4-7 days; (1) Powell & Myers (1995); (2) = Tinetti, Richman & Powell (1990); (3) = Hill, Schwarz, Kalogeropoulos & Gibson (1996); (4) = Lachman et al. (1998); (5) = Yardley et al. (2005), (6) = Myers, Powell, Maki, Holliday, Brawley, & Sherk (1996); (7) = Tinetti, Mendes de Leon, Doucette & Baker (1994); (8) = Rosengren, McAuley, & Mihalko (1998); (9) = Kressig, Wolf, Sattin et al. (2001)
scale they described, it is impossible to determine how and in which ways this scale was adapted. Therefore, the aFES is not described in this review.

Several other instruments that researchers have used to measure falls efficacy include adaptations of the FES for different countries (i.e., FES Swedish version [FES(S)]; Hellstrom & Lindmark, 1999; FES-UK; Parry et al., 2001). Because there are numerous adaptations of the FES for use in other countries, the only international adaptation of the FES included in this review is the FES-I, which is a universal adaptation that is suitable for use in a wide range of cultural contexts and languages. As with several of the fear of falling multi-item measures, some of the falls efficacy instruments are used to measure other constructs. The most pronounced example of this is the use of the FES to measure fear of falling (Tinetti et al., 1990).

Falls Efficacy Scale (FES). The Falls Efficacy Scale (FES; Tinetti et al., 1990) assesses the perceived efficacy or confidence for avoiding a fall during activities of daily living. The authors, who originally intended for the FES to measure fear of falling, operationalized a fear of falling as a low perceived self-efficacy for performing a specific activity (Tinetti et al.). The FES, which was the first instrument to “expand on the conceptualization of fear as a dichotomous entity” (Tinetti et al., 1990; p. P239), was based upon Bandura’s concept of self-efficacy (Bandura, 1986). In the development of the instrument, Tinetti and colleagues consulted with a panel of expert physical therapists and nurses to develop a list of the ten most important activities that are essential to independent-living for the majority of community-dwelling older adults. After finalizing the list, the items were converted into efficacy measures. In the final version of the instrument, each of the 10 relatively nonhazardous activities are rated on a 10-point scale with a higher score reflecting a lower efficacy or confidence to complete the task without falling. The total FES score is the sum of scores on each of the 10 activities with a range of possible values between 10 and 100 (Tinetti et al.). Tinetti and colleagues observed mean FES scores of 18.56 ($SD = 9.04$) in a sample of 18 cognitively intact, independent-living older adult volunteers ($M$ age = 79 years; 78% female), and 25.11 ($SD = 12.26$) in 56 cognitively intact,
independent-living older adult volunteers (M age = 78 years; 75% female). Consistent with Tinetti and colleagues (1990), Powell and Myers observed a mean FES score of 26.9 (SD = 18.6) and a mean converted FES score (i.e., 0 to 100% scale) of 80.9 (SD = 20.8; Powell & Myers, 1995) in a sample of community-dwelling older adults.

Tinetti and colleagues (1990) have shown that the FES demonstrates good 4 to 7 day test-retest reliability (r = .71), and that usual walking pace (p < .0001), depression (p < .0001), and anxiety trait (p < .0001) are independently associated with FES scores (Tinetti et al.). Results indicating that FES scores increase progressively from older adults who denied any fear of falling, to those who reported fear but denied restriction of activity, to those who were afraid and reported avoidance of activities provide further evidence of validity (Tinetti et al.). Several other investigators have provided evidence of the reliability and/or validity of this instrument (Myers et al. 1996; Powell & Myers, 1995; Tinetti et al.). For example, in their development and validation of the ABC Scale, Powell and Myers (1995) found the FES to be a reliable measure, demonstrating good internal consistency reliability (α = .90) and an acceptable intraclass correlation value of rho = .89 in a sample of 60 community-dwelling older adults. Powell and Myers also provided additional psychometric support for the FES by demonstrating evidence of its scalability (H = .44) and reliability (rho = .89). Evidence of validity of the FES was demonstrated by discriminating between high mobility and low mobility groups (t = 5.7, p < .001) and by correlating the FES with the ABC (r = .84; p < .001) and the Physical Self-Efficacy Scale (PSES; Ryckman, Robbins, Thornton, & Cantrell, 1982; r = -.33, p < .001; Powell & Myers).

Myers, Powell, Maki and colleagues (1996) found that the FES could discriminate between older adults with fear of falling and no fear of falling (M fear = 32.4; M no fear = 19.7; t = 2.88, p < .001) and between those who avoid activity and those who do not avoid activity (M avoidance = 43.4; M no fear group = 19.9; t = 5.46, p < .001). Further, the investigators observed moderate correlations between FES scores and postural sway (r = .37 - .61; Myers et al., 1996). Other investigators have found that the FES can predict future falls and decline in functional capacity (Cumming et al., 2000;
Many studies have used the FES in clinical interventions, and have shown that the FES is sensitive to change (Cameron et al., 2000; Petrella et al., 2000; Tennstedt et al., 1998; Wolf et al., 1996).

Since the development of the FES, several authors have demonstrated that fear of falling and falls efficacy are two separate constructs (Li et al., 2002; McAuley et al., 1997; Tinetti et al., 1994), and therefore, the FES should be used to measure a more specific confidence in ability to perform activities without falling (i.e., falls efficacy), not fear of falling. However, researchers have continued to use the FES to measure fear of falling, and have used fear of falling as a “general term” to represent a low fall-related self-efficacy (Wolf et al., 1996; Zhang et al., 2006). Inappropriate use of the instrument as a “jack of all fall-related psychological trades” has created widespread confusion about the true meaning of, and difference between, these constructs. This has made it very difficult to interpret and compare studies that have used the FES.

In addition, researchers have criticized the FES for its 10-point numerical response format and its inclusion of a narrow scope of simple daily activities (Lachman et al., 1998; Powell & Myers, 1995). Although the FES may be better suited for lower functioning, frail older adults in which this range of activities is appropriate, the FES fails to accurately capture the fall-related concerns of more active, higher functioning older adults who score at the higher ends of the self-efficacy continuum (Lusardi & Smith, 1997). For this reason, several researchers have attempted to solve this problem with the FES by creating their own instrument to measure fear of falling or falls efficacy by adding or omitting items from the original version (Buchner et al., 1993; Hill et al., 1996; Lusardi & Smith; Parry et al., 2001; Powell & Myers; Tinetti et al., 1994; Velozo & Peterson, 2001). Consequently, there are several variations of the FES available. These instruments are presented in chronological order.

Amended FES (amFES). The amended version of the FES (amFES; Buchner et al., 1993) is a modified version of the original FES (Tinetti et al., 1990) that assesses falls-related self-efficacy among older adults participating in the Frailty and Injuries: Cooperative Studies of Intervention
Techniques (FICSIT) trials. Authors of the amFES modified the wording of the FES from “how confident” to “how concerned” participants are about the possibility of falling when performing ten mainly indoor, home-based activities such as getting in and out of a chair and preparing simple meals (Buchner et al.). A four-point Likert scale (range 1 to 4) was also adopted to alleviate difficulties that many older adults have faced in using the ten levels of response categories of the original FES (i.e., 1 = “not at all concerned”, 2 = “somewhat concerned”, 3 = “fairly concerned”, 4 = “very concerned”; Buchner et al., 1993). Total amFES scores can range from 10 to 40, with lower scores indicating a higher falls efficacy. As Parry and colleagues (2001) highlight, Buchner and colleagues do not reference or document validation of their modified version of the FES instrument.

In a study investigating the associations between demographic, functional, and behavioral characteristics and activity-related fear of falling, Kressig and colleagues (2001) dichotomized the amFES score by classifying participants with scores ≥ 20 as fearful (i.e., representing those who are “somewhat”, “fairly”, and “very” concerned about falling) and those with scores less than 20 as not fearful (Kressig et al., 2001). In this investigation, Kressig and colleagues observed mean amFES scores of 20.2 (SD = 6.2) in a sample of 287 independent-living older adults who were transitioning to frailty (M age = 80.9 years, SD = 6.2; 94% female). Furthermore, in an intervention designed to reduce fear of falling though Tai Chi training, Sattin and colleagues (2005) demonstrated that the amFES is sensitive to change by observing mean FES scores that were significantly lower for a Tai Chi group after 8 months (18.4 vs. 20.5, p = .01) and 12 months (17.6 vs. 21.2, p < .001; Sattin, Easley, Wolf, Ying, & Kutner, 2005).

Evidence for the validity of the amFES was demonstrated by comparing the amFES with the ABC (r = -.65, p < .001; Kressig et al., 2001). Kressig and colleagues also found that the amFES was significantly correlated with depression, as measured by the Center for Epidemiological Studies Depression Scale (CES-D; p = .007). It was also found that participants with impaired gait or balance were 2.5 times more likely to yield high amFES scores (95% CI = 1.0-6.5), and those reporting use of
a walking aid were 3.2 times more likely to yield high amFES scores (95% CI = 2.0-5.1; Kressig et al.). In a review comparing fall-related psychological outcome measures, Jorstad and colleagues (2005) indicate that although the amFES contends to measure falls efficacy, it more appropriately relates to fear of falling. As of December 2006, no other published studies were found using the amFES in an independent-living older adult population.

Revised FES (rFES). The revised version of the FES (rFES; Tinetti et al., 1994) is also a modified version of the original FES (Tinetti et al., 1990) that assesses falls-related self-efficacy among community-dwelling older adults. Tinetti and colleagues (1994) slightly modified the original FES (Tinetti et al., 1990) so that when participants were asked how confident they felt in performing each activity without falling, high scores would correspond with high confidence and low scores would correspond with low confidence (i.e., 0 = “not at all confident”, 10 = “completely confident”). The rFES, which is administered in an interview format, includes 10 relatively nonhazardous activities, rated on a 10-point scale. Total scores for the rFES can range from 0 to 100 (Tinetti et al., 1994).

In a sample of 1,103 community-dwelling older adults ($M_{age} = 79.6$ years, $SD = 5.2$; 73% female; 84% white), the authors observed mean rFES scores of 84.9 ($SD = 20.5$) with approximately 7.8 items ($SD = 2.9$) in which participants reported a confidence level of seven or higher. Results from Tinetti et al. (1994) also show evidence of the validity of the rFES in that rFES scores were moderately associated with physical activity, as measured by the Yale Physical Activity Survey (DiPietro, Caspersen, Ostfeld, & Nadel, 1993; $r = .49$), a 10-item ADL/IADL scale (Branch, Katz, Kneipmann, & Papsidero, 1984; Lawton & Brody, 1969; $r = .55$), and social activities, as measured by the New Haven Established Populations for Epidemiologic Studies of the Elderly questionnaire (Cornoni-Huntley, Brock, Ostfeld, Taylor, & Wallace, 1986; $r = .34$).

Although they cited Tinetti et al.’s 1990 study, Lachman and colleagues also used the modified rFES to test the validity of the SAFFE (Lachman et al., 1998). In their study, Lachman and colleagues compared the total rFES score with the SAFFE fear score ($r = -.76$), SAFFE activity level score ($r =$
.69), SAFFE activity restriction score ($r = -.59$), and a single-item fear of falling item (Howland et al., 1993; $r = .43$). Further, Lachman and colleagues found that all eight subscales from the SF-36 were significantly correlated with the rFES ($r = -.44$ to .67, $p < .05$; Lachman et al.). Additionally, an investigation of gait adjustments in older adults by Rosengren, McAuley, and Mihalko (1998) found that the rFES was significantly associated with a revised version of the Gait Efficacy Scale ($r = .68$, $p < .01$), and the Berg Balance Scale ($r = .48$, $p < .01$).

**Modified FES (mFES).** The Modified FES (mFES; Hill et al., 1996) is an expanded version of the original FES (Tinetti et al., 1990) that assesses fear of falling across a wider range of activities including outdoor activities. Also designed for use among community-dwelling older adults, the mFES was expanded to include four additional activities that induced greater levels of fear (i.e., “using public transport”, “crossing roads”, “light gardening or hanging out the washing”, and “using front or rear steps at home”; Hill et al.). Compared to the original 10-item version of the FES, the mFES is an interviewer administered questionnaire that consists of 14 items rated on a 10-point visual analog scale. Scores for each item can range from 0 to 10 (i.e., 0 = “not confident/not sure at all”, 5 = “fairly confident/fairly sure”, and 10 = “completely confident/completely sure”), and the total mFES score, which is calculated as the average of the 14 items, can range from 0 to 10. Unlike the original FES, higher scores reflect higher falls efficacy and lower fear of falling.

In a sample of 111 healthy community-dwelling older adults ($M$ age = 74 years) and 68 older adults referred to a balance clinic (BC; $M$ age = 74 years), the authors observed mean mFES scores of 9.76 ($SD = .32$) and 7.69 ($SD = 2.21$), respectively (Hill et al., 1996). In a different study, Hill and colleagues (1999) reported similar findings with a mean score of 9.8 in a sample of healthy, older adult women ($M$ age = 74.1 years, $SD = 4.0$; Hill, Schwartz, Flicker, & Carroll, 1999). Additionally, a study that evaluated the effectiveness of a community-based program for reducing the incidence of falls among community-dwelling older adults reported mean mFES scores of 66.75 ($SD = 26.28$) and 65.42 ($SD = 26.58$) in control and intervention groups, respectively (Clemson et al., 2004). It was not
mentioned in the Clemson et al. article as to why the rating scale was different from the scale used in the Hill et al. (1996) study.

The mFES has excellent internal consistency reliability ($\alpha = .95$) and high one-week test-retest reliability ($ICC = .93$; Hill et al., 1996). Moreover, the mFES exhibits less skew than the original version of the FES (i.e., -2.4 [mFES], -3.3 [FES]; Hill et al., 1996). Further evaluation of the psychometric properties of the mFES indicates that two main factors, including an “indoor type activity” and an “outdoor type activity”, account for approximately 75% of the variance in the sample (Hill et al.). Evidence of the validity of the mFES has also been demonstrated in that, when controlling for age, the mFES accurately discriminates between healthy and BC participants ($F [14,159] = 5.25, p <.001$; Hill et al.). The mFES has been used in falls prevention programs (Cameron et al., 2000; Cheal & Clemson, 2001; Zijlstra et al., 2005), and it has been recommended as a “standard” psychological consequence of falling measure by the ProFaNE consensus (Lamb et al., 2005). Further, the authors suggest that the mFES can be a useful instrument for evaluating fear of falling among older adults with balance or mobility dysfunction (Hill et al.). As with the amFES, the mFES contends to measure falls efficacy, but appears better suited to measure fear of falling (Jorstad et al., 2005).

FES-International (FES-I). The FES-I (Yardley et al., 2005) is the newest version of the FES scale that was designed for use in a range of cultural contexts. The FES-I, which can be administered in a structured interview or self-report format, was developed to expand upon the original FES by including a wider range of both basic and challenging activities, as well as items regarding social activities. According to Yardley and colleagues (2005), neither the FES nor any of its variations have evaluated the effect of fear of falling on social life (i.e., fear of the social consequences of falling, such as embarrassment) that independently contributes to avoidance of activity (Yardley & Smith, 2002). In developing the instrument, the authors and members of the ProFaNE workgroup created 16 items—ten from the original FES (reworded for cross-cultural relevance when necessary) and six new items (e.g., “walking on slippery, uneven or sloping surfaces”, “visiting friends or relatives”, “going to a social
event”, “going to a place with crowds”; Yardley et al.). The FES-I items are rated on a 4-point scale (i.e., 1 = “not at all concerned” to 4 = “very concerned”) that is similar to the format used by Tinetti et al. (1994). The total FES-I score, which can range from 16 to 64, is calculated by summing the scores on each of the 16 questions (Yardley et al.). Higher FES-I scores reflect greater concern about falling.

In a sample of 704 community-dwelling older adults (\(M_{\text{age}} = 74.7\) years, \(SD = 7.1\); 72.9% female), the authors observed mean FES-I scores of 30.92 (\(SD = 12.15\)) and 34.57 (\(SD = 14.5\)) in participants who received questionnaires by mail and in interview formats, respectively (Yardley et al.).

The FES-I demonstrates good internal reliability (\(\alpha = .96\)), excellent one-week test-retest reliability (\(\alpha = .96\)), and good inter-item correlations (range .29 - .79; Yardley et al., 2005). The authors found evidence of validity of the FES-I in that it demonstrates the expected relationships with age (\(M \geq 75 = 33.86\) vs. \(M < 75 = 29.37, p < .001\)), gender (\(M_{\text{females}} = 32.5\) vs. \(M_{\text{males}} = 28.69, p < .001\)), falls history (\(M \geq 1 \text{ fall} = 35.54\) vs. \(M \text{ no falls} = 26.94, p < .001\)), and fall risk factors (i.e., chronic illness, dizziness, number of medications, and psychoactive medications all significant at \(p < .001\)) similar to the original FES (Yardley et al.). Further evaluation of the psychometric properties of the FES-I indicated that two main factors, including a “concern about lower demand physical activities within the home” and a “concern about more demanding physical activities outside the home” accounted for approximately 37% and 33% of the variance in the sample, respectively (Yardley et al.).

Although only one published study as of December 2006 has examined the psychometric properties of the FES-I, it appears to have close continuity with the original FES (Yardley et al., 2005). Interestingly, the FES-I is named the “falls efficacy scale”, but the authors contend that it actually measures concern about falling. Although it appears that the FES-I is a promising new instrument that can be used to measure fall-related psychological outcomes among community-dwelling older adults internationally, it has continued the confusion that plagues the literature.
Balance Confidence

On first glance, it appears that measuring balance confidence is less complex than measuring fear of falling or falls efficacy because there is only one instrument that has been used extensively to measure the construct (i.e., Activities-Specific Balance Confidence Scale [ABC]). In addition to the ABC Scale, several adaptations of the instrument also exist (see Table 2.4) including a new 6-item version (ABC-6; Peretz et al., 2006), and a modified version (Williams et al., 2005). The original instrument has also been referred to as the ABC-16 to avoid confusion with the modified versions (Peretz et al., 2006). As with the FES, there are also several international adaptations of the ABC Scale (i.e., ABC United Kingdom version [ABC-UK]; Parry et al., 2001; ABC Canadian French version [ABC-CF]; Salbach, Mayo, Hanley, Richards, & Wood-Dauphinee, 2006; ABC Chinese version; Hsu & Miller, 2006). For the purpose of this review, the adaptations developed for use in specific countries are not discussed. Another instrument, the Balance Self-Perceptions Test (Shumway-Cook, Gruber et al., 1997), was developed to assess perceived confidence in balance-related tasks, but has not been widely used. With fewer instruments available to assess balance confidence, choosing an instrument to measure this construct is not as daunting a task as choosing an instrument to measure falls efficacy or fear of falling. Nevertheless, balance confidence has been used to measure fear of falling (Kressig et al., 2001; Peretz et al.; Williams et al.) and fall-related efficacy (Li et al., 2002), which only adds to the complexity of the situation and further blurs the boundaries between these fall-related psychological constructs.

Activities-Specific Balance Confidence Scale (ABC). The Activities-Specific Balance Confidence Scale (ABC; Powell & Myers, 1995) is an interviewer-administered questionnaire that assesses confidence in balance ability while performing several ADL’s. The ABC Scale, which was developed by Powell and Myers (1995) to address several limitations of the FES, is the primary instrument employed to assess balance confidence among independent-living older adults. In the development of
Table 2.4. Instruments Measuring Balance Confidence for Independent-living and Community-dwelling Elderly

<table>
<thead>
<tr>
<th>Survey Name</th>
<th>Primary Reference</th>
<th>Construct measured</th>
<th>No. of Items</th>
<th>Design</th>
<th>Item Response Scale</th>
<th>Pop.</th>
<th>Reliability</th>
<th>Validation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activities-specific Balance Confidence (ABC) Scale</td>
<td>Powell &amp; Myers (1995)</td>
<td>Balance confidence</td>
<td>16</td>
<td>CS</td>
<td>101-point numerical rating (range 0-100)</td>
<td>CDE</td>
<td>Cronbach’s $\alpha = .96$ (1)</td>
<td>Concurrent (1,2) Convergent (1-5, 8) Discriminant (1) Construct (1,2,4)</td>
</tr>
<tr>
<td>ABC-6</td>
<td>Peretz, Herman, Hausdorff &amp; Giladi (2006)</td>
<td>Balance confidence/fear of falling</td>
<td>6</td>
<td>CS</td>
<td>101-point numerical rating (range 0-100)</td>
<td>Patients with HLGD, PD; &amp; HC</td>
<td>Cronbach’s $\alpha = .90-.91$ (6)</td>
<td>Discriminant (6)</td>
</tr>
<tr>
<td>Modified ABC Scale</td>
<td>Williams, Hadjistavropoulos, &amp; Asmundson (2005)</td>
<td>Balance confidence/fear of falling</td>
<td>16</td>
<td>CS</td>
<td>21-point horizontal box scales (range 0-100)</td>
<td>CDE</td>
<td>Cronbach’s $\alpha = .95$ (7)</td>
<td></td>
</tr>
<tr>
<td>Balance Self-perceptions Test</td>
<td>Shumway-Cook, Gruber, Baldwin, &amp; Liao (1997)</td>
<td>Balance confidence/Falls efficacy</td>
<td>12</td>
<td>CS</td>
<td>5-point rating scale (range 1-5)</td>
<td>CDE</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: CDE = community-dwelling elderly; HLGD = higher-level gait disorders; PD = Parkinson’s disease; HC = healthy controls; $r =$ Pearson’s correlation coefficient; $\alpha =$ alpha; (1) = Powell & Myers (1995); (2) = Myers et al. (1996); (3) = Kressig et al. (2001); (4) = Myers, Fletcher, Myers, & Sherk (1998); (5) = Li et al. (2002); (6) = Peretz, Herman, Hausdorff & Giladi (2006); (7) = Williams, Hadjistavropoulos, & Asmundson (2005); (8) = Hotchkiss et al. (2004)
the ABC, a group of clinicians and older adult outpatients receiving physiotherapy developed 16 items representing both indoor and outdoor activities with a wide range of difficulty levels (e.g., picking up an object from the floor, standing on a chair and reaching for an object, walking on icy sidewalks; Powell & Myers). The inclusion of a broader range of functional activities makes it more sensitive to detecting loss of confidence for higher-functioning individuals than the FES (McAuley et al., 1997; Powell & Myers). The final version of the ABC consists of 16 items in which participants rate their level of confidence in maintaining balance and remaining steady when performing each of the activities. Each item is rated on a 0 to 100% response continuum (Bandura, 1977; 1991), with zero indicating no confidence in performing the activity and 100 indicating complete confidence in performing the activity (Powell & Myers). The total ABC score, which can range from 0 to 100, is calculated by adding the scores from each question (range 0 to 1600) and dividing by 16. The authors observed a total mean ABC score of 59.6 ($SD = 27.7$), with means of 80.9 and 38.3 for groups of “high” (n = 30; $M$ age = 71.4 years) and “low” mobility (n = 30; $M$ age = 77.7 years) community-dwelling older adults, respectively (Powell & Myers).

The ABC demonstrates very good internal consistency reliability ($\alpha = .96$), excellent two-week test-retest reliability ($r = .92, p < .001$), and item-total correlations greater than $r = .49 (p < .001$; Powell and Myers, 1995). Further, Powell and Myers observed “more than acceptable” coefficients for both the scalability ($H = .59$) and reliability ($rho = .95$) of the ABC, indicating hierarchical ordering of the items. The authors also found evidence of the validity of the ABC using the FES ($r = .84, p < .001$), and the PSES ($r = .49, p < .001$), with higher correlations found with the PSES physical abilities subscale ($r = .63, p < .001$) and lower correlations found with the PSES self-presentation subscale ($r = .03$), respectively. Furthermore, two investigations have demonstrated evidence of the utility of the ABC as a discriminative index using high and low mobility groups including Powell and Myers ($t = 9.34, p < .001$; 1995) and Myers and colleagues ($F = 97.7, p < .001$; 1998). In evaluating the discriminative and evaluative properties of the ABC, Myers, Fletcher, Myers and Sherk (1998) also
found that the ABC significantly relates with depression (CES depression scale; \( r = -.33 \)), as well as measures of mobility and balance performance including the Timed Up and Go Test \( (r = -.59 \) and \(-.92 \)), a paced walk test \( (r = .47 \) and \(.65 \)), a mobility performance test \( (r = .78 \)), a functional rating questionnaire \( (r = .49 \)), self-report walking distance \( (r = .44 \)), and pain intensity ratings (VAS; \( r = -.35 \)).

Other investigators have shown evidence of the reliability and validity of the ABC Scale (Hotchkiss et al., 2004; Kressig et al., 2001; Li et al., 2002; Powell & Myers, 1995; Myers et al., 1996). In examining whether self-efficacy moderates the relationship between fear of falling and functional ability in a sample of 256 community-dwelling older adults \( (M \text{ age} = 77.5, SD = 5.0) \), Li and colleagues (2002) found the ABC to exhibit good internal consistency \( (\alpha = .87) \). Further, Li and colleagues found that three scale scores for the ABC (e.g., scale scores determined by breaking down ABC so that five items were in each scale) were significantly correlated with the SAFFE fear scale \( (r = -.24 \) to \-.33, \( p < .001 \)), and with measures of balance and physical function \( (r = .25 \) - \.54; Li et al., 2002). In a different study, Myers, Powell, Maki and colleagues (1996) compared ABC scores with walking speed \( (\text{m/sec}; r = .56) \) and posturography measures to quantify postural sway \( (r = .37-.61) \). In addition, Myers and colleagues found that ABC scores could effectively discriminate older adults with fear of falling from those without fear of falling \( (t = 3.91, p < .001) \) and older adults who avoided activity from those that did not avoid activity \( (t = 7.19, p < .001; \) Myers et al., 1996). In a validation study comparing the measurement properties of the FES, ABC, and the fear scale of the SAFFE in 118 community-dwelling adults 60 years of age and older \( (M \text{ age} = 75.8) \), Hotchkiss and colleagues (2004) found evidence of the validity of the ABC in that the ABC was moderately correlated with both the FES \( (r = .86) \) and the SAFFE worry scale \( (r = .66) \). Results from their investigation suggest that the ABC and FES measure similar constructs, while the SAFFE measures a different construct (Hotchkiss et al., 2004). Evidence of the validity of the ABC has also been shown by correlating the ABC with the amFES \( (r = -.65; \) Kressig et al.).
6-item Version of the Activities-Specific Balance Confidence Scale (ABC-6). The 6-item version of the Activities-Specific Balance Confidence Scale (ABC-6; Peretz et al., 2006) is a shorter version of the original ABC (Powell & Myers, 1995) that was designed to assess both fear of falling and balance confidence among older adults. The ABC-6, which includes only the most challenging activities from the original version, was intended to be a shorter questionnaire that can be used as a quick screening tool in applied settings (Peretz et al.). In developing this instrument, Peretz and colleagues used a sample of 19 older adults with Parkinson’s disease (PD; $M$ age = 72 years, $SD = 6$; 63% male), 70 older adults with higher-level gait disorders (HLGD; $M$ age = 78 years, $SD = 5$; 74% female), and 68 healthy independent-living older adults ($M$ age = 75 years, $SD = 6$; 54% female). The original 16-item version of the ABC was reduced by identifying the scale items in which patient groups rated highest levels of fear (i.e., items in which HLGD and PD groups exhibited lowest scores). The final version of the ABC-6, which was designed to be administered in a face-to-face interview format, asks participants to rate his/her “level of confidence lost in the course of the following daily activities…” (e.g., standing on a chair to reach, walking on icy sidewalks) on a zero to 100 percent scale. Total ABC-6 scores can range from 0 to 100, with higher scores reflecting a higher balance confidence and lower fear of falling. Observed mean scores from the Peretz and colleagues study were 92.7 for healthy older adult participants, and 45.5 and 68.9 for the HLGD and PD groups, respectively (Peretz et al.).

The ABC-6 demonstrates good internal consistency reliability in healthy older adults ($\alpha = .86$), as well in as HLGD ($\alpha = .81$) and PD patients ($\alpha = .90$; Peretz et al., 2006). The ABC-6 has also demonstrated evidence of validity in that it could effectively discriminate between the HLGD, PD, and healthy groups of participants ($p < .0001$; Peretz et al.). Intraclass correlation coefficient (ICC) values indicated agreement between the ABC-6 and the original ABC scales for all three groups, with values of .78, .88, and .83 for the healthy, HLGD, and PD groups, respectively (Peretz et al.). The authors of the ABC-6 concluded that the ABC-6 is comparable to the original ABC and it is useful in assessing fear of falling among healthy and patient populations. Because this is a new instrument, there are
currently no other published studies that have used the ABC-6 in an independent-living older adult population.

Finally, although it purports to measure balance confidence, the authors that developed it refer only to its use for measuring fear of falling. They conclude that it is analogous to the 16-item version and that it can be useful for measuring fear of falling in research and applied or clinical settings, but they do not provide any information or discuss the implications of using it to measure balance confidence. No other authors have examined the ABC-6 for the purpose of measuring balance confidence in an independent-living older adult population.

**Modified Version of the Activities-Specific Balance Confidence Scale.** The Modified version of the Activities-Specific Balance Confidence Scale (Williams et al., 2005) is a newer version of the ABC (Powell & Myers, 1995) that assesses balance confidence and fear of falling. Williams and colleagues (2005) modified the original ABC by replacing the 0 to 100% rating scale with a 21-point horizontal box scale (Jensen, Miller, & Fisher, 1998). Using the 21-point scale, the 16 items from the original ABC were rated using a continuum with 21 numbers ranging from 0 to 100 (i.e., 0 = “no confidence”, 100 = “complete confidence”). Total modified ABC scores can range from 0 to 2100, and as with the original ABC, lower scores correspond to less confidence in perceived ability to perform specified activities without losing balance. Mean scores for a group of 128 older participants (M age = 73.6 years, SD = 5.9; 66% female) and a group of 122 participants who were 55 years and younger (M age = 34.3 years, SD = 12.5; 67% female) were 1226.22 (SD = 337.12) and 1449.64 (SD = 244.93), respectively, and the authors report very good internal consistency reliability (α = .95; Williams et al.). Williams and colleagues also found that in older adult participants, ABC scores were significantly correlated with the Fear of Pain Questionnaire –III (FPQ-III; McNeil & Rainwater, 1998) scores (r = -.27, p < .01; Williams et al.), the Modified Geriatric Pain Measure (GPM; Ferrell, Stein, & Beck, 2000) scores (r = -.48, p < .01), depression (CES-D scores; r = -.24, p < .05), years of education (r =
.24, \( p < .01 \)), cognitive status (Mini-mental State Examination [MMSE] scores; Folstein, Folstein, & McHugh, 1975; \( r = .27, p < .05 \)), and age \( (r = -.28, p < .01) \).

Williams and colleagues used “fear of falling” and “low balance confidence” interchangeably in this article. The authors argued it was “reasonable to assume that both would lead to avoidance of activities, and thus deconditioning” (Williams et al., 2005, p. 64). After reviewing the available instruments used to measure balance confidence, it appears that balance confidence, or at least the measurement of balance confidence, may not be a construct in its own right. For instance, it could be argued that all of the balance confidence instruments should be placed under an umbrella “fear of falling” category or possibly under the falls efficacy category because they were developed or used to measure fear of falling or fall-related efficacy. Similarly, Powell and Myers (1995) developed the ABC to create an instrument that had better properties and assessed a wider range of activities than the FES. In fact, other researchers have referred to the ABC as “an extended version” of the FES (Li et al., 2002). Therefore, it is possible that a distinct “balance confidence” construct may not be necessary. More research is needed to determine the exact relationship between these constructs.

**Balance Self-Perceptions Test.** The Balance Self-Perceptions Test (Shumway-Cook, Gruber et al., 1997) is a modification of the rFES (Tinetti et al., 1994) that assesses perceived confidence when performing common ADL’s without experiencing fear or loss of balance. The Balance Self-Perceptions Test consists of 20 items (Shumway-Cook, Gruber et al.) in which participants are asked to self-report their degree of confidence on a scale of 1 to 5 (i.e., 1 = “no confidence”, 5 = “extreme confidence”) for performing ADL’s and IADL’s without experiencing fear or loss of balance (Shumway-Cook, Gruber et al.). The total score for the Balance Self-Perceptions Test can range from 20 to 100 (i.e., 20-item version), with higher scores reflecting the perception that balance and fear of falling do not limit performance of activities. A 12-item version has also been utilized (Shumway-Cook, Baldwin, Polissar, & Gruber, 1997), and scores from this version of the instrument range from 0 to 60.
The 20-item instrument has been used to assess the effects of a multidimensional exercise program on balance, mobility, and falls risk in 105 community-dwelling older adults with a history of two or more falls in the past six months (control: \( n = 21 \), \( M \) age = 78 years, 67% female; partially adherent exercise group: \( n = 32 \), \( M \) age = 80 years, 78% female; fully adherent exercise group: \( n = 52 \), \( M \) age = 79 years, 73% female). Shumway-Cook, Gruber and colleagues reported mean scores on pre- and post-tests for the control group of 64.1 (\( SD = 16.7 \)) and 59.8 (\( SD = 15.7 \)), respectively, for the partially adherent group of 54.8 (\( SD = 12.6 \)) and 61.1 (\( SD = 14.7 \)), respectively, and mean scores for the fully adherent group of 57 (\( SD = 12.9 \)) and 70.4 (\( SD = 13.2 \)), respectively. Another study by Shumway-Cook, Baldwin and colleagues (1997) used the 12-item Balance Self-Perceptions Test and reported means of 51.4 (\( SD = 3.4 \)) and 38.8 (\( SD = 15.1 \)) in a group of non-fallers (\( n = 22 \)) and fallers (\( n = 22 \)), respectively. Further, their investigation yielded significant correlations between the Balance Self-Perceptions Test and the Berg Balance Scale (\( r = .76, p < .001 \)), use of an assistive device (\( r = -.52, p < .001 \)), and a history of imbalance (\( r = -.60, p < .01; \) Shumway-Cook, Baldwin, et al.).

**Other Fall-related Psychological Instruments**

In addition to the three constructs discussed in the previous sections, several other less common fall-related psychological instruments exist that are intended for use in an independent-living older adult population (see Table 2.5). Fall-related psychological instruments that do not fall within the categories of fear of falling, falls efficacy, or balance confidence include the Consequences of Falling Scale (CoF; Yardley & Smith, 2002), the Gait Efficacy Scale (GES; McAuley et al., 1997), the Mobility Efficacy Scale (MES; Lusardi & Smtih, 1997), the Perceived Control Over Falling scale (PCOF; Lawrence et al., 1998), and the Perceived Ability to Manage Falls scale (Lawrence et al., 1998). Although all five of these scales have demonstrated adequate reliability, as of December 2006 only the MES has been validated.
Table 2.5. Instruments Measuring Other Fall-Related Psychological Constructs for Independent-living and Community-dwelling Elderly

<table>
<thead>
<tr>
<th>Survey Name</th>
<th>Primary Reference</th>
<th>Construct measured</th>
<th>No. of Items</th>
<th>Design</th>
<th>Item Response Scale</th>
<th>Pop.</th>
<th>Reliability</th>
<th>Validation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consequences of Falling Scale (CoF)</td>
<td>Yardley &amp; Smith (2002)</td>
<td>Feared consequences of falling</td>
<td>12</td>
<td>CS, LG</td>
<td>4-point Likert (range 1-4)</td>
<td>CDE</td>
<td>Cronbach’s α = .86-.94 (1)</td>
<td>CDE, LTC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Test-retest† r = .61-.64 (1)</td>
<td></td>
</tr>
<tr>
<td>Gait Efficacy Scale (GES)</td>
<td>McAuley, Mihalko, &amp; Rosengren (1997)</td>
<td>Gait efficacy</td>
<td>10</td>
<td>CS</td>
<td>10-point numerical rating (range 1-10)</td>
<td>CDE</td>
<td>Cronbach’s α = .91 (3)</td>
<td></td>
</tr>
<tr>
<td>Mobility Efficacy Scale (MES)</td>
<td>Lusardi &amp; Smith, (1997)</td>
<td>Mobility Efficacy; Fear of falling</td>
<td>10</td>
<td>CS</td>
<td>4-point numerical rating (range 1-4)</td>
<td>CDE</td>
<td>Cronbach’s α = .82 (2)</td>
<td>Convergent (2)</td>
</tr>
<tr>
<td>Perceived Control Over Falling (PCOF)</td>
<td>Lawrence et al. (1998)</td>
<td>Control over the environment, mobility, &amp; ability to manage &amp; prevent falls</td>
<td>4</td>
<td>CS</td>
<td>5-point Likert (range “strongly disagree” to “strongly agree”)</td>
<td>CDE</td>
<td>Cronbach’s α = .71 (4)</td>
<td></td>
</tr>
<tr>
<td>Perceived Ability to Manage Falls (PAMF)</td>
<td>Lawrence et al. (1998)</td>
<td>Beliefs regarding certainty about managing falls</td>
<td>5</td>
<td>CS</td>
<td>4-point Scale (range “not at all” to “very sure”)</td>
<td>CDE</td>
<td>Cronbach’s α = .76 (4)</td>
<td></td>
</tr>
<tr>
<td>“Has fear of falling made you avoid any activities?”</td>
<td>Tinetti, Richman &amp; Powell (1990)</td>
<td>Activity Avoidance</td>
<td>1</td>
<td>CS</td>
<td>Dichotomous yes/no</td>
<td>CDE, LTC</td>
<td>Test-retest* K = .36 (5)</td>
<td></td>
</tr>
</tbody>
</table>

Note: CS = cross-sectional; LG = longitudinal; CDE = community-dwelling elderly; LTC = long-term care; α = alpha; r = Pearson’s correlation coefficient; K = kappa correlation coefficient; † = test-retest 6 months; * = test-retest 4-7 days; (1) = Yardley & Smith (2002); (2) = Lusardi & Smith, 1997; (3) = McAuley, Mihalko, & Rosengren (1997); (4) = Lawrence et al. (1998); (5) = Tinetti, Richman, & Powell (1990)
Consequences of Falling Scale (CoF). In 2002, Yardley and Smith developed the Consequences of Falling Scale (CoF) to assess perceived consequences of falling among community-dwelling older adults (Yardley & Smith, 2002). The authors argue that, in addition to a fear of physical harm, functional incapacity and loss of independence, there are other feared consequences of falls that can motivate activity avoidance (e.g., fear of social embarrassment, fear of pain and suffering, fear that a fall is an indicator of terminal physical decline; Yardley & Smith). The purpose of developing the CoF scale was to quantify several of the most common consequences of falling. A series of semistructured focus group interviews in which 35 older adults were asked “about their worries about the perceived consequences of falling” yielded four types of feared consequences (i.e., fear of physical injury, long-term functional incapacity, subjective anxiety, and social discomfort; Yardley & Smith). For each of 16 items (i.e., 4 items for each type of feared consequence), participants were asked to rate their level of agreement or disagreement to the statement “I think that if I fall over I will…” using a 4-point Likert response scale (i.e., 1 = “disagree strongly”, 2 = “disagree”, 3 = “agree”, 4 = “strongly agree”; Yardley & Smith). The final version of the CoF is a 12-item self-report questionnaire that includes Loss of Functional Independence (CoF-LFI) and Damage to Identity (CoF-DI) subscales (Yardley & Smith). The CoF-DI subscale consists of items regarding difficulty getting up, causing a nuisance, losing confidence, embarrassment, pain, and feeling foolish, while the CoF-LFI subscale assesses being active, losing independence, becoming disabled, being severely injured, helpless, and unable to cope. Scores for each of the subscales are calculated by summing the scores (range 1 to 4) for the six items in each scale, and a total CoF score can be calculated by summing the scores on all 12 of the questions. Higher scores reflect greater levels of concern.

Yardley and Smith (2002) observed mean CoF-LFI scores of 12.2 (SD = 4.1) and 12.4 (SD = 4.0) and mean CoF-DI scores of 14.3 (SD = 3.7) and 14.4 (SD = 3.8) in samples of 224 (Time 1; M age = 80.7 years, SD = 4.25; 53% female) and 166 community-dwelling older adults (Time 2; M age = 80.7 years, SD = 4.16; 52% female), respectively. In examining the psychometric properties of the CoF
subscales, the authors found good internal consistency reliability for both the CoF-LFI (α = .94) and the CoF-DI (α = .86-.87; Yardley & Smith). In addition, Yardley and Smith demonstrated adequate 6-month test-retest reliability in the CoF-LFI (r = .61) and the CoF-DI (r = .64) subscales. In comparing the CoF subscales to a single-item fear of falling question (i.e., “In general, are you afraid of falling over” using a 4-point Likert scale), the authors observed significant positive relationships between the CoF-LFI ($F_{[2, 209]} = 39.48, p < .001$) and the CoF-DI ($F_{[2, 208]} = 61.37, p < .001$) subscales with the fear of falling item (Yardley & Smith). Further, Yardley and Smith found that when adjusting for time one mSAFFE scores, the CoF-LFI ($\beta = .21, p < .001$), COF-DI ($\beta = .16, p < .01$), and the one-item fear of falling question ($\beta = .15, p < .05$) were longitudinal predictors (i.e., 6-months) of avoidance of activity, as measured by the mSAFFE scale (Yardley & Smith). As of December 2006, no other published studies have utilized this instrument in an independent-living older adult population.

Gait Efficacy Scale (GES). The Gait Efficacy Scale (GES; McAuley et al., 1997) is a self-efficacy measure that quantifies older adults’ confidence in their ability to perform movement-related tasks in a variety of gait and mobility-related situations. For example, the authors were interested in assessing older adults’ beliefs in their capabilities to carry out tasks including negotiating stairs, using an escalator, and navigating obstacles in their path (McAuley et al.). Although the GES was designed to assess specific movement-related situations, McAuley and colleagues note that there is some overlap between the GES and the FES because the instrument includes several items related to balance. The GES consists of 10 items that are rated using a 10-point Likert scale, with one representing “no confidence at all” and 10 representing “complete confidence” (McAuley et al.). Total scores for the GES can range from 10 to 100, with higher scores reflecting higher levels of confidence. McAuley and colleagues (1997) observed mean GES scores of 82.65 ($SD = 16.34$) and 88.76 ($SD = 14.58$) in a sample of 58 (78% female) “low active” ($M$ age = 71.72 years, $SD = 6.36$) and “high active” ($M$ age = 70.14 years, $SD = 6.25$) community-dwelling older adult volunteers, respectively. Further, the GES
exhibits high internal consistency reliability ($\alpha = .91$) and positive correlations with the perceived physical ability subscale of the PSES ($r = .38$, $p < .01$), the Berg Balance Scale ($r = .47$, $p < .01$), and a one-item 5-point Likert scale fear of falling measure ($r = -.56$, $p < .01$; McAuley et al.). In an investigation of gait adjustments in older adults it was also found that GES was significantly associated with the rFES ($r = .68$, $p < .01$) and with the Berg Balance Scale ($r = .43$, $p < .01$; Rosengren et al., 1998). The GES scale has also been used to study the influence of self-efficacy on physical activity and functional limitations (McAuley et al., 2006), and to test the effects of anxiety on allocation of attention during locomotion (Gage, Sleik, Polych, McKenzie, & Brown, 2003). Findings from these studies indicate that gait efficacy is associated with physical activity and with functional limitations (McAuley et al., 2006), and that a low gait efficacy and/or an anxiety about falling may help to explain “the known age differences associated with the temporal demands of gait” (Gage et al., 2003; p. 393). Further, results suggest that reductions in functional limitations may be determined by a combination of lifestyle and psychosocial factors including physical activity, self-efficacy (including both exercise and gait and balance self-efficacy), and functional performance (McAuley et al., 2006).

Mobility Efficacy Scale (MES). The Mobility Efficacy Scale (MES; Lusardi & Smith, 1997) measures fear of falling among community-dwelling older adults. Specifically, Lusardi and Smith used a Rasch modeling approach to address several shortcomings of the FES (i.e., the ceiling effect that results from the inclusion of items that are too low in difficulty) by asking a sample of 92 community-dwelling older women which activities were the most “posturally challenging” and had the highest risk of falling associated with them (Lusardi & Smith). Because the MES was constructed using items developed entirely by older adults, it includes a wider variety of more challenging activities than the FES. The MES instrument, which takes approximately 10 minutes to administer, consists of 10 items scored using a 4-point Likert rating scale (e.g., “How concerned (about your ability) are you that you might fall when you are…”; 1 = “not at all concerned”, 2 = “a little concerned”, 3 = “fairly concerned”, and 4 = “very concerned”). Higher MES scores reflect higher levels of fear of falling. Although mean
scores for the MES instrument, which can range from 10 to 40, were not reported in the Lusardi and Smith (1997) article, a study by Clemson and colleagues investigating the effectiveness of a randomized fall prevention trial among 310 community-dwelling older adults ($M$ age = 78.4 years) reported a mean MES score of approximately 66.

The authors have shown that the MES demonstrates good internal consistency reliability ($\alpha = .82$) and it provides evidence of validity against an adapted version of the FES (aFES; $r = .77$; Lusardi & Smith, 1997). A search of the research literature revealed no further validation of this instrument. Although the MES can provide accurate estimates of self-efficacy perceptions on its own, Lusardi and Smith recommend using it in conjunction with the aFES (Lusardi & Smith). One of the strengths of the MES is that its items were constructed entirely by older adults. Alternatively, a limitation of the MES is that it appears better suited to measure falls efficacy or concern about falling as opposed to fear of falling.

Perceived Control Over Falling Scale. The Perceived Control Over Falling scale (PCOF; Lawrence et al., 1998) was developed to gain a better understanding of different fall-related dimensions of efficacy among community-dwelling older adults who report a basic concern about falling. The PCOF was designed using the premise of a memory efficacy scale (Lachman, Weaver, Bandura, Elliott, & Lewkowicz, 1992) and it assesses an older adult’s ability to control their mobility while preventing falls and reducing fear of falling in their own environment (Lawrence et al.). The PCOF scale consists of four items (i.e., “I can reduce my risk of falling”, “I can overcome my fear of falling”, “there are things I can do to keep myself from falling”, and “falling is something that I can control”) that are rated on a 5-point Likert response scale (1 = “strongly disagree”, 2 = “disagree”, 3 = “unsure”, 4 = “agree”, 5 = “strongly agree”; Lawrence et al.). The total PCOF score is calculated by averaging the scores from all four items. Scores can range from one to five, with higher scores reflecting higher levels of control over falling (Lawrence et al.). Lawrence and colleagues (1998) observed mean PCOF scores of 3.45 ($SD = .92$) in a sample of 392 community-dwelling older adults.
The PCOF scale demonstrates acceptable internal consistency reliability (α = .71, standardized) and it is positively correlated with the Perceived Ability to Manage Falls scale (r = .43; Lawrence et al.). Further, Lawrence and colleagues found that lower levels of perceived control over falling were related to higher levels of fear of falling and hurting oneself in the next year (OR = .73; p < .001; Lawrence et al.). The PCOF scale has also been used to measure fall-related outcomes in falls prevention interventions designed to reduce fear of falling and activity restriction (Tennstedt et al., 1998; Tennstedt et al., 2001; Zijlstra et al., 2005). Findings from these studies indicate that participants who report higher perceived control over falling and higher levels of both social and physical functioning before experiencing a SCT-based falls prevention intervention are more likely to experience improvements in falls efficacy and perceived ability to manage falls (Tennstedt et al., 1998; Tennstedt et al., 2001).

**Perceived Ability to Manage Falls Scale.** The Perceived Ability to Manage Falls scale (PAMF; Lawrence et al., 1998), like the PCOF, was developed to gain a better understanding of different fall-related dimensions of efficacy. Similarly, the PAMF scale was also designed using the premise of a memory efficacy scale (Lachman et al., 1992). The PAMF assesses an older adult’s beliefs regarding their confidence and ability to avoid falls and manage falls if they occur (Lawrence et al.). The PAMF scale consists of five items that quantify a person’s confidence in “finding a way to get up if they fall”, “finding ways to reduce falls”, “protecting themselves if they do fall”, “increasing their physical strength”, and “getting steadier on their feet” (Lawrence et al.). PAMF items are rated using a 4-point Likert scale (1 = “not at all sure”, 4 = “very sure”; Lawrence et al.). The total PAMF score is calculated by averaging the scores from all five items. Scores can range from one to four, with higher scores reflecting higher ability to manage falls (Lawrence et al.). Lawrence and colleagues (1998) observed mean PAMF scores of 2.17 (SD = .72) in a sample of 392 community-dwelling older adults (M age = 77.43, SD = 7.65; 90% female; 90% Caucasian). The PAMF scale demonstrates acceptable internal consistency reliability (α = .76, standardized) and it is positively correlated with the PCOF.
scale ($r = .43$; Lawrence et al.). Further, Lawrence and colleagues found that lower levels of perceived ability to manage falls were related to higher levels of fear of falling and hurting oneself in the next year ($OR = .47; p < .001$; Lawrence et al., 1998). Similar to the PCOF, The PAMF scale has also been successfully used as an outcome measure in falls prevention interventions (Tennstedt et al., 1998; Tennstedt et al., 2001). Additionally, results on the PAMF revealed that men were more likely to experience higher levels of perceived ability to manage falls than their female counterparts (Tennstedt et al., 1998; Tennstedt et al., 2001).

**One-item Instruments.** In addition to measuring fear of falling, single item questions have been used to assess activity avoidance. For example, the single item question, “Has fear of falling made you avoid any activities?” (Tinetti et al., 1990) has been used to determine whether individuals restrict their activity as a result of a fear of falling. Powell and Myers (1995) found that this activity avoidance question was effective at discriminating between high and low mobility groups ($p < .001$; Powell & Myers, 1995). Based on their findings, they suggest using the question as “an initial screening tool regarding balance confidence” (Powell & Myers, 1995, pg. M33).

**Implications and Directions for Future Research**

Evidence from the published research literature (from 1966 to 2006) does not point to one unanimous solution to the measurement issue among the fall-related psychological constructs. Several of the issues that make deciphering the literature so challenging include inappropriate operationalization and measurement of constructs, inconsistencies in evidence of validity across studies, and different recommendations as to which instrument, if any, should serve as a “criterion” or “gold standard” fall-related psychological measure. The research findings indicate that several fall-related psychological instruments are being employed to measure constructs other than those the instruments were designed to assess. Before it can be determined what the most important constructs are to measure and which instruments are the best to use in falls prevention efforts, it is first necessary to determine and quantify the underlying relationship between fear of falling, falls efficacy, and
balance confidence and other fall-related psychological constructs. Several studies have attempted to clarify the relationship between fear of falling and falls efficacy. Results from studies collectively indicate that each of these constructs are unique, yet related constructs, and evidence for this are consistent moderate correlations observed between instruments. Although the findings from these studies have helped us to understand the relationship between fear of falling and falls efficacy, researchers have continued to use falls efficacy instruments to measure fear of falling. According to Bandura’s SET (Bandura, 1977; 1986), measures of efficacy including fall-related or other efficacy measures, should be composed of items that are specific to the situation or task of interest in the investigation. Future research efforts need to follow this SET principle for efficacy measures instead of using one fall-related psychological measure as a broad, overarching measure to assess all constructs. Because efficacy measures are situation specific, it seems that the best approach to measuring fall-related psychological outcomes is to include several constructs of interest in our studies to examine specific dimensions of fall-related efficacy such as falls efficacy, balance confidence, gait efficacy, perceived control over falling, consequences of falling, and so on.

Another issue that has created confusion in the literature lies in the lack of consistency across studies in providing evidence of validity of fall-related psychological instruments. For clarification purposes, it is first necessary to define several types of validity that have been used in these studies including construct, convergent, discriminant, criterion, and concurrent validity. Construct validity, which has been referred to as the “unifying concept for all validity evidence” (American Educational Research Association [AERA], American Psychological Association [APA], & National Council on Measurement in Education [NCME], 1999) refers to “a judgment about the appropriateness of inferences drawn from test scores regarding individual standings on a variable called a construct” (Cohen & Swerdlik, 2005; p. 175). One way to provide evidence of construct validity of an instrument is to formulate a hypothesis based on the research literature, then test whether the instrument can accurately discriminate the higher scorers and lower scorers on the construct. For example, the FES
discriminates between high mobility and low mobility groups (Powell & Myers, 1995), and the ABC discriminates between older adults with and without a fear of falling (Myers et al., 1996). Technically most other types of validity fall under the “construct validity” umbrella, but two specific types of construct validity include convergent and discriminant validity. Convergent validity can be evidenced when tests “converge from a number of sources, such as other tests or measures designed to assess the same (or a similar) construct”, and discriminant validity is demonstrated when a test shows “little relationship between test scores and/or other variables with which scores on the test being construct-validated should not theoretically be correlated” (Cohen & Swerdlik; p. 179). For example, convergent validity is found when similar fall-related psychological measures (i.e., fear of falling measures such as the SAFFE, GFFM, one-item fear of falling measure) yield moderate to high correlations between instruments, and discriminant validity is demonstrated when instruments that should not be related (i.e., self-report physical activity and vision score on a falls risk screening instrument; Ellis et al., 2007a) yield low correlations between instruments. Criterion validity refers to “a judgment regarding how adequately a score or index on a test or other tool of measurement can be used to infer an individual’s most probable standing on some measure of interest (the criterion)” (Cohen & Swerdlik; p. I-6). One specific type of criterion validity that has been tested in several fall-related psychological studies is concurrent validity that refers to “an index of the degree to which a test score is related to some criterion measure obtained at the same time (i.e., concurrently; Cohen & Swerdlik; p. I-5). One of the inconsistencies across studies can be attributed to the determination of an appropriate criterion measure, if one exists. For example, in some cases researchers have used the FES as a criterion measure (Huang, 2006; Powell & Myers), and in other cases, quality of life variables have been used as a criterion (Lachman et al., 1998).

This review of the literature revealed inconsistencies within and across studies in providing evidence of validity of fall-related psychological instruments. For example, some researchers reported examining the criterion validity of an instrument in their abstract, but indicated in the manuscript that it
was construct validation. Studies have also compared the same or similar instruments, while one study labels the evidence for validity as concurrent, and the other labels it convergent. For example, in correlating a newer instrument (i.e., ABC, SAFFE, GFFM) with the FES, some studies claim to provide evidence of the convergent validity of the instrument (Hotchkiss et al., 2004), while other studies have identified it as concurrent (empirical) validity (Huang, 2006; Powell & Myers, 1995).

Perhaps even more distressing is that the only review article on fall-related psychological measures (Jorstad et al., 2005) is not consistent in its classification of different types of validity. Part of the confusion arises as Jorstad and colleagues attempt to identify which type of validation a study provided when the study did not state they were providing evidence of validity (Jorstad et al.). Although this is not necessarily a problem in its own right, Jorstad and colleagues incorrectly referenced many types of validity as convergent when they more appropriately referred to construct validity. For example, when Li and colleagues (2002) correlated the SAFFE with the SF-12, ADL’s, physical performance, and balance measures ($r = -.19$ to $.04$), Jorstad and colleagues identified these correlations as providing evidence of the convergent validity of the SAFFE. According to the definition, convergent validity would be evidenced if these variables were measuring the same or a similar construct as the SAFFE instrument, which measures fear of falling. Clearly, health-related quality of life, activities of daily living, and physical and balance measures are not measures designed to assess fear of falling or a similar construct. Therefore, this example should more appropriately be identified as construct validity in the broad sense. This also becomes a problem and further plagues the literature because many researchers look to review articles as a “frame of reference”. Regardless of whether studies have incorrectly identified the type of validity they are claiming to report, many are not clear in indicating the methodology used to provide evidence of a certain type of validity. When the validity evidence presented is not clearly stated or is not consistent with the literature, more confusion results and it is impossible to replicate findings and determine what still needs to be investigated.
The research findings have also attempted to direct our focus to the use of one instrument over another. Unfortunately, there has been no agreement among these studies, and each recommendation has been different from the previous recommendation. Some researchers have considered the FES to be the “gold standard” fall-related psychological measure, although others are quick to call attention to its limitations. Some researchers have concluded that the best approach to handling this measurement issue is to develop a new instrument that addresses the limitations of previous instruments (FES, ABC, SAFFE, etc.). Although this appears to be a satisfactory solution to the problem, developing a new instrument only creates more confusion in the literature because now instead of choosing between two or three instruments, researchers have to choose between five or more. Further, if researchers are modifying the FES and not coming up with a unique name for their instrument (i.e., all studies calling their version the “modified FES”) or they are not referencing the questions they use, there will be inconsistencies when researchers attempt to replicate their instrumentation for future studies. More problems arise when new instruments are developed because validation studies are slow to appear, if they ever appear, to quantify the appropriateness of the new instrument for measuring the intended construct.

While studies have compared the psychometric properties of several fall-related psychological measures, they have focused primarily on the most widely used instruments (i.e., FES, ABC, and SAFFE). To determine which instrument or instruments performs the most favorably against all of the available instruments, it is imperative to know how the newer instruments compare to the older measures. In an attempt to identify a standardized, outcome data set of fall-related measures for fall prevention trials, the ProFaNE consensus recommended conceptualizing psychological consequences of falls in terms of a fall-related self-efficacy measure (Lamb et al., 2005). Because they felt that an appropriate fall-related psychological measure should be a self-efficacy-based measure with a solid theoretical foundation in the SET, they recommended using the mFES (Hill et al., 1996) as a standard against which new measures can be tested (Lamb et al.). Since the 2005 ProFaNE consensus, other
researchers have supported the use of self-efficacy measures based on the SET, and have recommended the FES and the FES-I as universal fall-related self-efficacy measures (Yardley & Kempen, 2006).

More recently, researchers have suggested the incorporation of an outcome expectancy measure as a supplement to self-efficacy measures for evaluating fall prevention interventions (Lach, 2006). Consequently, the CoF scale (Yardley & Smith, 2002) was identified as a potential outcome expectancy measure. Although the ProFaNE consensus attempted to move researchers towards using a standardized fall-related psychological measure for all fall-prevention trials, it is too soon to tell whether their recommendations will be followed. In line with the ProFaNE consensus, future research efforts need to identify a standardized outcome measure(s) for each specific fall-related psychological construct to facilitate comparisons between studies. Based on the collective results from published fall-related psychological studies, the mFES or the FES-I, pending more research support, and the ABC could be recommended to measure falls efficacy and balance confidence constructs, respectively. To date, the available evidence relating to fear of falling measures does not indicate one measure as superior to another. Although there is more evidence to support the validity of the SAFFE instrument as compared to the other fear of falling measures, it is cumbersome to administer and therefore would not be recommended for use in many situations. Alternatively, the mSAFFE could be recommended as a measure of fear of falling-related activity restriction, pending more research support. Because the instruments identified in the “other” category of fall-related measures encompass a wider range of efficacy-related constructs, an instrument from this category should be selected based on the specific goal and purpose of the intended research. As only one of these measures has been validated, more research is needed in this area. Another potential direction for future research could be to combine several questions from each of the constructs into a solitary questionnaire in which researchers could measure all fall-related psychological constructs at one time.
Based on the findings from this review, one of the next steps in the line of inquiry is to determine which of these scales is the most suitable for use in an initial assessment to identify older adults in the community who are at-risk for falls (e.g., falls risk screening). A screening situation can be the first line of defense in identifying fall-related psychological issues among independent-living older adults (Ness, Gurney, Wall, Olsen, & Boergerhoff, 2004). There is also a need to replace the single-item screening instruments with multi-item measures that more accurately capture the multidimensional nature of fall-related psychological concerns of this population. Therefore, research efforts should begin by evaluating and comparing the psychometric properties of the fall-related psychological multi-item scales for use in this particular context. Further, the instrument validation process is situation-specific and the psychometric evaluation of these scales should be directed towards determining which instrument or instruments are best-suited and most feasible for use in a preliminary falls risk-screening context.

More specifically, there is a need to evaluate and compare the reliability and validity of scales from each of the three identified categories (i.e., fear of falling, falls efficacy, and balance confidence) to determine if one scale or multiple scales are better suited to use in a falls risk screening for community-dwelling older adults. The validity of each scale should be tested by determining how the instruments correlate with (a) each other (i.e., convergent validity), (b) self-reported physical activity (i.e., construct validity), (c) HRQL (i.e., construct validity), and (d) objective measures of physical function and/or mobility (i.e., construct validity). Moreover, the construct validity of the instruments should also be tested by determining whether scores derived from any of the instruments can (a) discriminate between fallers and non-fallers, and (b) predict a “total falls risk score”, derived from a falls risk instrument (Ellis et al., 2007a; Wood et al., 2007). Additionally, psychometric evaluation of the instruments should examine whether the scales exhibit adequate internal reliability. By employing measures that can accurately characterize which fall-related psychological issues older adults face, appropriate social-cognitive intervention strategies can be used to enhance participants sense of
efficacy for falls, balance, gait, etc., while reducing fear of falling and other negative consequences of falls. In so doing, falls prevention interventions can be tailored to meet not only the physical, but also the psychological needs of the participants.
CHAPTER 3
STUDY 1: COMPARISON OF THE VALIDITY OF FOUR FALL-RELATED PSYCHOLOGICAL MEASURES IN A COMMUNITY-BASED FALLS RISK SCREENING

Falls are not only a serious health problem in aging adults, with one out of three adults over age 65 experiencing a fall each year (American Geriatrics Society [AGS], 2001), they are the leading cause of injury death among this population (Centers for Disease Control and Prevention [CDC], 2005). As a result, the health care costs associated with falls and fall-related injuries in the United States are more than 20 billion dollars per year (CDC; Stevens, Corso, Finkelstein, & Miller, 2006) and are expected to more than double by the year 2020 (Englander, Hodson, & Terregrossa, 1996). In addition to fall-related physical injuries and health care costs, falls can also trigger psychological consequences including loss of confidence, low self-efficacy, and fear (Jorstad, Hauer, Becker & Lamb, 2005). More specifically, fall-related psychological issues become problematic when they increase the risk of future falls by triggering overly protective self-imposed activity restriction, and losses in strength, mobility, physical and emotional functioning, and independence (Howland et al., 1998; Yardley & Smith, 2002). This undesirable cycle of events ultimately compromises an older adult’s ability to function in their everyday environment, seriously compromises health-related quality of life (HRQL), and becomes a major barrier to a physically active lifestyle.

Of the fall-related psychological issues, fear of falling (Tinetti, Richman, & Powell, 1990), fall-related self-efficacy or falls-efficacy (Tinetti et al.), balance confidence (Powell & Myers, 1995), and similar constructs including feared consequences of falling (Yardley & Smith, 2002) are the most widely-studied. Fear of falling is the most commonly investigated fall-related psychological construct and is also characterized as low fall-related self-efficacy for avoiding falls while performing activities of daily living (ADL; Tinetti et al.). Although fear of falling is a popular psychological dimension of falls, some researchers argue that because fear is a poor predictor of actual behavior (Bandura, 1982), measuring the presence or absence of fear of falling is not the best method for capturing the true
psychological impact of falls (Tinetti et al.). Thus, Tinetti and colleagues (1990) replaced “fear of falling” with “falls efficacy”, which is a specific, fall-related form of confidence based on the self-efficacy theory (SET; Bandura, 1977; 1986). Although falls-efficacy and fear of falling were initially thought to be identical constructs, recent research shows that falls-efficacy and fear of falling are related, but essentially different (McAuley et al., 1997; Li et al., 2002). Other constructs similar to falls efficacy are also modeled on the SET including gait efficacy (McAuley et al.), mobility efficacy (Lusardi & Smith, 1997), and balance confidence (Powell & Myers). Balance confidence is a balance-specific form of self-efficacy that refers to the confidence in one’s ability to maintain balance and remain steady when performing ADL (Powell & Myers). Apart from falls efficacy, balance confidence is the most researched of the fall-related self-efficacy constructs. Consequently, balance confidence instruments may be better at detecting changes among higher functioning older adults that are beginning to lose confidence in their balance, as compared to falls efficacy or fear of falling instruments (Filiatrault et al., 2007; Powell & Myers).

Fall-related psychological measures can also serve as important endpoints for evaluating falls prevention programs (Jorstad et al., 2005). Unfortunately, no consensus exists as to the best method of defining and measuring the fall-related psychological effects on confidence and independence. For instance, falls efficacy instruments have been used extensively to measure fear of falling (Tinetti et al., 1990), and balance confidence instruments have been used to measure fear of falling (Brouwer, Musselman, & Culham, 2004) and fall-related self-efficacy (Davison, Bond, Dawson, Steen, & Kenny, 2005; Li et al., 2002). Because distinguishing fall-related psychological constructs from one another has been problematic, the best method of defining and measuring them is not clear. Thus, there is a need to compare the measurement properties of the psychological constructs related to falling (Jorstad et al.). Additionally, to date, several fall-related psychological instruments have not been validated against measures of mobility, HRQL, or physical activity, or tested in the United States with a racially and socioeconomically diverse population (i.e., Falls Efficacy Scale-International [FES-I]; Yardley et
al., 2005; modified Survey of Activities and Fear of Falling in the Elderly [mSAFFE]; Yardley & Smith, 2002; Consequences of Falling scale [CoF]; Yardley & Smith, 2002).

One measurement property of an instrument that must be evaluated before an instrument can be used in a research setting is reliability. Reliability refers to the repeatability or consistency of an instrument across multiple observations. Validity, or the extent to which a test measures what it purports to measure, is another essential measurement property. Attaining acceptable reliability and evidence of validity of an instrument with the population of interest and in the setting in which the instrument will be used is imperative. Although previously referred to in terms of several different types (i.e., content, concurrent, convergent, discriminant, etc.), validity is now considered to be a solitary concept (i.e., construct validity) in which researchers must accumulate evidence for the construct validity of an instrument (American Educational Research Association [AERA], American Psychological Association [APA], & National Council on Measurement in Education [NCME], 1999). When there is no gold standard available to assess the concurrent validity of an instrument, evidence for construct validation can be provided by evaluating the ability of an instrument to demonstrate the expected relationships in the hypothesized direction and magnitude with related constructs (AERA, APA, & NCME, 1999) or by formulating a research-based hypothesis and testing whether an instrument can discriminate between the highest and lowest scorers on the construct (McDowell, & Newell, 1996; Streiner, & Norman, 1995).

Reliability and validity are specific to the setting and situation in which an instrument is used; therefore, it is important to test the measurement properties of instruments not only in laboratory-based settings, but also in real-world, community-based settings where falls risk factors may be evaluated. Although fall-related psychological measures have been used in different contexts (Jorstad et al., 2005), little research is available on the measurement properties of these instruments in an initial community-based screening to identify older adults who are at-risk for falls (e.g., falls risk screening). This type of community-based setting is different than those traditionally used in research studies in
that community organizations, members, and researchers are actively involved in the research process with the goal of transitioning the community organization to take over the assessments after the researchers have finished conducting their study. Moreover, falls risk screenings are an especially important setting to test these instruments because they can be used to identify independent-living older adults in the community who are at-risk for falling because of fear or low balance- or mobility-related confidence levels. Further, early identification of those who are at-risk for falls can result in the earlier implementation of interventions designed to decrease fall risk factors including reduced activity and confidence levels (Hill & Schwarz, 2004). Therefore, research efforts should be directed towards investigating the measurement properties of fall-related psychological instruments for use in a falls risk-screening context where participants are members of the community utilizing these preventative services. Further, because the instrument validation process is situation-specific, and investigators cannot tightly control every aspect of the research process in this type of setting, the psychometric evaluation of these scales should be directed towards determining which instrument or instruments are best-suited and most feasible for use in a preliminary falls risk-screening in a community-based setting.

Falls risk has typically been quantified in a community-based screening through the use of a falls risk screening instrument (Ellis et al., 2007a; 2007b; Oliver, Britton, Seed, Martin, & Hopper, 1997). These instruments identify those who are in need of further assessment and/or intervention and are based on the premise that the higher the number of risk factors, the higher the risk of falling (Tinetti, Williams, & Mayewski, 1986). Several tests that are frequently used in falls risk screenings (i.e., Functional Reach test, Timed Up and Go Test) are validated as predictors of falls risk using a falls risk screening instrument (Duncan et al., 1990; Shumway-Cook, Baldwin, Polissar, & Gruber, 1997; Shumway-Cook, Brauer, Woollacott, 2000). Although falls risk screening instruments have assessed falls risk among community-dwelling older adults, most have included only one or two individual risk factors to predict risk for falls (Perrell et al., 2001). More recently, falls risk has been quantified using
a comprehensive approach, whereby a total “overall falls risk” is calculated based on multiple risk factors (Ellis et al., 2007a, 2007b). To date, no fall-related psychological measures have been evaluated in relation to falls risk using a comprehensive falls risk screening instrument. It is important to classify older adults living in the community who experience fall-related psychological issues according to their overall risk for falls so they can be targeted for interventions that include strategies to improve fall-related psychological difficulties to reduce the likelihood of a future fall.

Therefore, the overall purpose of this investigation was to test the psychometric properties of the Falls Efficacy Scale-International (FES-I; i.e., falls-efficacy and concern about falling), Activities-specific Balance Confidence scale (ABC; i.e., balance confidence), a modified version of the Survey of Activities and Fear of Falling in the Elderly (mSAFFE; i.e., fear of falling and activity avoidance), and the Consequences of Falling scale (CoF; i.e., feared consequences of falling) in a falls risk screening context using a cross-sectional design. The specific objective of this study was to examine the reliability and validity of four fall-related psychological instruments in a community-based falls risk screening context.

It was hypothesized that scores derived from the FES-I, ABC, mSAFFE, and CoF would demonstrate (a) moderate to large correlations with each other (i.e., construct validity), and moderate correlations with (b) self-reported physical activity, (c) health-related quality of life (HRQL), and (d) an objective measure of mobility (i.e., construct validity; Jorstad et al., 2005). It was also hypothesized that scores derived from the FES-I, ABC, mSAFFE, and CoF would: (e) demonstrate evidence for internal reliability with lower confidence limits for sample Cronbach’s alpha coefficients > .70 (Fan & Thompson, 2001; McDowell & Newell, 1996; Streiner & Norman, 1995), and (f) discriminate between fallers and non-fallers (i.e., construct validity) with fallers reporting significantly higher scores on the FES-I, mSAFFE, and CoF scales and significantly lower scores on the ABC (Jorstad et al., 2005). A new research question was to determine whether scores derived from the FES-I, ABC, mSAFFE, and CoF scales would predict the total falls risk score calculated on a comprehensive falls risk screening.
instrument described by Ellis and colleagues (2007a; 2007b). The analysis for predicting total falls risk score was exploratory, and therefore, it was not hypothesized which instrument(s) would explain the most variance.

**Method**

**Participants**

Participants were 189 older adults recruited through local community organizations including YMCAs, retirement communities, and Council on Aging offices who volunteered for a falls risk screening. Attempts were made to include a representative sample of participants that was reflective of the local demographic composition with regards to race, sex, and age of four surrounding Louisiana parishes where falls risk screenings were conducted (i.e., East Baton Rouge, West Baton Rouge, Washington, and Ascension parishes; see Table 3.1). All participants were required to sign an informed consent approved by the LSU Institutional Review Board. Exclusion criteria included: (a) age younger than 50 years, (b) wheelchair bound, (c) self-reported severe dementia or other severe neurological impairment, and (d) living outside of a 100-mile radius of East Baton Rouge Parish, LA.

**Table 3.1. Target Demographic Profile based on 2000 Louisiana Census Data**

<table>
<thead>
<tr>
<th>Age</th>
<th>50-59</th>
<th>60-69</th>
<th>70-79</th>
<th>80+</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>47.8%</td>
<td>45.5%</td>
<td>41.2%</td>
<td>31.8%</td>
<td>44.3%</td>
</tr>
<tr>
<td>Female</td>
<td>52.2%</td>
<td>54.5%</td>
<td>58.8%</td>
<td>68.2%</td>
<td>55.7%</td>
</tr>
<tr>
<td><strong>Race</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>68.8%</td>
<td>71.1%</td>
<td>75.2%</td>
<td>75.7%</td>
<td>71.3%</td>
</tr>
<tr>
<td>African-American</td>
<td>29.5%</td>
<td>27.6%</td>
<td>24.1%</td>
<td>23.9%</td>
<td>27.4%</td>
</tr>
<tr>
<td>American Indian</td>
<td>0.2%</td>
<td>0.2%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.2%</td>
</tr>
<tr>
<td>Asian</td>
<td>1.5%</td>
<td>1.1%</td>
<td>0.6%</td>
<td>0.3%</td>
<td>1.1%</td>
</tr>
</tbody>
</table>
Procedure

Using a cross-sectional design, data was collected as part of a community-based falls risk screening that lasted approximately 3 hours. Participants were asked to sign up for a 20-minute testing block, and they were asked to bring a completed home safety survey and list of current medications to the screening. Participants visited the following four stations, each with trained testers: (a) participant check-in, consent, demographics, and home safety, (b) medical history and medications, (c) mobility and balance, and (d) vision.

After participants visited all four stations, a total falls risk score was calculated using data obtained from participants’ medical history questionnaire, medications, home safety, and tests of mobility, balance, and visual acuity (Ellis et al., 2007a; 2007b). During the time period between stations and the time required for calculating the total falls risk score, the participants responded to a physical activity questionnaire and four fall-related psychological questionnaires in a structured interview format. Fall-related psychological questionnaires were administered to each participant in a counterbalanced order by the same interviewer (i.e., 24 possible orderings of the four questionnaires were used with each questionnaire appearing first, second, third, and fourth an equal number of times). After a total falls risk score was generated, testers reviewed the score and several brief educational points regarding the reduction of falls risks with each participant.

Within 14 days of the falls risk screening, the primary investigator contacted participants by phone to administer the MOS 36-Item Short-Form Health Survey (SF-36). The average length of time between the falls risk screenings and subsequent phone interview for all participants was approximately 6.5 days ($SD = 4$ days; $N = 135$). The SF-36 was administered over the phone because it was too time consuming to administer during the screening. Administration of the questionnaire by phone took approximately 20 minutes. To increase the opportunity to obtain complete data, participants were reimbursed $15.00 for completing the screening and the additional data collection by phone.
Measures

Demographic Information

A questionnaire developed by the researchers was used to gather demographic information including age, race, sex, marital status, education level, and household income category.

Falls Risk Screening Instrument

To assess falls risk, a comprehensive falls risk screening instrument was used (Ellis et al., 2007a; 2007b). The screening instrument assessed falls risk using five subscales including history of falls, medication management, vision, physical functioning (i.e., mobility and balance), and home environment. The five domains were averaged to produce a total falls risk score. All scores from the instrument ranged from 0 to 100, with higher scores representing high risk for falls.

History Subscale. Several questions regarding age and fall history were used to calculate a history subscale score. Specifically, participants responded to two history of falls questions (i.e., “Have you fallen in the past 3 years?” yes/no; “Have you fallen in the past 12 months?” yes/no). In addition, data regarding the use of an assistive device (e.g., “Do you use any walking aids?” yes/no) and the presence of arthritis (e.g., “Do you have arthritis?” yes/no) was collected. Falls risk was higher for those who reported an age above 80 years, had a history of falls, used an assistive device, and/or had arthritis.

Medications Subscale. Participants were asked to provide a list of their current medications, and they were asked about any side effects they may have experienced. In addition, participants were interviewed regarding their use of multiple pharmacists and frequency of pharmacy consults. Based on this information, a medications risk score was calculated. Falls risk was higher for those who reported taking more than four prescription medications, experiencing medication side effects, not filling prescriptions at the same pharmacy, and/or not having a pharmacist review their current medications.

Physical Subscale. The physical subscale incorporated scores from a mobility test (i.e., the Expanded Timed Get-Up-and-Go Test [ETGUG]; Wall, Bell, Campbell, & Davis, 2000) and a balance test (i.e., Functional Reach Test [FR]; Duncan, Weiner, Chandler, & Studenski, 1990). The ETGUG
test is a validated mobility test that has demonstrated good sensitivity for identifying multiple fallers (Dite & Temple, 2002). The ETGUG test required the participant to rise from a seated position in a chair that has no arms, walk 10 meters, and return to their original seated position in the chair from which they started. The score for the test was recorded as the total time (in seconds) taken to complete the task. Falls risk was higher for those who took more time to complete the test (i.e., higher score = higher risk).

The FR test is a validated balance test that is a predictor of falls risk (Duncan et al., 1990). It required the participant to stand with his or her feet together, and with their dominant arm flexed at a 90-degree angle to the frontal plane (i.e., reaching forward), to a position that was horizontal to the floor, with their palm facing down. From this position the participant was asked to reach as far forward as possible along a measurement tape that was fixed to a wall without stepping forward. The score for the FR test was recorded as the distance between the starting position and final position of the middle finger tip of the extended arm (in inches). Falls risk was higher for those who recorded a smaller distance (i.e., lower score = higher risk).

Vision Subscale. The screening instrument included questions regarding frequency of optometry consults, use of prescription lenses, and a simple test of visual acuity. Visual acuity was assessed using a Snellen eye chart read from a distance of six meters. The participants were asked to read the chart using prescriptive lenses when appropriate. Falls risk was higher for those who had not had a vision test in the last 12 months, did not wear corrective lenses as prescribed, and/or had poor visual acuity (i.e., Snellen eye scores greater than 20/20).

Environment Subscale. An environmental checklist with 12 questions about potential falls risks in the home was used to assess home safety (National Center for Injury Prevention and Control and Home Safety Council [2004] checklist). The participants were asked to complete this prior to the screening period; however, they were given the option to complete one at the screening if they forgot. This information was scored based on the total number of items checked “no” (e.g., “Do you have grab
bars in your bath?” yes/no; “Do you keep floors clean by promptly wiping up grease, water, and other spills?” yes/no). Falls risk was higher for those that checked more “no” responses.

Fall-related Psychological Measures

Four fall-related psychological constructs were assessed including falls efficacy (i.e., FES-I), fear of falling (i.e., mSAFFE), balance confidence (i.e., ABC), and consequences of falling (i.e., CoF). These fall-related psychological instruments were selected for this investigation after reviewing the measurement properties of all available fall-related psychological instruments designed for use among independent-living older adults (Chapter 2; Moore & Ellis, 2008). Specifically, the FES-I, mSAFFE, and CoF scales were selected because in addition to best capturing the respective constructs of interest, they had yet to be validated in the U.S. with a racially and socioeconomically diverse population or against measures of mobility, HRQL, or physical activity. The ABC was selected because it demonstrated the best psychometric properties out of all instruments designed to assess balance confidence.

Falls Efficacy Scale- International (FES-I). The FES-I (Yardley, Beyer, Hauer, Kempen, Piot-Ziegler & Todd, 2005), designed for use in a range of cultural contexts, measured confidence for avoiding a fall and level of concern about falling. The FES-I is a newer version of the FES scale that can be administered in a structured interview or self-report format and expands upon the original 10-item FES by incorporating cross-culturally relevant terms including 6 new physical and social activities such as walking on slippery or uneven surfaces, visiting friends or relatives, and going to social events. The 16 FES-I items are rated on a 4-point scale (i.e., 1 = “not at all concerned” to 4 = “very concerned”) and are summed to produce a total FES-I score that ranges from 16 to 64 (Yardley et al.). Total FES-I scores are operationalized so that higher scores reflect greater concern about falling. Translations of the FES-I are available in several languages (http://www.profane.eu.org/eu_map/FESI_by_country.php), and evidence of the reliability and validity
of the FES-I has been established across different samples in several countries (Kempen et al., 2007; Yardley et al.). Moreover, the FES-I has recently been recommended for use in falls prevention interventions to facilitate comparison of results (Zijlstra et al., 2007b).

**Activities-specific Balance Confidence (ABC) Scale.** The ABC scale (Powell & Myers, 1995), also developed to address several limitations of the original FES (Tinetti et al., 1990), assessed balance-related confidence levels while performing 16 ADL. The ABC, which can be used in an interview or self-administered format, was developed to include a wider variety of activities that makes it more sensitive to detecting loss of confidence among lower- and higher-functioning individuals (McAuley et al., 1997; Powell & Myers). The 16 ABC items are rated on a 0 to 100% scale (i.e., 0% = no confidence to 100% = complete confidence in performing the specified activity) and are averaged to produce a total ABC score that ranges from 0 to 100 (Powell & Myers). Total ABC scores are operationalized so that higher scores reflect higher balance confidence. Evidence of the validity and reliability of the ABC among independent-living older adults has been documented (Hotchkiss et al., 2004; Kressig et al., 2001; Li et al., 2002; Myers et al., 1996; Myers, Fletcher, Myers & Sherk, 1998; Powell & Myers; Talley, Wyman, & Gross, 2008).

**Modified Survey of Activities and Fear of falling in the Elderly (mSAFFE).** The mSAFFE (Yardley & Smith, 2002) is a modified, self-administered version of the SAFFE instrument (Lachman et al., 1998) that collected information about fear of falling and activity restriction. The 17 mSAFFE items that quantify the extent an activity would be avoided due to a fear of falling are rated on a 3-point Likert scale (i.e., 1 = “never avoid”, 2 = “sometimes avoid”, 3 = “always avoid”) and are summed to produce a total mSAFFE score that ranges from 17 to 51 (Yardley & Smith). Total mSAFFE scores are operationalized so that higher scores reflect higher levels of activity restriction. Evidence of the validity of the mSAFFE has been demonstrated by correlating mSAFFE scores with general physical frailty ($r = -.49, p < .001$), Functional Reach scores ($r = -.36, p < .001$), and history of
falls \( r = .33, p < .001; \) Delbaere et al., 2004). Further, Yardley and Smith (2002) provided evidence of the internal consistency and test-retest reliability of the mSAFFE.

**Consequences of Falling Scale (CoF)**. The CoF collected information about the perceived consequences of falling. The CoF is a 12-item scale with two subscales (e.g., Loss of Functional Independence [CoF-LFI] and Damage to Identity [CoF-DI]) that was developed by Yardley and Smith (2002) to assess four types of fear including fear of physical injury, long term functional incapacity, subjective anxiety, and social discomfort. The 12 CoF items are scored based on the extent to which participants agree or disagree with the statement “I think that if I fall over I will…” using a 4-point Likert scale (i.e., 1 = “disagree strongly” to 4 = “strongly agree”). Scores from the individual items are summed to produce a total CoF score that ranges from 12 to 48 (Yardley & Smith), with total CoF scores operationalized so that higher scores reflect greater levels of concern. The authors provided evidence of the reliability of the CoF (Yardley & Smith) and found that the CoF-LFI \( \beta = .21, p < .001 \), and CoF-DI \( \beta = .16, p < .01 \) subscales were longitudinal predictors (i.e., 6-months) of activity avoidance (Yardley & Smith).

**Physical Activity Measure**

**Physical Activity Scale for the Elderly (PASE)**. The PASE (Washburn, Smith, Jette, & Janney, 1993) is a measure of self-reported physical activity that assessed participant activity levels over the past seven days. The PASE collected information on the frequency (days/week) and duration (hours) of participant’s involvement in various strength and endurance, sport, occupational, family care, household, yard work, and gardening activities. The PASE yields a unitless total score that ranges from 0 to 400 or more, with higher scores reflecting higher levels of physical activity (Washburn et al.). Evidence of validity and reliability of the PASE has been demonstrated among independent-living older adults (Moore et al., 2008; Schuit, Schouten, Westerterp, & Saris, 1997; Washburn & Ficker, 1999; Washburn, McAuley, Katula, Mihalko, & Boileau, 1999; Washburn et al.).
Health-related Quality of Life (HRQL) Measure

MOS 36-Item Short-Form Health Survey (SF-36v2). The MOS-SF 36 (McHorney, Kosinski, & Ware, 1994) assessed HRQL. The SF-36 requires participants to report his or her perceptions of their level of functioning across eight domains (i.e., subscales) including physical function (PF), role physical (RP), bodily pain (BP), general health (GH), vitality (VT), social function (SF), mental health (MH), and role emotional (RE), as well as physical (PCS) and mental health (MCS) summary scores. The SF-36 subscale and summary scores are transformed to range from 0 to 100 with higher scores representing better perceptions of health and functioning (i.e., HRQL). Evidence for the validity and reliability of the SF-36 among independent-living older adults has been established (Hayward, Garratt, & Fitzpatrick, 2006; Lyons, Perry, & Littlepage, 1994; Walters, Munro, & Brazier, 2001). The SF-36 is a copyrighted instrument. Please visit qualitymetric.com for information about obtaining a license.

Statistical Analyses

The analyses for study one included four separate regression models, each with one predictor (i.e., 4 fall-related psychological measures); therefore, a sample size of approximately 115 was required to achieve a power of 80% and a moderate effect size of $f^2 = .15$ at an alpha level of .0125 after a Bonferroni adjustment (i.e., $\alpha = .05/4$ predictors = .0125; Cohen, 1992). Further, based on a 50% attrition rate (Marcus & Telesky, 1983) that accounted for potential participant nonresponses to data collection by phone and potentially unusable data due to complications occurring after the screening (i.e., participant experienced a fall or an event that could have potentially affected HRQL between the time of the screening and the phone interview), the target sample size for this study was 230 participants (i.e., 115 / .50 = 230).

Before conducting analyses, tests for normality and univariate and multivariate outliers were conducted. Demographic variables were summarized using frequencies, means, and standard deviations. Further, multivariate analyses of variance (MANOVA) with Bonferroni adjustments for
alpha were used to determine group differences in scores for the fall-related psychological measures based on age (i.e., 50-64 vs. 65 +), gender, race, income, education, and facility. To facilitate a more meaningful comparison between facilities, facilities were categorized as either majority African-American or majority Caucasian based on the racial composition of the participants (i.e., > 50% of participants were African-American or Caucasian). In addition, before running the correlational and regression analyses, ANOVAs with Bonferroni adjustments for alpha were run to determine whether significant differences were present for physical activity, HRQL, mobility, and total falls risk scores by any of the demographic variables. To test hypothesis (a), Pearson correlation coefficient and 95% confidence intervals (Denton, Durning, & Hemmer, 2004) were used to establish validity evidence across the FES-I, ABC, mSAFFE, and CoF instruments. Further, the construct validity of the FES-I, ABC, mSAFFE, and CoF was evaluated in three models against (b) self-report physical activity (i.e., PASE), (c) HRQL (i.e., SF-36), and (d) a measure of mobility (i.e., ETGUG) using Pearson correlation coefficient and 95% confidence intervals. Finally, the statistical analysis for hypothesis (e) involved assessing the internal consistency of the FES-I, ABC, mSAFFE, and CoF instruments by constructing lower confidence limits (LCL) for Cronbach’s alpha to determine if they were greater than the hypothesized population Cronbach’s alpha value of .70 (Fan & Thompson, 2001). To test hypothesis (f), the construct validity of the fall-related psychological instruments was evaluated using four ANOVA models with Bonferroni corrections for alpha to discriminate FES-I, ABC, mSAFFE, and CoF scores between fallers (i.e., fallen in previous 12 months) and non-fallers (i.e., not fallen in previous 12 months). Effect sizes (e.g., Cohen’s $d$), observed power, and 95% confidence intervals (CI) were also calculated. Finally, to test the new research question, the construct validity of the FES-I, ABC, mSAFFE, and CoF instruments with the total falls risk score was evaluated using separate regression analyses for each instrument with a Bonferroni adjustment for alpha (i.e., $\alpha = .05/4 = .0125$).

Correlations between .10-.29 were classified as small, correlations between .30-.49 were classified as moderate, and correlations .50 and greater were considered large (Cohen, 1988; 1992).
Effect size thresholds of $d = .2$, .5, and .8 were considered to be small, moderate, and large effects, respectively (Cohen, 1988), and the proportion of variance in the dependent variable explained by the independent variable (i.e., partial eta squared) was reported with thresholds of .01, .06 and .14 for small, moderate and large explained variances, respectively (Cohen, 1988). Statistical calculations were considered significant at alpha level of $p < .05$ unless indicated otherwise (i.e., Bonferroni adjustment). Statistical calculations were performed using SPSS.

**Results**

One-hundred eighty-nine older adults between the ages of 51 and 95 years ($M$ age = 74.1 yr, $SD$ = 9.5) from nine community organizations ($n$= 6 “majority Caucasian” facilities with > 50% Caucasian participants and $n$ = 3 “majority African American” facilities with > 50% African American participants) participated in the falls risk screenings. Of the 189 participants, 9 participants were missing the PASE questionnaire and 45 did not complete the additional data collection by phone. This left 135 participants with complete data from the screening and the phone interview (135/189= 71.4 % response rate; see Table 3.2).

**Table 3.2. Reasons for Missing Phone Interview Data**

<table>
<thead>
<tr>
<th>Reason</th>
<th>$n$</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Could not be reached by phone/unavailable</td>
<td>20</td>
<td>44.44</td>
</tr>
<tr>
<td>No available phone #</td>
<td>7</td>
<td>15.56</td>
</tr>
<tr>
<td>Refused the phone interview</td>
<td>6</td>
<td>13.33</td>
</tr>
<tr>
<td>Too busy</td>
<td>4</td>
<td>8.89</td>
</tr>
<tr>
<td>Deaf or hearing problem</td>
<td>3</td>
<td>6.67</td>
</tr>
<tr>
<td>Did not consent to phone interview</td>
<td>2</td>
<td>4.44</td>
</tr>
<tr>
<td>Hung up on interviewer more than one time</td>
<td>1</td>
<td>2.22</td>
</tr>
<tr>
<td>Fell after the screening, before phone interview</td>
<td>1</td>
<td>2.22</td>
</tr>
<tr>
<td>Had surgery after screening, before phone interview</td>
<td>1</td>
<td>2.22</td>
</tr>
</tbody>
</table>
Two of the 135 participants were identified as univariate outliers and were excluded from the analyses. Thus, the final sample included 133 participants ($M$ age = 74.4 yr, $SD = 9.4$; see Table 3.3). There were no significant demographic differences between the excluded participants ($n = 56$) and the included participants ($n = 133$), Wilks’ Lambda = .99, $F (6, 149) = .38, p = .90, \eta^2_p = .02$, observed power = .16, and an examination of the data on the final 133 participants indicated that all outcome measures were approximately normally distributed (Curran, West, & Finch, 1997). Of the 133 participants, 39.8% reported experiencing a fall in the past 12 months, and 54.9% reported having fallen in the past 3 years. Additional participant characteristics are reported in Table 3.4.

For the demographic variables, MANOVA indicated no significant group differences in fall-related psychological scores by age, Wilks’ Lambda = .97, $F (4, 128) = 1.10, p = .36, \eta^2_p = .03$, observed power = .34, gender, Wilks’ Lambda = .96, $F (4, 128) = 1.46, p = .22, \eta^2_p = .04$, observed power = .44, race, Wilks’ Lambda = .95, $F (4, 126) = 1.57, p = .19, \eta^2_p = .05$, observed power = .47, income, Wilk’s Lambda = .92, $F (4, 109) = 2.29, p = .06, \eta^2_p = .08$, observed power = .65, education, Wilks’ Lambda = .91, $F (4, 126) = 3.14, p = .02, \eta^2_p = .09$, observed power = .81, or facility, Wilks’ Lambda = .94, $F (4, 128) = 2.16, p = .08, \eta^2_p = .06$, observed power = .62 (see Table 3.5).

When testing whether any of the demographic variables had a significant effect on the relationship between physical activity, HRQL (MCS or PCS), mobility, or total falls risk scores, differences were observed only for the PASE by age, $F (1, 130) = 22.9, p = .000, \eta^2_p = .15$, observed power = .99. Consequently, partial correlations controlling for age were used to test hypothesis (b). None of the other demographic variables were included in any of the correlation or regression models. Specifically, separate ANOVAs revealed no differences for the PASE by gender, $F (1, 130) = 2.7, p = .10, \eta^2_p = .02$, observed power = .38, race, $F (1, 130) = .60, p = .44, \eta^2_p = .01$, observed power = .12, income, $F (1, 110) = 1.78, p = .19, \eta^2_p = .02$, observed power = .26, education, $F (1, 127) = .31, p = .58, \eta^2_p = .00$, observed power = .09, or facility, $F (1, 130) = 1.70, p = .20, \eta^2_p = .01$, observed power = .25. For the SF-36, no differences were observed for the MCS by age, $F (1, 132) = 1.92, p = .17, \eta^2_p = .01$,
Table 3.3. Frequencies of Participant Characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50 – 64 years</td>
<td>20</td>
<td>15.0</td>
</tr>
<tr>
<td>65 years +</td>
<td>113</td>
<td>85.0</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>30</td>
<td>22.6</td>
</tr>
<tr>
<td>Female</td>
<td>103</td>
<td>77.4</td>
</tr>
<tr>
<td><strong>Marital Status</strong></td>
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<td></td>
</tr>
<tr>
<td>Single, never married</td>
<td>10</td>
<td>7.5</td>
</tr>
<tr>
<td>Married</td>
<td>52</td>
<td>39.1</td>
</tr>
<tr>
<td>Widowed</td>
<td>53</td>
<td>39.8</td>
</tr>
<tr>
<td>Divorced/ Separated</td>
<td>11</td>
<td>8.3</td>
</tr>
<tr>
<td>Did not answer</td>
<td>7</td>
<td>5.3</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤ High School</td>
<td>63</td>
<td>47.4</td>
</tr>
<tr>
<td>&gt; High School</td>
<td>68</td>
<td>51.1</td>
</tr>
<tr>
<td>Did not answer</td>
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<td>1.5</td>
</tr>
<tr>
<td><strong>Annual income</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤ $20,000</td>
<td>61</td>
<td>45.9</td>
</tr>
<tr>
<td>&gt; $20,000</td>
<td>53</td>
<td>39.8</td>
</tr>
<tr>
<td>Did not answer</td>
<td>19</td>
<td>14.3</td>
</tr>
<tr>
<td><strong>Race</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caucasian, Non-Hispanic</td>
<td>70</td>
<td>52.6</td>
</tr>
<tr>
<td>Black, African American, Non-Hispanic</td>
<td>61</td>
<td>45.9</td>
</tr>
<tr>
<td>Did not answer</td>
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<td>1.5</td>
</tr>
<tr>
<td><strong>Facility</strong></td>
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<td></td>
</tr>
<tr>
<td>Caucasian facility</td>
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<td>73.7</td>
</tr>
<tr>
<td>African American facility</td>
<td>35</td>
<td>26.3</td>
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</table>
Table 3.4. Sample size (N), Minimum (min), Maximum (max), Mean (M), and Standard Deviation (SD) for Falls Risk, Health-related Quality of Life, Physical Activity, and Mobility Scores

<table>
<thead>
<tr>
<th>Measure</th>
<th>Subscales/Domains</th>
<th>N</th>
<th>min</th>
<th>max</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Falls Risk Screening</td>
<td>History Risk Score</td>
<td>133</td>
<td>6.8</td>
<td>92.5</td>
<td>44.5</td>
<td>23.5</td>
</tr>
<tr>
<td>Instrument</td>
<td>Physical Risk Score</td>
<td>133</td>
<td>14.6</td>
<td>85.0</td>
<td>45.1</td>
<td>14.0</td>
</tr>
<tr>
<td></td>
<td>Medicine Risk Score</td>
<td>133</td>
<td>11.6</td>
<td>98.9</td>
<td>48.1</td>
<td>25.3</td>
</tr>
<tr>
<td></td>
<td>Vision Risk Score</td>
<td>133</td>
<td>7.9</td>
<td>98.9</td>
<td>26.7</td>
<td>18.0</td>
</tr>
<tr>
<td></td>
<td>Environment Risk Score</td>
<td>133</td>
<td>1.5</td>
<td>76.0</td>
<td>28.1</td>
<td>18.4</td>
</tr>
<tr>
<td></td>
<td>Total Fall Risk Score</td>
<td>133</td>
<td>13.9</td>
<td>69.8</td>
<td>38.5</td>
<td>9.9</td>
</tr>
<tr>
<td>SF-36</td>
<td>Physical Function (PF)</td>
<td>133</td>
<td>5.0</td>
<td>100.0</td>
<td>67.7</td>
<td>26.5</td>
</tr>
<tr>
<td></td>
<td>Role Physical (RP)</td>
<td>133</td>
<td>0.0</td>
<td>100.0</td>
<td>75.8</td>
<td>23.3</td>
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<tr>
<td></td>
<td>Bodily Pain (BP)</td>
<td>133</td>
<td>0.0</td>
<td>100.0</td>
<td>66.3</td>
<td>22.8</td>
</tr>
<tr>
<td></td>
<td>General Health (GH)</td>
<td>133</td>
<td>10.0</td>
<td>100.0</td>
<td>64.8</td>
<td>21.7</td>
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<tr>
<td></td>
<td>Vitality (VT)</td>
<td>133</td>
<td>12.5</td>
<td>100.0</td>
<td>64.2</td>
<td>18.3</td>
</tr>
<tr>
<td></td>
<td>Social Function (SF)</td>
<td>133</td>
<td>12.5</td>
<td>100.0</td>
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<td>17.9</td>
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<td>Role Emotional (RE)</td>
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<td>100.0</td>
<td>88.9</td>
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<td>Mental Health (MH)</td>
<td>133</td>
<td>20.0</td>
<td>100.0</td>
<td>82.7</td>
<td>15.9</td>
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<tr>
<td></td>
<td>Physical Composite Score (PCS)</td>
<td>133</td>
<td>15.7</td>
<td>58.8</td>
<td>43.8</td>
<td>9.5</td>
</tr>
<tr>
<td></td>
<td>Mental Composite Score (MCS)</td>
<td>133</td>
<td>31.9</td>
<td>68.9</td>
<td>56.0</td>
<td>8.0</td>
</tr>
<tr>
<td></td>
<td>Physical Activity Scale for the Elderly (PASE)</td>
<td>133</td>
<td>0.0</td>
<td>378.1</td>
<td>100.3</td>
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<td></td>
<td>Expanded Timed Get-Up-and-Go Test (ETGUG)</td>
<td>133</td>
<td>9.4</td>
<td>60.0</td>
<td>23.0</td>
<td>9.5</td>
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Table 3.5. Mean (M) and Standard Deviation (SD) Scores for Fall-related Psychological Instruments

<table>
<thead>
<tr>
<th>Age</th>
<th>FES-I</th>
<th>ABC</th>
<th>mSAFFE</th>
<th>CoF</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>50 – 64</td>
<td>32.8</td>
<td>12.6</td>
<td>70.0</td>
<td>24.6</td>
</tr>
<tr>
<td>65 +</td>
<td>28.5</td>
<td>10.0</td>
<td>75.5</td>
<td>18.9</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Gender</th>
<th>FES-I</th>
<th>ABC</th>
<th>mSAFFE</th>
<th>CoF</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Male</td>
<td>27.3</td>
<td>8.6</td>
<td>81.4</td>
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<tr>
<td>Female</td>
<td>29.7</td>
<td>11.0</td>
<td>72.7</td>
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<table>
<thead>
<tr>
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<th>FES-I</th>
<th>ABC</th>
<th>mSAFFE</th>
<th>CoF</th>
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<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Caucasian</td>
<td>27.4</td>
<td>9.4</td>
<td>76.8</td>
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</tr>
<tr>
<td>African American</td>
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<td>11.2</td>
<td>73.3</td>
<td>19.9</td>
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<table>
<thead>
<tr>
<th>Income</th>
<th>FES-I</th>
<th>ABC</th>
<th>mSAFFE</th>
<th>CoF</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>≤ $20,000</td>
<td>31.3</td>
<td>11.7</td>
<td>69.5</td>
<td>22.0</td>
</tr>
<tr>
<td>&gt; $20,000</td>
<td>27.0</td>
<td>8.6</td>
<td>79.7</td>
<td>16.3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Education</th>
<th>FES-I</th>
<th>ABC</th>
<th>mSAFFE</th>
<th>CoF</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>≤ HS</td>
<td>29.7</td>
<td>11.0</td>
<td>70.5</td>
<td>22.2</td>
</tr>
<tr>
<td>&gt; HS</td>
<td>28.8</td>
<td>10.2</td>
<td>78.1</td>
<td>16.9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Facility</th>
<th>FES-I</th>
<th>ABC</th>
<th>mSAFFE</th>
<th>CoF</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Caucasian</td>
<td>28.7</td>
<td>10.4</td>
<td>73.2</td>
<td>20.9</td>
</tr>
<tr>
<td>African American</td>
<td>30.3</td>
<td>10.8</td>
<td>78.6</td>
<td>16.3</td>
</tr>
</tbody>
</table>

Note. FES-I = Falls-Efficacy Scale-International; ABC = Activities-Specific Balance Confidence Scale; mSAFFE = Modified Survey of Activities and Fear of Falling in the Elderly Scale; CoF = Consequences of Falling Scale; HS = high school
observed power = .28, gender, \( F(1, 132) = .22, p = .64, \eta^2_p = .00 \), observed power = .08, race, \( F(1, 132) = .77, p = .38, \eta^2_p = .01 \), observed power = .14, income, \( F(1, 113) = 5.13, p = .03, \eta^2_p = .04 \), observed power = .61, education, \( F(1, 130) = 1.55, p = .22, \eta^2_p = .01 \), observed power = .24, or facility, \( F(1, 132) = 1.38, p = .24, \eta^2_p = .01 \), observed power = .22, or for the PCS by age, \( F(1, 132) = .46, p = .50, \eta^2_p = .00 \), observed power = .10, gender, \( F(1, 132) = .24, p = .63, \eta^2_p = .00 \), observed power = .08, race, \( F(1, 132) = .77, p = .38, \eta^2_p = .01 \), observed power = .14, income, \( F(1, 113) = 2.23, p = .14, \eta^2_p = .02 \), observed power = .32, education, \( F(1, 130) = 3.89, p = .05, \eta^2_p = .03 \), observed power = .50, or facility, \( F(1, 132) = .26, p = .61, \eta^2_p = .00 \), observed power = .08.

For the ETGUG, no differences were observed by age, \( F(1, 132) = 2.38, p = .13, \eta^2_p = .02 \), observed power = .33, gender, \( F(1, 132) = 3.84, p = .05, \eta^2_p = .03 \), observed power = .49, race, \( F(1, 132) = .35, p = .55, \eta^2_p = .00 \), observed power = .09, income, \( F(1, 113) = 1.85, p = .18, \eta^2_p = .02 \), observed power = .27, education, \( F(1, 130) = 3.17, p = .08, \eta^2_p = .02 \), observed power = .42, or facility, \( F(1, 132) = .35, p = .56, \eta^2_p = .00 \), observed power = .09. Finally, ANOVAs with Bonferroni adjustments revealed no difference in total falls risk scores by age, \( F(1, 132) = 1.54, p = .22, \eta^2_p = .01 \), observed power = .23, gender, \( F(1, 132) = .10, p = .76, \eta^2_p = .00 \), observed power = .06, race, \( F(1, 132) = .03, p = .86, \eta^2_p = .00 \), observed power = .05, income, \( F(1, 113) = .50, p = .48, \eta^2_p = .00 \), observed power = .11, education, \( F(1, 130) = .26, p = .61, \eta^2_p = .00 \), observed power = .08, or facility, \( F(1, 132) = .30, p = .58, \eta^2_p = .00 \), observed power = .09.

The four fall-related psychological instruments demonstrated significant moderate to large correlations with each other (hypothesis a), ranging from \( r = .40 \) (95% CI = .25 to .53, \( p < .01; \) CoF with mSAFFE) to \( r = -.68 \) (95% CI = -.76 to -.58, \( p < .01; \) ABC with FES-I; see Table 3.6).

For hypothesis (b), partial correlations controlling for age showed that three of the four fall-related psychological instruments were significantly associated with physical activity. Two of the four instruments yielded significant moderate correlations with the PASE (ABC: \( r = .34, 95\% \text{ CI} = .18 \) to .48, \( p < .01; \) mSAFFE: \( r = -.32, 95\% \text{ CI} = -.46 \) to -.16, \( p < .01 \)), and the other two instruments yielded
Table 3.6. Correlations for FES-I, ABC, mSAFFE , and CoF Scales

<table>
<thead>
<tr>
<th>Scale</th>
<th>FES-I</th>
<th>ABC</th>
<th>mSAFFE</th>
<th>CoF</th>
</tr>
</thead>
<tbody>
<tr>
<td>FES-I</td>
<td>-</td>
<td>-.68**</td>
<td>.66**</td>
<td>.51**</td>
</tr>
<tr>
<td>ABC</td>
<td>-</td>
<td>-</td>
<td>-.68**</td>
<td>-.56**</td>
</tr>
<tr>
<td>mSAFFE</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>.40**</td>
</tr>
</tbody>
</table>

**p < .01; *p < .05.

small correlations (FES-I: $r = -.21$, 95% CI = -.37 to -.04, $p = .02$; CoF: $r = -.17$, 95% CI = -.33 to .00, $p = .06$). For hypothesis (c), the four fall-related psychological measures demonstrated significant small and moderate correlations with the eight SF-36 subscales, as well as with the physical (PCS) and mental (MCS) composite scores, ranging from $r = -.19$ (95% CI = -.35 to -.02, $p < .05$; mSAFFE and PF) to $r = .51$ (95% CI = .37 to .63, $p < .01$; ABC and PF; see Table 3.7). The CoF and the FES-I yielded the only correlations that were not significant at the $p < .01$ level (i.e., CoF and RE: $r = -.20$, $p = .02$; CoF and MH: $r = -.20$, $p = .02$; CoF and MCS: $r = -.19$, $p = .03$; FES-I and GH: $r = -.21$, $p = .02$).

The analyses for hypothesis (d) revealed that three of the four fall-related psychological scales yielded significant moderate correlations with ETGUG scores (ABC: $r = -.45$, 95% CI = -.58 to -.30, $p < .01$; mSAFFE: $r = .41$, 95% CI = .26 to .54, $p < .01$; CoF: $r = .34$, 95% CI = .18 to .48, $p < .01$). Although the correlation between the FES-I and ETGUG scores was also significant, it was small ($r = .28$, 95% CI = .12 to .43, $p < .01$). Further, results for hypothesis (e) showed that the four fall-related psychological scales exhibited good internal consistency reliability with lower confidence limits above the .70 threshold (ABC: $\alpha = .93$, LCL = .92; FES-I: $\alpha = .94$, LCL = .93; mSAFFE: $\alpha = .86$, LCL = .83; CoF: $\alpha = .84$, LCL = .81).
Table 3.7. Correlations for FES-I, ABC, mSAFFE, and CoF with SF-36 Subscales

<table>
<thead>
<tr>
<th>Survey</th>
<th>PF</th>
<th>RP</th>
<th>BP</th>
<th>GH</th>
<th>VT</th>
<th>SF</th>
<th>RE</th>
<th>MH</th>
<th>PCS</th>
<th>MCS</th>
</tr>
</thead>
<tbody>
<tr>
<td>FES-I</td>
<td>-.37**</td>
<td>-.44**</td>
<td>-.32**</td>
<td>-.21*</td>
<td>-.38**</td>
<td>-.40**</td>
<td>-.30**</td>
<td>-.30**</td>
<td>-.37**</td>
<td>-.31**</td>
</tr>
<tr>
<td>ABC</td>
<td>.51**</td>
<td>.40**</td>
<td>.42**</td>
<td>.33**</td>
<td>.49**</td>
<td>.36**</td>
<td>.36**</td>
<td>.43**</td>
<td>.46**</td>
<td>.38**</td>
</tr>
<tr>
<td>mSAFFE</td>
<td>-.49**</td>
<td>-.39**</td>
<td>-.32**</td>
<td>-.24**</td>
<td>-.41**</td>
<td>-.34**</td>
<td>-.24**</td>
<td>-.28**</td>
<td>-.44**</td>
<td>-.24**</td>
</tr>
<tr>
<td>CoF</td>
<td>-.43**</td>
<td>-.28**</td>
<td>-.24**</td>
<td>-.28**</td>
<td>-.38**</td>
<td>-.30**</td>
<td>-.20*</td>
<td>-.20*</td>
<td>-.38**</td>
<td>-.19*</td>
</tr>
</tbody>
</table>

Note: FES-I = Falls Efficacy Scale-International; ABC = Activities-Specific Balance Confidence Scale; mSAFFE = Modified Survey of Activities and Fear of Falling in the Elderly Scale; CoF = Consequences of Falling scale; PF = physical functioning; RP = role physical; BP = bodily pain; GH = general health; VT = vitality; SF = social function; RE = role emotional; MH = mental health; PCS = physical summary score; MCS = mental health summary scores; * = p < .05; ** p < .01.
For hypothesis (f) separate ANOVA models indicated that only the ABC, $F(1, 131) = 7.59, p = .01, \eta^2_p = .06$, observed power = .78, $d = .49$, could discriminate between fallers and non-fallers (see Table 3.8). Analyses for the FES-I, $F(1, 131) = 1.74, p = .19, \eta^2_p = .01$, observed power = .26, $d = .23$, mSAFFE, $F(1, 131) = .91, p = .34, \eta^2_p = .01$, observed power = .16, $d = .17$, and CoF, $F(1, 131) = 2.20, p = .14, \eta^2_p = .02$, observed power = .31, $d = .26$, scales did not detect any group differences in scores between fallers and non-fallers.

Table 3.8. Means, 95% Confidence Intervals, and Effect Sizes of Fall-related Psychological Scales

<table>
<thead>
<tr>
<th>Scale</th>
<th>Total</th>
<th>Fallers</th>
<th>Non-fallers</th>
<th>Effect Size</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$</td>
<td>CI</td>
<td>$M$</td>
<td>CI</td>
</tr>
<tr>
<td>FES-I</td>
<td>29.2</td>
<td>27.3-31.0</td>
<td>30.6</td>
<td>27.8-33.5</td>
</tr>
<tr>
<td>ABC</td>
<td>74.7</td>
<td>71.3-78.1</td>
<td>69.0*</td>
<td>63.7-74.2</td>
</tr>
<tr>
<td>mSAFFE</td>
<td>23.2</td>
<td>22.3-24.1</td>
<td>23.8</td>
<td>22.2-25.3</td>
</tr>
<tr>
<td>CoF</td>
<td>25.1</td>
<td>24.1-26.2</td>
<td>26.1</td>
<td>24.5-27.7</td>
</tr>
</tbody>
</table>

* $p < .05$

Finally, for the research question, the four fall-related psychological instruments significantly predicted the total falls risk score in separate hierarchical linear regression analyses. Specifically, the results showed that the ABC ($R^2 = .25, \beta = -.50, p < .01$) explained the most variance in the total falls risk score, followed by the mSAFFE ($R^2 = .16, \beta = .40, p < .01$), FES-I ($R^2 = .12, \beta = .35, p < .01$), and the CoF ($R^2 = .10, \beta = .31, p < .01$).

Discussion

It is important to scrutinize the psychometric properties of fall-related psychological instruments to ensure that the best-suited and most feasible instrument will be used in the appropriate context. For example, in clinical fall prevention trials the most comprehensive, valid, reliable, and sensitive instruments are necessary, whereas in a quick, community-based health screening a shorter
psychometrically sound instrument may be more appropriate. Because little research has focused on the use of fall-related psychological instruments in a community-based assessment to identify older adults who are at-risk for falls (e.g., falls risk screening), the purpose of this investigation was to determine which of four fall-related psychological measures, selected after reviewing the measurement properties of all available fall-related psychological instruments used with independent-living older adults, was the most appropriate for use in a falls risk screening context. The specific objective of this study was to examine the reliability and validity of the FES-I, ABC, mSAFFE, and CoF scales in a community-based falls risk screening context using a sample of independent-living older adults.

The participants in this study (see Table 3.3) were more diverse compared to the local demographic composition of the four surrounding Louisiana parishes in which falls risk screenings were conducted (see Table 3.1) and compared to the Louisiana and U.S. populations of adults 50 years and older. For example, the study sample was about 77% female and 46% African American, whereas the U.S. and Louisiana older adult populations are about 55% female and 10% African American (U.S. Census Bureau, 2002), and 56% female and 27% African American (U.S. Census Bureau, 2000), respectively. When attempting to compare the racial composition of the present study sample to those of similar studies, it was found that most investigators failed to report the racial composition of their samples (Hotchkiss et al., 2004; Powell & Myers, 1995; Yardley et al., 2005; Yardley and Smith, 2002). Interestingly, the two studies that included this information reported samples that were 97% (Lachman et al., 1998) and 98.5% white (Talley et al., 2008). While the make-up of the study sample consisted of more African Americans than the U.S. and state demographic composition and is a unique aspect of this research, it is also important to point out the small percentage of males participating in this study compared to the U.S. and state demographics. Despite the unequal representation of males and females in the screenings, previous research indicates that men tend to participate in health screenings at a lower rate than women (Evans, Brotherstone, Miles, & Wardle, 2005). Moreover, other investigators have reported similar participation rates (i.e., between 72% and 78% female) when using
fall-related psychological instruments in the community (Lachman et al., 1998; Powell & Myers, 1995; Yardley et al., 2005).

About 46% of the study participants reported an annual income of less than $20,000 with about 20% reporting an annual income of $9,312 or less, which is below the national poverty threshold of $9,944 for adults 65 years and older (U.S. Census Bureau, 2008). Comparatively, only about 10% of the U.S. older adult population (U.S. Census Bureau, 2000) and about 17% of the Louisiana older adult population report living in poverty (U.S. Census Bureau, 2000). Consequently, it appears that the community-based falls risk screenings, while attracting a large number of female participants, also attracted “hard-to-reach” groups including African American and lower income older adults. Although it would be interesting to compare the socioeconomic status of the study participants with similar studies that included these instruments, previous investigators have not reported the socioeconomic status of their participants (Hotchkiss et al., 2004; Lachman et al., 1998; Powell & Myers, 1995; Yardley et al., 2005; Yardley & Smith, 2002). Thus, it is impossible to determine whether the present study included a more socioeconomically diverse sample than previous studies utilizing these instruments.

In general, results show that our participants were reflective of the larger older adult population in terms of falling status, with about 39% and 55% of participants reporting that they experienced a fall in the past 12 months and 3 years, respectively. This finding is consistent with previous research showing that approximately one-third of adults over age 65 fall annually (AGS, 2001). Additionally, the overall mean scores for the study participants were consistent with those observed in previous studies. For example, the overall sample means for the FES-I ($M = 29.2, SD = 10.5$) and the mSAFFE ($M = 23.2, SD = 5.5$) were similar to those reported by Yardley and colleagues (2005; FES-I: $M_{\text{mail-based format}} = 30.92, SD = 12.15$ and $M_{\text{interview-based format}} = 34.57, SD = 14.5$) and Yardley and Smith (2002; mSAFFE: Time 1: $M = 24.0, SD = 6.8$; Time 2: $M = 24.0, SD = 6.3$), respectively. Further, when CoF scores were separated into the subscales used by Yardley and Smith (2002), the mean CoF-LFI ($M = 11.1, SD = 92$)
3.2) and CoF-DI scores ($M = 14.1, SD = 3.6$) were similar to their mean CoF-LFI (Time 1: $M = 12.2$, $SD = 4.1$; Time 2: $M = 12.4, SD = 4.0$) and CoF-DI scores (Time 1: $M = 14.3, SD = 3.7$; Time 2: $M = 14.4, SD = 3.8$), respectively. For the ABC, Powell and Myers (1995) observed a total mean ABC score of 59.6 ($SD = 27.7$), with means of 80.9 and 38.3 for groups of “high” ($n = 30; M age = 71.4$ years) and “low” mobility ($n = 30; M age = 77.7$ years) community-dwelling older adults, respectively (Powell & Myers, 1995). Consequently, compared to the mean ABC scores observed by Powell and Myers’ participants, the participants in this study ($M = 74.7, SD = 19.9$) could be classified as “high mobility” or high-functioning older adults. Overall, based on scores reported in previous studies that included these instruments the participants in this study appear to be comparable on levels of concern about falling, fear of falling, consequences of falling, and balance confidence. Specifically, findings from the present study suggest that a diverse sample of older adults experience similar psychological difficulties related to falling as older adults described in previous research.

The results for hypothesis (a) were consistent with previous research findings in that the four fall-related psychological instruments demonstrated significant, moderate to large correlations with each other. Specifically, the moderate to large correlations among the four instruments were similar to those reported by previous investigators (Hotchkiss et al., 2004; Kressig et al., 2001; Powell & Myers, 1995). When examining the psychometric properties of the ABC and the original versions of the FES and SAFFE instruments (as compared to the FES-I and mSAFFE used in the present study), correlations of $r = .66$ and $r = .67$ were reported for the ABC with the SAFFE (Hotchkiss et al., 2004; Talley et al., 2008) and the FES with the SAFFE, respectively (Hotchkiss et al., 2004), which are similar to the correlations observed in the present study (e.g., ABC and mSAFFE $r = -.68$; FES-I and mSAFFE: $r = .66$). Regarding the correlations between the FES-I and ABC, these instruments were strongly correlated ($r = -.68$), but not correlated enough to suggest that they were measuring the same construct, which has been observed with the original FES and the ABC ($r = .86$; Hotchkiss et al., 2004 and $r = .84$; Powell & Myers, 1995). Moreover, other investigators using variations of the FES have
reported similar sized correlations with the ABC ($r = -.65$ for the ABC with the amFES; Kressig et al., 2001). Overall, results for hypothesis (a) of this investigation provide further evidence of the construct validity of the ABC, FES-I, mSAFFE, and CoF instruments in a community-based setting and provide evidence that they are measuring related yet different constructs, as evidenced by the observed correlations between .40 and -.68.

When testing whether the four psychological instruments were associated with self-reported physical activity (hypothesis b), only the ABC and the mSAFFE were moderately correlated with physical activity and the ABC yielded the largest correlation with the PASE. The moderate correlations observed for the balance confidence and fear of falling measures with physical activity are consistent with previous research in which decreases in mobility-related confidence (e.g., heightened levels of fear of falling) are linked to reductions in physical activity (Bruce, Devine, & Prince, 2002; Li, Fisher, Harmer, McAuley, & Wilson, 2003; McAuley et al., 2006; Tinetti & Powell, 1993). Results also showed that the FES-I and CoF scales only yielded small correlations with the PASE, with the correlation between the CoF and the PASE being nonsignificant. The implication of this could be that the FES-I and CoF are not capturing as broad a range of activities (McAuley et al., 1997; Powell & Myers, 1995) as compared to the ABC and mSAFFE. More specifically, the FES-I and the CoF may be failing to capture an activity restriction aspect that the ABC and the mSAFFE incorporate. Nevertheless, whether small or moderate, the ABC, mSAFFE, and the FES-I were significantly associated with physical activity, which provides additional evidence of their construct validity in a community-based setting. In light of these findings and because fall-related psychological issues can be barriers to physical activity among older adults (Bruce et al.), falls prevention interventions designed to increase physical activity levels should also incorporate strategies to enhance balance confidence and reduce fear of falling, and/or falls efficacy.

The results for hypothesis (c) were also consistent with previous studies in that the four fall-related psychological measures exhibited significant, small to moderate correlations with HRQL measures
(i.e., more fear or lower efficacy was associated with poorer quality of life). When correlating the original FES and SAFFE instruments with the SF-36, Lachman and colleagues (1998) found that a higher fear of falling was correlated with poorer quality of life and reported correlations ranging from .24 to .67 for the FES and from -.27 to -.55 for the SAFFE, which is consistent with the present results. For all four of the instruments, the expected relationship between fall-related psychological measures and quality of life variables was observed, providing further evidence of their construct validity in this setting. Specifically, higher levels of balance confidence (i.e., ABC) and lower concern about falling (i.e., FES-I), perceived consequences of falling (i.e., CoF), and fear of falling/ activity restriction (i.e., mSAFFE) were associated with better quality of life. This is consistent with research that demonstrates individuals who are more fearful of falling also report experiencing a poorer quality of life (Lachman et al., 1998; Li et al., 2003; Talley et al., 2008). Consequently, these findings further highlight the importance of understanding the relationship between psychological difficulties related to falls and HRQL among older adults and developing strategies to improve fall-related psychological issues to ultimately enhance HRQL, which is consistent with one of the primary goals of Healthy People 2010 (U.S. Department of Health and Human Services [USDHHS], 2000). Further, by enhancing HRQL the downward spiral of activity restriction, physical frailty, and loss of independence could be reversed, which could ultimately reduce the risk of future falls (Howland et al., 1998; Yardley & Smith, 2002). Out of the four instruments, the ABC yielded the largest correlation with one of the SF-36 subscales (i.e., ABC and PF: \( r = .51 \)), although a comparison of the 95% confidence intervals of the \( r \)-values did not provide any evidence to suggest that the ABC was statistically superior to the other fall-related psychological instruments with regards to HRQL.

The results for hypothesis (d) were similar to results from previous studies in that the four fall-related psychological instruments demonstrated significant, mostly moderate correlations with ETGUG scores (e.g., less fear or higher efficacy was associated with better mobility). These findings provide further evidence of the construct validity of the ABC, FES-I, mSAFFE, and CoF instruments in a
community-based falls risk screening context. Although no studies have compared any of the four psychological instruments used in this study with ETGUG scores, several studies have examined relationships between balance confidence or fear of falling measures with some type of mobility test. For example, moderate correlations were observed between ABC scores and walking speed ($r = .56$; Myers et al., 1996), the Timed Up and Go Test ($r = -.59$ and -.92; Myers, Fletcher, Myers & Sherk, 1998), a paced walk test ($r = .47$ and .65; Myers et al., 1998), a mobility performance test ($r = .78$; Myers et al., 1998), a functional rating questionnaire ($r = .49$; Myers et al., 1998), and self-report walking distance ($r = .44$; Myers et al., 1998). Similarly, Delbaere and colleagues (2004) reported significant moderate correlations between the mSAFFE and several mobility measures including Functional Reach scores ($r = -.36$, $p < .001$) and timed chair stands ($r = -.41$, $p < .001$). Based on the findings from the present study, it appears that higher balance confidence and lower concern about falling, perceived consequences of falling, and fear of falling/activity restriction were also associated with higher levels of mobility. This is consistent with research documenting that older adults who are more fearful of falling also experience poor mobility and increased restriction of activity (Lachman et al., 1998; Li et al., 2003; Talley et al., 2008; Vellas, Wayne, Romero, Baumgartner, & Garry, 1997). Because poor mobility, activity restriction, and fear of falling can trigger a vicious cycle of physical and psychological decline, understanding the relationship between fall-related psychological factors and mobility may reduce the risk of falls and extend the length of time older adults can live independently. Similar to results observed with the SF-36, the ABC demonstrated the largest correlation with the ETGUG out of the four psychological instruments, but did not appear to be statistically superior to the other fall-related psychological instruments when comparing the 95% confidence intervals of the $r$-values.

For hypothesis (e), all four instruments demonstrated adequate internal consistency reliability with LCLs greater than $\alpha = .70$. This finding was expected based on previous studies that have used the ABC, FES-I, mSAFFE, and CoF instruments among independent-living older adults (Powell & Myers,
Specifically, the Cronbach’s alpha values observed in this study for the ABC (α = .93), FES-I (α = .94), mSAFFE (α = .86) and CoF (α = .84) scales were comparable to values previously reported (i.e., ABC: α = .96, Powell & Myers; FES-I: α = .96, Yardley et al., 2005; mSAFFE: α = .91-.92 and CoF: α = .86-.94, Yardley & Smith, 2002). Consequently, the findings from this study extend the available reliability evidence of these four fall-related psychological scales for use in a community-based falls risk screening context.

When testing whether the four psychological instruments could discriminate between fallers and non-fallers (hypothesis f), only the ABC could differentiate between the two groups, with fallers reporting significantly lower ABC scores than non-fallers, although the effect size was small. These results are consistent with previous research using the ABC (Lajoie & Gallagher, 2004) and a British-adaptation of the ABC (i.e., ABC-UK; Parry, Steen, Galloway, Kenny, & Bond, 2001), and provide further evidence of the construct validity of the ABC in a community-based falls risk screening context. Although it was also expected that the other instruments including the FES-I would be able to discriminate between fallers and non-fallers based on their ability to do so in previous studies (Yardley et al., 2005), the results did not yield any significant differences between groups for these instruments. However, it is important to point out that the observed power of these scales was low (e.g., observed power between .16 and .31). Consequently, with more power these instruments may have been able to detect fall-related psychological differences between fallers and non-fallers. On the other hand, it is possible that the present study sample may be different than typical “convenience samples” utilized in other studies (Talley et al., 2008). Future researchers could compare the characteristics of those who agree to participate versus those who decline to participate by using qualitative interview or focus group methods to investigate motivation, expectations, and/or reasons for participating in a falls risk screening. Overall, the results for hypothesis (f) provide further evidence of the construct validity of the ABC and suggest that the ABC may be superior to the mSAFFE, CoF, and FES-I in a community-
based falls risk screening context in terms of capturing fall-related psychological differences between fallers and non-fallers.

Finally, results for the research question revealed that all four of the instruments significantly predicted the total falls risk score (Ellis et al., 2007a, 2007b), with the ABC explaining the most variance compared to the other measures. The ABC explained about 25% of the variance in total falls risk score, and although this may not appear to be a large amount of explained variance, it is a reasonable amount considering that risks for falls are multifactorial and consist of a variety of intrinsic and extrinsic factors beyond a psychological risk factor such as balance confidence (AGS, 2001; Rubenstein, 2006). Although less evidence for the validity of the CoF, FES-I, and mSAFFE scales for predicting falls risk in this population was found, these instruments explained between 10% and 16% of the variance in the total falls risk score, which indicates that they are capturing some aspect of overall falls risk as well. Collectively, findings from the research question suggest that the ABC may be the most useful fall-related psychological instrument for predicting total falls risk as measured by a comprehensive falls risk screening instrument.

There are several unique aspects of this study that extend the previous research literature on fall-related psychological constructs. One of the strengths of this study was that it was the first to evaluate fall-related psychological measures among independent-living older adults based on their ability to predict falls risk using a comprehensive falls risk screening instrument (Ellis et al., 2007a; 2007b). Specifically, results from this study provide evidence of the reliability and validity of the ABC, FES-I, mSAFFE, and CoF scales in a community-based falls risk screening environment and evidence of the validity of the ABC, FES-I, mSAFFE, and CoF scales as predictors of falls risk (Ellis et al., 2007a; 2007b). Not only do results from this study provide further evidence of the construct validity of the ABC using measures of HRQL, mobility, and physical activity, this study was one of the first to provide evidence of the construct validity of the FES-I, mSAFFE, and CoF against measures of HRQL and mobility, as well as the mSAFFE and FES-I against measures of physical activity in a community-
based setting. Additionally, this study was the first to test the measurement properties of the FES-I, mSAFFE, and CoF scales in the U.S. using a racially and socioeconomically diverse sample.

Another unique contribution of this study was the demographics of the study sample. As there has been increased interest in including hard-to-reach and underserved populations in health-related research (Hendrickson, 2005; Rose, 2004; Simmons & Voyle, 2003), there has also been interest in testing the validity of instruments among more culturally diverse groups of older adults (Long Foley, Reed, Mutran, & DeVellis, 2002; Moore et al., 2008). Therefore, it is important to demonstrate that fall-related psychological instruments can also be used among a broad range of older adults (Talley et al., 2008). Further, because African-Americans and socioeconomically challenged older adults experience disproportionately high rates of disability and are least likely to be physically active when compared to their Caucasian and higher income counterparts (USDHHS, 2000), it could be argued that these groups of older adults are at an especially high risk for falls. Findings from this study (a) provide evidence of the validity of the ABC, FES-I, mSAFFE, and CoF scales among a diverse range of older adults who may be at-risk for falls, and (b) identify the ABC, FES-I, mSAFFE, and CoF scales as useful instruments when used in conjunction with a comprehensive falls risk screening instrument to identify those older adults who are experiencing fall-related psychological difficulties and are in the most need of falls prevention programs.

As with most studies, there were several limitations of this investigation. One of the limitations of this study was that the study sample was self-selected because participants voluntarily signed up for the falls risk screening. This may have resulted in sample bias in which the sample was overrepresented by older adults who are more interested in adopting preventative health strategies and perceived that they are more at-risk for falling (Engebretson, Mahoney, & Walker, 2005). Therefore, the participants included in this study may not adequately reflect the full spectrum of psychological difficulties related to falls and falls risk among independent-living older adults. While the investigators advertised the screenings in the community, it is possible that the information failed to reach those
older adults who do not utilize community-based facilities and are less interested in preventative behaviors, thus limiting the generalizability of the results.

A second limitation of this investigation was the inclusion of a relatively small number of men compared to women. Research indicates that men are less likely than women to participate in preventative health behaviors including health screenings and early detection practices (Evans et al., 2005). Moreover, Evans et al. suggested that health screenings are less likely to reach men than women. Although efforts were made to include more men in this study, only 22.4% of the study participants were men, which compromises the generalizability of the results to the older adult male population. Along those lines, the diverse nature of the study sample, though a major strength of this research, may also limit generalizability of the findings across different racial/ethnic groups (i.e., Hispanic/Latino Americans, Asian Americans, American Indian, etc.) and with higher-income older adults.

Another limitation of this study was the collection of HRQL data 1-2 weeks following the falls risk screening. In an attempt to keep the screening as brief as possible and to move participants through the stations quickly, the HRQL data was collected within a two-week period over the phone. On average, the length of time between the falls risk screenings and subsequent phone interview for all participants was less than one-week ($M = 6.5$ days, $SD = 4$ days). Although the interviews were conducted in a timely manner, the available pool of participants decreased from 189 older adults that participated in the screenings to a final sample of 135 participants with complete data from the screening and phone interview. This limitation was addressed by offering to pay participants $15.00 for completing the screening and subsequent phone interview. As a result of this participant reimbursement, the study yielded a sample size larger than proposed. Unfortunately, one of the unanticipated consequences of the participant reimbursement was the university’s requirement for social security numbers (SSN) before dispersing funds for participation. Because many of the participants refused to disclose their SSN, the utilization of participant reimbursement as an incentive
to complete the study may not have been as effective as originally planned. Although anticipated, a minor consequence of collecting the HRQL data following the falls risk screening was that two participants did not complete the additional data collection by phone because they experienced an event that could have negatively affected their health-related quality of life (e.g., experiencing a fall: $n = 1$ and having surgery: $n = 1$) between the time of the screening and phone interview. Therefore, the inability to reach all of the participants for phone interviews may have biased the results in favor of those older adults who had access to a phone, were willing to disclose their SSN, did not experience a major health-threatening event between the screening and phone call, and were not hearing impaired. Despite these limitations, the analyses for this study were appropriately powered and the response rate (71.4%) was much higher than anticipated.

A final limitation of the study was the reliance on self-reported information. Because the results were based mostly on self-reported survey data, there is no way to determine how truthfully participants responded to the questionnaires. One issue that arises is that the data from the study rely on the recall of older adults, about a third of whom were over 80 years of age ($n = 46$). Consequently, there may be some limitations to the quality of the data obtained. Additionally, due to the sensitive nature of the questionnaires (i.e., older adults may be unwilling to admit possessing a fear of falling), social desirability bias could have led to inflated efficacy and physical activity scores, which may have affected the study results.

Overall, the results from this study provide additional psychometric support for the ABC, FES-I, mSAFFE, and CoF, while providing the strongest evidence of the validity of the ABC in a community-based setting. Specifically, it was found that the ABC could detect significant differences in balance confidence levels between fallers and non-fallers, whereas the other fall-related instruments could not and it explained the most variance in total falls risk, which suggests that the ABC may be the better instrument to choose in a community-based falls risk screening. Although the FES-I, mSAFFE, and CoF instruments were evaluated in different contexts with other groups of older adults (i.e., hospital
patients, nursing home residents, etc.), this study demonstrated the importance of evaluating their measurement properties in other contexts. In light of the favorable findings observed for the ABC in this study, it would be interesting to test the utility of one of its shorter variations (Filiatrault et al., 2007; Peretz, Herman, Hausdorff, & Giladi, 2006) in a similar setting. Particularly considering the need for quick, easy-to-use instruments that can be administered by leaders of community-based programs, future research efforts should be directed towards comparing the psychometric properties of a shorter instrument with the original ABC for use in a community-based falls risk screening context.
CHAPTER 4
STUDY 2: AN EXAMINATION OF THE RESPONSIVENESS OF THE ACTIVITIES-SPECIFIC BALANCE CONFIDENCE (ABC) SCALE IN A COMMUNITY-BASED FALLS RISK SCREENING CONTEXT

Falls are currently the leading cause of injury death among adults aged 65 years and older (Centers for Disease Control and Prevention [CDC], 2005). Not only can falls and fall-related injuries jeopardize the independence and daily functioning of independent-living older adults, they can create a loss of confidence in mobility that can lead to self-imposed reductions in physical activity (Tinetti, Mendes de Leon, Doucette, & Baker, 1994; Yardley & Smith, 2002). Beyond the restriction of activity, the presence of fall-related psychological issues can also lead to decreased muscle strength, flexibility, coordination, and progressive functional decline that can negatively impact health-related quality of life (HRQL), and lead to a loss of independence and damage to identity, thereby increasing the risk for future falls (Cumming et al., 2000; Lach, 2002; Quigley, Hann, & Evitt, 2003; Yardely & Smith). Considering that more than half of older adults acknowledge experiencing some type of fall-related psychological issue (Howland et al., 1998), there is a need to detect mobility-related losses of confidence before they lead to this “downward spiral of events” (Binda, Culham & Brouwer, 2003).

The most commonly investigated fall-related psychological issues are fear of falling and fall- or balance-related self-efficacy (Cheal & Clemson, 2001; McAuley, Mihalko & Rosengren, 1997; Tinetti & Powell, 1993). Self-efficacy refers to an individual’s belief or confidence in his or her own capabilities to perform a specific activity successfully (Bandura, 1986) and has been used more recently to capture the psychological impact of falls because self-report global states such as fear are not effective predictors of actual behavior (Bandura, 1982). Thus, fear of falling has also been operationalized as a falls specific form of self-efficacy, with one’s confidence at avoiding a fall assessed as opposed to one’s fear (Tinetti et al., 1990).

A potential advantage of measuring “balance confidence”, a situation specific form of self-efficacy that relates to perceived balance ability (Powell & Myers, 1995), as compared to “fear of
falling” or “falls efficacy” is that the slight difference in wording may be more sensitive to healthy older adults that have not fallen, but occasionally lose their balance (Powell & Myers). Further, research illustrates that balance confidence can serve as a key indicator of independence, physical functioning, and quality of life among older adults (Myers, Fletcher, Myers, & Sherk, 1998).

The most commonly used instrument to assess balance confidence is the Activities-specific Balance Confidence (ABC) Scale (Powell & Myers, 1995). The ABC is an interview-administered questionnaire that assesses the confidence in one’s ability to maintain balance and remain steady when performing 16 activities of daily living (ADL). Developed to address several limitations of the seminal Tinetti and colleagues (1990) Falls Efficacy Scale (FES), the ABC includes a broader range of functional activities that make it more sensitive for detecting loss of confidence among higher-functioning individuals than the FES (McAuley et al., 1997; Powell & Myers).

Before utilizing an instrument such as the ABC, it is imperative to know whether its measurement properties have been tested in the setting and with the population in which it will be used. Because measurement properties are context- and population-specific, an instrument that has demonstrated acceptable measurement properties in one setting may not be appropriate for use in other settings with a different population (Fitzpatrick, Davey, Buxton, & Jones, 1998). Most commonly, when researchers test the measurement properties of an instrument they examine an instrument’s reliability and validity. Another less frequently reported measurement property that is equally important is sensitivity (i.e., responsiveness), or the ability of an instrument to detect differences between two points in time (changes over time) within groups (Middel & van Sonderen, 2002). Also considered a form of longitudinal validity, sensitivity assesses whether changes in participant scores coincide with “real changes” in the construct being measured (Husted, Cook, Farewell, & Gladman, 2000; Terwee, Dekker, Wiersinga, Prummel, & Bossuyt, 2003). Evidence for sensitivity, along with high internal consistency and evidence of construct validity, are considered by researchers to be “essential” properties of health-related questionnaires (Guyatt, Walter, & Norman, 1987).
There has been a call for more health researchers to report the sensitivity of instruments when examining psychometric properties such as validity and reliability, yet few studies report this information (Deyo & Inui, 1984; Fitzpatrick, Ziebland, Jenkinson, Mowat, & Mowat, 1992). Further, even when sensitivity has been reported, because there is not one agreed upon method, it is difficult to compare this measurement property across studies. Several common methods for assessing the sensitivity of an instrument have included calculating change scores, effect size, t-test or ANOVA, or standardized response mean (Fitzpatrick et al., 1998).

Despite the importance of evaluating sensitivity, a recent review of the measurement of psychological constructs related to falling highlighted that previous studies have failed to provide sufficient evidence for this measurement property (Jorstad et al., 2005). Furthermore, because fall-related psychological instruments are useful for detecting those older adults in the community who may be at-risk for falling because of a loss of confidence in mobility, research efforts should be directed towards investigating their validity, reliability, and sensitivity in a community-based falls risk-screening context. Falls risk screenings are especially important because the early identification of those who are at-risk for falling can result in further assessment of falls risk and earlier implementation of interventions designed to decrease fall risk factors including reduced activity and confidence levels (Hill & Schwarz, 2004). Testing the sensitivity of fall-related psychological instruments is also essential when evaluating the efficacy of a fall prevention intervention for enhancing balance confidence levels over time. If these instruments are not sensitive to detecting changes in confidence levels or fear of falling over time, it is not possible to measure psychological improvements experienced as a result of a fall prevention intervention.

While research exists to substantiate the psychometric properties of the ABC scale (Hotchkiss et al., 2004; Myers et al., 1996; Myers et al., 1998; Powell & Myers, 1995), there is minimal evidence about its sensitivity (Miller, Deathe, & Speechley, 2003; Talley, Wyman, & Gross, 2008). In an earlier study, the validity and reliability of the ABC were assessed in a community-based falls risk screening
context with acceptable results (i.e., study one); however, there is still a need to provide evidence for the responsiveness of the ABC in a falls risk screening context. Therefore, the purpose of study two was to test the sensitivity (or responsiveness) of the ABC scale in fallers and non-fallers participating in two community-based falls risk screenings over a 12-month time period using a longitudinal design. It was hypothesized that, when controlling for falling status at time one, there would be a significant decrease in balance confidence scores (e.g., negative change scores) among the participants who self-report a fall in the 12 months between the falls risk screenings (fallers) compared to those participants who did not self-report a fall (non-fallers).

Method

Participants

Participants were 22 older adults who participated in two community-based fall risk screenings (described in study one) that were held approximately 12 months apart and who completed the ABC scale during both screenings. Screenings were held at community organizations including local Council on Aging offices, retirement communities, and YMCAs, and included participants who met the following criteria: (a) age of 50 years and older, (b) non-wheelchair dependent, (c) absence of severe psychological or neurological impairment, and (d) living within a 100-mile radius of East Baton Rouge Parish, LA. Before participating in both of the screenings, participants signed an informed consent approved by the LSU Institutional Review Board.

Procedure

Using a longitudinal design, self-reported falls and balance confidence scores were collected at two community-based falls risk screenings that were separated by about 12 months. The average length of time between the falls risk screenings for all participants was approximately 12.4 months ($SD = .7$ months; $N = 22$). Participants who had previously participated in a community-based falls risk screening, and who had complete data for the ABC scale were contacted to participate in a 1-year
follow-up falls risk screening. Both falls risk screenings followed the same procedures as described in
study one, in which participants signed up for 20-minute testing blocks and visited stations including:
(a) participant check-in, consent, demographics, and home safety, (b) medical history and medications,
(c) mobility and balance, and (d) vision. After data was collected from each station, a total falls risk
score was calculated (Ellis et al., 2007a; 2007b). Depending on the number of participants at each
screening, balance confidence scores were collected between stations or while participants waited for
their falls risk score to be calculated. After each participant completed the screening, testers reviewed
their total falls risk scores and individualized recommendations regarding the reduction of falls risk.

Measures

Demographic Information. Demographic information including age, sex, race, marital status,
education level, and household income was collected using a questionnaire developed by the
researchers.

Falls Risk Screening Instrument. One question from the history subscale of the falls risk screening
instrument (Ellis et al., 2007a; 2007b; e.g., “Have you fallen in the past 12 months?” yes/no) was used
to determine group assignment. Specifically, participants’ responses to this question at year two were
used to group participants into faller and non-faller categories. A fall was defined as “an unexpected
event in which the participants come to rest on the ground, floor, or lower level” (Lamb, Jorstad-Stein,
Hauer, & Becker, 2005; World Health Organization, 2006).

Fall-Related Psychological Measure. The Activities-specific Balance Confidence Scale (ABC;
Powell & Myers, 1995) assessed balance confidence while performing ADL. The ABC scale (Powell
& Myers, 1995) can be administered in a self-report or interviewer-administered format and
incorporates a range of functional activities including walking around the house, getting into or out of
a car, and walking outside on icy sidewalks (Powell & Myers). The total ABC score, which is
calculated by averaging the 16 items that are rated on a 0 to 100% scale, can range from 0 (i.e., no

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balance-related confidence) to 100 (i.e., complete balance-related confidence). The ABC is widely used in fall-related research and is translated into several languages including Chinese (Mak, Lau, Law, Cheung, & Wong, 2007) and Dutch (van Heuvelen et al., 2005). Moreover, it is a valid and reliable measure of balance confidence among independent-living older adults in a variety of settings (Hotchkiss et al., 2004; Kressig et al., 2001; Li et al., 2002; Myers et al., 1996; Myers, Fletcher, Myers & Sherk, 1998; Powell & Myers, 1995).

**Statistical Analyses**

To test the hypothesis with a small sample size \((N = 22)\) and large standard deviations \((SD = 9.3 – 22.3)\), the nonparametric equivalent to an independent samples t-test was used (e.g., Mann-Whitney \(U\) test). Because the main analysis for study two involved a Mann-Whitney \(U\) test, it was determined that a sample size of approximately 128 \((n = 64\) per group) would be needed to provide approximately 80% power to detect a moderate effect size of \(d = .50\) at an alpha level of 0.05 (i.e., \(n = 128\) for a \(t\)-test; Cohen, 1992; Lehmann, 1998). Before conducting the analyses, normality of ABC scores were assessed and tests for univariate and multivariate outliers were also performed. Demographic variables were summarized using frequencies, means, and standard deviations. Cronbach’s alpha with lower confidence limits (LCL) for alpha (Fan & Thompson, 2001) was constructed to assess the internal consistency of the ABC at time 1 and time 2. Mean change scores in balance confidence were calculated by subtracting the ABC time 1 score from the ABC time 2 score. For a baseline comparison, Mann-Whitney \(U\) test was used to test for group differences in ABC time 1 scores for fallers versus non-fallers at time one. Further, separate Mann-Whitney \(U\) tests were used to examine possible differences in ABC change scores based on age (i.e., 50-64 vs. 65 +), gender, race, income, and education, and a Kruskal-Wallis test was used to examine possible differences by facility. Sensitivity to change was evaluated using Mann-Whitney \(U\) test by examining the extent to which changes in
ABC scores across the 12 months differed between fallers and non-fallers at time 2. Statistical calculations were considered significant at alpha level of $p < .05$ and were performed using SPSS.

**Results**

Twenty-two participants between the ages of 55 and 92 years ($M$ age = 74.2 yr, $SD$ = 11.3) from four community organizations participated in two consecutive falls risk screenings over an approximate 12-month period ($M$ = 12.4 months, $SD$ = .7). One participant was identified as a univariate outlier; therefore, the final sample size was 21. The majority of study two participants were female (95.2%) and Caucasian (61.9%; see Table 4.1). Of the 21 participants, approximately 38%

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>$n$</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50 – 64 years</td>
<td>7</td>
<td>33.3</td>
</tr>
<tr>
<td>65 years +</td>
<td>14</td>
<td>66.7</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>1</td>
<td>4.8</td>
</tr>
<tr>
<td>Female</td>
<td>20</td>
<td>95.2</td>
</tr>
<tr>
<td>Marital Status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single, never married</td>
<td>1</td>
<td>4.8</td>
</tr>
<tr>
<td>Married</td>
<td>6</td>
<td>28.6</td>
</tr>
<tr>
<td>Widowed</td>
<td>9</td>
<td>42.9</td>
</tr>
<tr>
<td>Divorced/ Separated</td>
<td>5</td>
<td>23.8</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\leq$ High School</td>
<td>12</td>
<td>57.1</td>
</tr>
<tr>
<td>$&gt;$ High School</td>
<td>9</td>
<td>42.9</td>
</tr>
<tr>
<td>Annual income</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\leq$ $20,000$</td>
<td>15</td>
<td>71.4</td>
</tr>
<tr>
<td>$&gt;$ $20,000$</td>
<td>3</td>
<td>14.3</td>
</tr>
<tr>
<td>Did not answer</td>
<td>3</td>
<td>14.3</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caucasian, Non-Hispanic</td>
<td>13</td>
<td>61.9</td>
</tr>
<tr>
<td>Black, African American, Non-Hispanic</td>
<td>8</td>
<td>38.1</td>
</tr>
</tbody>
</table>
reported experiencing a fall in the past 12 months at time 1, and approximately 43% reported having fallen in the past 12 months at time 2.

Means and standard deviations for ABC time 1, time 2, and change scores by falling status are presented in Table 4.2. Mann-Whitney $U$ test revealed no baseline group differences in ABC scores at time 1 based on falling status, $U = 50.0, p = .89$. The mean ranks for time 1 ABC scores were 10.8 and 11.2 for fallers and non-fallers, respectively. For the demographic variables, no significant group differences in ABC change scores were found by age, $U = 35.5, p = .31$, gender $U = 4.0, p = .32$, race, $U = 28.5, p = .09$, income, $U = 20.0, p = .77$, education, $U = 47.5, p = .64$, or facility, Kruskal-Wallis $H = 2.54, df = 3, p = .47$ (see Table 4.3). Further, internal consistency reliability of the ABC was acceptable at time 1 ($\alpha = .92$, LCL = .86) and time 2 ($\alpha = .91$, LCL = .85) with lower confidence limits above the .70 threshold.

Table 4.2. Means (M) and Standard Deviations (SD) for the Activities-specific Balance Confidence (ABC) scale

<table>
<thead>
<tr>
<th>Falling Status at time 2</th>
<th>ABC</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Time 1</td>
<td>Time 2</td>
<td>(\Delta) score</td>
<td></td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Fallers</td>
<td>54.2</td>
<td>21.4</td>
<td>58.5</td>
<td>22.3</td>
</tr>
<tr>
<td>Non-fallers</td>
<td>63.5</td>
<td>18.6</td>
<td>63.7</td>
<td>19.7</td>
</tr>
<tr>
<td>Overall</td>
<td>59.6</td>
<td>19.9</td>
<td>61.5</td>
<td>20.5</td>
</tr>
</tbody>
</table>

Mann-Whitney $U$ test revealed no statistically significant differences in ABC change scores between fallers and non-fallers at time 2, $U = 45.0, p = .52$. The mean ranks for ABC change scores were 12.0 and 10.3 for fallers and non-fallers, respectively.
Table 4.3. Mean rank and Sum of ranks for Activities-specific Balance Confidence (ABC) change scores

<table>
<thead>
<tr>
<th>Demographic variables</th>
<th></th>
<th>ABC Δ score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean rank</td>
<td>Sum of ranks</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50 – 64</td>
<td>9.1</td>
<td>63.5</td>
</tr>
<tr>
<td>65 +</td>
<td>12.0</td>
<td>167.5</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>5.0</td>
<td>5.0</td>
</tr>
<tr>
<td>Female</td>
<td>11.3</td>
<td>226.0</td>
</tr>
<tr>
<td><strong>Race</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>12.8</td>
<td>166.5</td>
</tr>
<tr>
<td>African American</td>
<td>8.1</td>
<td>64.5</td>
</tr>
<tr>
<td><strong>Income</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤ $20,000</td>
<td>9.7</td>
<td>145.0</td>
</tr>
<tr>
<td>&gt; $20,000</td>
<td>8.7</td>
<td>26.0</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤ High School</td>
<td>10.5</td>
<td>125.5</td>
</tr>
<tr>
<td>&gt; High School</td>
<td>11.7</td>
<td>105.5</td>
</tr>
<tr>
<td><strong>Facility</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>13.0</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>12.5</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>10.6</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>5.0</td>
<td>-</td>
</tr>
</tbody>
</table>

*Note. ‡ = Kruskal-Wallis test*

**Discussion**

When examining the psychometric properties of an instrument, it is important to test whether meaningful changes over time can be detected between groups (i.e., sensitivity). For example, when
evaluating the effectiveness of a falls prevention intervention for enhancing balance related confidence levels, researchers must first determine whether the instrument being employed is sensitive enough to detect changes in balance confidence levels over time. Although sensitivity is considered an essential measurement property, to date no studies have focused on assessing the sensitivity to change of a fall-related psychological instrument in a community-based falls risk screening assessment. Therefore, the objective of this study was to test the sensitivity of the ABC scale by examining the extent to which it could detect significant changes in balance confidence levels between fallers and non-fallers.

Although the composition of the larger study sample (i.e., study one; $N = 133$) was mostly reflective of the local demographic profile, the subsample of participants who met the criteria to participate in this investigation (i.e., study two; $N = 21$) contained a disproportionately small number of males compared to females. For example, 95.2% of the participants in this study were female, compared to 77% in study one. Comparatively, the U.S. and Louisiana older adult populations are about 55% (U.S. Census Bureau, 2002) and 56% female (U.S. Census Bureau, 2000), respectively. It is likely that these demographic differences could have occurred because of the longitudinal nature of this study. Because those older adults who participated in the falls risk screening in the first year of the study were not required to participate in year two, participant attrition was high; however, it has been reported that females tend to participate in health screenings at a higher rate than males (Evans, Brotherstone, Miles, & Wardle, 2005), and previous studies that have used the ABC in a community setting have reported higher levels of female participation (i.e., between 72% and 78% female; Lachman et al., 1998; Powell & Myers, 1995; Yardley et al., 2005). It is also possible that some of the older adults who participated in the year one screening became less active at their respective community-based facility and were not informed that the investigators were returning for a second year falls screening assessment. Consequently, with less overall participation, the unequal gender representation observed in the larger investigation (i.e., less than 25 % male participation) was amplified in the second year of the study (i.e., less than 5 % male participation). As a result, the ability
to generalize these findings to the entire older adult male population is limited. The study sample was more reflective of the national and state populations of adults 50 years and older than the 133 older adults who participated in study one. For example, compared to the participants in study one (e.g., 46% African American), study two participants were 38% African American versus 10% and 27% for the U.S. and Louisiana older adult populations, respectively (U.S. Census Bureau, 2002; U.S. Census Bureau, 2000). When comparing the older adults who participated in this investigation to those who have participated in similar studies (i.e., between 97% and 99% Caucasian; Lachman et al., 1998; Talley et al., 2008), the present study sample is more racially diverse than these previous samples.

The majority of older adults that participated in this investigation reported annual incomes less than or equal to $20,000 (e.g., 71%). Compared to the larger sample of older adults who participated in study one (46% reported an annual income of less than $20,000), the present study sample includes a greater proportion of low-income older adults. Moreover, about 43% of the study sample (compared to 20% of the study one sample) reported an annual income below the national poverty threshold of $9,944 for adults 65 years and older (U.S. Census Bureau, 2008). This is well above the national and state statistics of 10% and 17% that report living in poverty, respectively (U.S. Census Bureau, 2000; U.S. Census Bureau, 2000). One potential explanation for this could be that those who participated in both falls risk screenings (no cost to participate) were doing so in lieu of paying to visit their doctor. Future researchers could investigate this possibility by also inquiring about the healthcare utilization patterns of their participants. Overall, despite the overrepresentation of females in this study, the present study sample was racially and socio-economically diverse in nature, which suggests that a range of older adults were attracted to participate in both falls risk screenings.

Compared to other studies that have used the ABC, the mean ABC scores from this investigation appear consistent with previously reported scores. For example, the overall sample means for the ABC at the time 1 ($M = 59.6, SD = 19.9$) and time 2 ($M = 61.5, SD = 20.5$) screenings were very similar to those reported by Powell and Myers (1995; $M = 59.6, SD = 27.7$). Interestingly, ABC scores from both
times 1 and 2 are slightly lower when compared to the ABC scores reported in study one ($M = 74.7$, $SD = 19.9$) and those reported by Talley and colleagues (2008; baseline: $M = 78.2$, $SD = 16.7$; 12-week: $M = 78.5$, $SD = 16.5$). The lower ABC scores at times one and two compared to study one may indicate that the older adults in this study were more likely to participate in multiple screenings and were concerned about falling. However, when comparing the mean change scores observed for the ABC ($M = 1.9$, $SD = 12.5$) from this study to the change scores reported for participants receiving a home-based multifactorial fall prevention program that included risk-reduction counseling, exercise and educational components (e.g., fall prevention group: $M = -1.1$; Talley et al.), it appears that our participants had higher balance confidence levels at time 2 compared to time 1; whereas, Talley et al.’s sample had lower balance confidence levels at time 2 compared to baseline. A possible explanation for the higher ABC scores observed during year two of this investigation could be that the older adults who participated in both of the falls risk screenings followed some of the individualized falls risk reduction recommendations and educational counseling made at the first screening, which may have increased their balance confidence scores at the year two assessment. Although this is a plausible explanation, there is no data to confirm that hypothesis at this time. Of interest, Talley et al. attributed their intervention group’s low balance confidence scores to participant characteristics as opposed to the intervention (Talley et al.). Consistent with study one results and scores reported from previous research using the ABC, findings from this study suggest that (a) the study participants are comparable on levels of balance confidence, and (b) a diverse sample of older adults exhibit similar levels of balance confidence when compared with less diverse groups of older adults described in previous studies.

Overall, the results from this investigation were consistent with previous research findings in several important ways. First, results from this study revealed that 38% and 43% of participants reported a fall in the past 12 months at time 1 and at time 2, respectively. This finding is consistent with previous research showing that approximately 35% to 40% of adults over age 65 fall annually.
(American Geriatrics Society [AGS], 2001) and indicates that our participants are reflective of the larger older adult population in terms of falling status. Secondly, findings from this investigation demonstrated that the ABC was not sensitive to change in a falls risk screening context. This finding is consistent with results observed by Talley et al. in which the ABC failed to detect significant changes in balance confidence levels following a multifactorial fall prevention intervention among community-dwelling older adults, \( t (103) = -.50, p = .62 \) (Talley et al.). Talley and colleagues postulated that one reason for the lack of sensitivity to change was because their participants were relatively nonfrail and exhibited higher scores on the ABC (i.e., ceiling effect) compared to participants in other studies. Consequently, they hypothesized that the ABC was not accurately capturing balance confidence levels of relatively nonfrail older adults, and therefore was not sensitive to change. Although a ceiling effect for the ABC was not observed in this study, another likely explanation for the lack of sensitivity observed in the present study is the small sample size. With a larger number of fallers and non-fallers, this investigation would have had enough power to detect whether the ABC was truly sensitive to change in this setting. Regardless of the reason, results from this study confirmed previous findings that the ABC was not sensitive to change in a community-based setting. While more research is needed to determine whether the ABC would be sensitive to change with a larger sample size that includes a representative mix of frail and nonfrail older adults, results from this study suggest that the ABC may not be the most appropriate instrument when measuring differences in balance confidence levels over time.

One of the major contributions of this study was that it was the first to test the sensitivity of a fall-related psychological instrument in a community-based falls risk screening context. Although results from this study did not support the sensitivity of the ABC in this setting, the findings observed in this study were consistent with results previously reported, which adds to the knowledge base in this area. Another significant contribution of this study was the racial and socioeconomic characteristics of the study sample. Recently, more attention has been directed toward establishing the psychometric
properties of instruments among more diverse and representative samples of participants, such as minority and lower socioeconomic status older adults. This study contributes to the knowledge base of the measurement of fall-related psychological issues among a racially and socioeconomically diverse group of older adults.

Although there were unique aspects of this study, there were also several limitations. The main limitation of this study was the small sample size. It was determined that a sample size of 128 ($n = 64$ in each group) was needed to provide enough power to detect true differences in balance confidence scores, and the final sample size attained was 21 ($n = 9$ fallers and $n = 12$ non-fallers). Without enough participants in each group (i.e., fallers and non-fallers) to detect a meaningful change in balance confidence over time, the conclusions derived from this study cannot be interpreted with confidence. This was a major limitation and could be the reason that the ABC was not found to be sensitive to change in this study. This may also explain why no baseline differences were detected in ABC scores or demographic variables at the year one screening. Future researchers should make efforts to attract and retain participants by enlisting the support of facility staff who can be instrumental in encouraging greater participation of their members. Another limitation of this investigation, which may have contributed to the small sample size, was the self-selected nature of the study sample. Because participants signed up to participate on a voluntary basis and were not required to participate in the falls risk screening in year two of the study, results may be biased in favor of those who were more likely to volunteer, were still members of the same facility in which they participated in the year one screening, and whose contact information had not changed. It is also possible that those who participated in both falls risk screenings, more than 70% of which were considered low-income older adults, thought of the screenings as low cost alternatives to visiting their doctor and were more inclined to take advantage of the free assessment.

Another limitation of the study was the reliance on self-report data collection methods. In the present study, the dependent (ABC scores) and independent (falling status) variables were collected
using self-report methods. With regard to self-reporting of falls (e.g., falling status), one issue that may have compromised the results is that participants may have forgotten whether they fell in the past year. Specifically, with about 43% of the sample over 80 years of age \((n = 9)\), it is possible that some of the participants were misclassified as non-fallers because they could not recall that they had fallen in the past year. Consequently, the number of participants classified as fallers may be inaccurate. In terms of the balance confidence data, participants may have been reluctant to admit to experiencing low confidence levels, which could have led to artificially inflated ABC scores. Moreover, because admitting to a fall and disclosing a low balance confidence are potentially embarrassing, social desirability bias could have also affected the study results.

In conclusion, the results from this study confirm prior findings showing that the ABC is not sensitive to change in a community-based setting. Because the small sample size in this investigation affected the study results, future researchers should examine whether the ABC is sensitive to change in a community-based falls risk screening context with a larger sample size. Additionally, more research is needed to test the sensitivity of the ABC, as well as other fall-related psychological instruments, in other contexts with a broad range of older adults from various racial and socioeconomic backgrounds. Considering the importance of evaluating the ability of an instrument to detect changes over time when examining the efficacy of fall prevention interventions, the sensitivity of other fall-related instruments should be tested and compared to the ABC to determine if they can better capture fall-related psychological changes over time.
CHAPTER 5
GENERAL DISCUSSION

The general objective of this dissertation was to evaluate and compare the psychometric properties of several fall-related psychological measures for use in independent-living older adults in a community-based falls risk screening context. Two studies were conducted to achieve this objective:

- Comparison of the validity of four fall-related psychological measures in a community-based falls risk screening (Study 1, Chapter 3)
- An examination of the responsiveness of the Activities-specific Balance Confidence scale in a community-based falls risk screening context (Study 2, Chapter 4).

Therefore, the purposes of the final chapter are to (a) summarize the main findings of studies one and two, (b) discuss the strengths and (c) limitations of both studies, (d) identify areas for future research, and (e) convey the general implications of this research.

Summary of the Dissertation Studies

Study 1: Comparing the Validity of Four Fall-Related Psychological Instruments in a Community-Based Falls Risk Screening Context

The main purpose of study 1 (Chapter 3) was to test the psychometric properties of the FES-I, ABC, mSAFFE, and CoF scales in a community-based falls risk screening context. One-hundred and thirty-three adults over age 50 (M age = 74.1 yr, SD = 9.5) participated in a community-based falls risk screening and a phone interview following the screening. Study one participants were mostly female (77.4%), Caucasian (52.6%), and widowed (39.8%) from majority Caucasian facilities (74%) with education levels greater than high school (51.1%). Evidence of the psychometric properties of the instruments included the following:

- Validity evidence:
  - Moderate to large correlations between FES-I, ABC, mSAFFE, and CoF
Moderate correlations for the ABC and mSAFFE with physical activity and small correlations for the FES-I and CoF with physical activity

Small and moderate correlations for FES-I, ABC, mSAFFE, and CoF with health-related quality of life (HRQL)

Moderate correlations for ABC, mSAFFE, and CoF with Expanded Timed Get-Up-and-Go Test (ETGUG) scores

Significant differences in ABC scores for fallers versus non-fallers

- Reliability evidence:
  - Internal consistency values with lower confidence limits above .70 for FES-I, ABC, mSAFFE, and CoF

In addition, results from study one revealed that the ABC scale explained approximately 25% of the variance in total falls risk score.

**Study 2: Responsiveness of the ABC in a Community-Based Falls Risk Screening Context**

The main purpose of this study was to test the sensitivity of the ABC scale in detecting changes in falling status over a 12-month time period. Participants included 21 older adults (Mean age = 74.2 yr, SD = 11.3) who volunteered to participate in two falls risk screenings that were approximately 12 months apart (Mean = 12.4 months, SD = .7). The majority of study two participants were female (95.2%) and Caucasian (61.9%), with approximately 38% fallers at time 1 and 43% fallers at time 2. Results revealed that the ABC was not sensitive to change in a falls risk screening context; however, a low statistical power limits confidence in this finding.

**Strengths of the Dissertation Studies**

There are several unique aspects of the dissertation studies that add to the research literature on the psychological issues of falls. Guided by the recommendations of a recent literature review on the psychological outcomes of falling (Jorstad et al., 2005), the present research attempts to clarify some
of the confusion that presently exists within the fall-related psychological literature by examining the measurement properties of four fall-related psychological instruments. One of the strengths of this research was that it was the first to provide evidence of the reliability and validity of the ABC, mSAFFE, FES-I, and CoF scales for use among independent-living older adults in a community-based falls risk screening context. Although several of these measures were tested in laboratory settings (Lajoie & Gallagher, 2004), participant homes (Lachman et al., 1998; Powell & Myers, 1995), or in clinical fall prevention trials (Talley, Wyman, & Gross, 2008; Yardley & Smith, 2002), the dissertation studies were the first to examine their measurement properties in a falls risk screening context where community members were actively involved in the research process. Additionally, at the time study one was conducted, the FES-I, mSAFFE, and CoF scales had yet to be used in the United States with a racially and economically diverse population or validated against measures of mobility, physical activity, or HRQL. Further, the additional psychometric evidence for the validity of the mSAFFE and CoF scales in an independent-living older adult population was another major strength of this research.

A second strength of this research was that it was the first to predict falls risk using a fall-related psychological measure. Researchers have used other instruments including mobility measures such as the Timed Up and Go Test to predict falls risk (Shumway-Cook, Brauer, Woollacott, 2000), but this was the first study designed to evaluate fall-related psychological measures among independent-living older adults based on their ability to predict falls risk using a comprehensive falls risk screening instrument (Ellis et al., 2007a; 2007b).

A third strength of this research was that it was the first to test the sensitivity of a fall-related psychological instrument in a falls risk screening context. Jorstad and colleagues’ review indicated that previous studies have failed to provide sufficient evidence for the sensitivity of fall-related psychological instruments (Jorstad et al., 2005). Consequently, although findings from this research did not support the sensitivity of the ABC in this setting, the results add to the available research literature on the psychometric properties of fall-related psychological instruments.
A fourth strength of the dissertation studies was the demographic composition of the participants. Because the falls risk screenings attracted a racially and economically diverse group of older adults, the findings from this research provide support for these instruments amongst a diverse range of older adults who may be at-risk for falls.

Finally, one of the most important contributions of this research is that the results from the dissertation studies suggest that balance confidence appears to be the most meaningful fall-related psychological construct to assess in a falls risk screening context where members of the community are actively involved in the research process. Consequently, researchers can use these findings to identify strategies to enhance balance-specific self-efficacy (i.e., balance confidence) to prevent falls among older adults in the community. Because high self-efficacy is known to have a buffering effect on functional decline for older adults (Mendes de Leon et al., 1996), successful community-based interventions should focus on enhancing self-efficacy in everyday physical and mobility-related tasks (Li et al., 2002) to reduce fear of falling, improve functional abilities, enhance HRQL, and ultimately prevent future falls. Specifically, balance confidence could be enhanced through participating in a gradually progressing, group-based strength training or Tai Chi program where positive performance experiences and vicarious experiences can be fostered.

**Limitations of the Dissertation Studies**

Although the dissertation studies made several unique contributions to the literature, there were several limitations of this research. For example, one of the major limitations of this research was the small sample size obtained in study two. Compared to the 128 participants needed to conduct a powerful enough analysis, study two included 21 participants. Accordingly, without a larger sample size it is not possible to determine whether the ABC is truly sensitive to change in a community-based falls risk screening context.

A second limitation of the dissertation studies was that participants volunteered to participate, which made both study samples self-selected. Consequently, results may be biased in favor of older
adults that are more likely to volunteer and may not adequately reflect the full spectrum of psychological difficulties related to falls and falls risk among all independent-living older adults. A third limitation of the dissertation studies was the comparatively small number of male versus female participants. For example, only 22.4% and 4.8% of the study one and two participants, respectively were males, which compromises the generalizability of the results of the dissertation studies to the older adult male population.

A fourth limitation, which was specific to study one, was that HRQL data was collected by phone following the collection of demographic, fall-related psychological, physical activity, and falls risk data. Implications of this decision included a reduced total sample size and the possibility that HRQL data did not accurately reflect self-reported HRQL at the time of the screening; however, this only affected 45 (out of 189) participants and the analyses were appropriately powered to test the study hypotheses. A final limitation of the dissertation studies was the use of self-reported information. Due to the self-report nature of the data, recall bias and/or social desirability bias may have affected the results of both dissertation studies. Because data from studies one and two relied heavily on the recall of older adults, 35% and 43% of whom were over 80 years of age, respectively, there may be some limitations to the quality of the data obtained from this research. Moreover, in study two it is possible that participants may have been misclassified as non-fallers if they could not remember whether they had fallen in the past year.

**Directions for Future Research**

These investigations bring to light several areas in which future research efforts could be targeted. Based on the psychometric support for the ABC attained in study one, a possible area for future research could be to compare the measurement properties of a shorter variation of the ABC (Filiatrault et al., 2007; Peretz, Herman, Hausdorff, & Giladi, 2006) with the original version for use in a community-based falls risk screening context. This would be an important area for future research considering the need for short, quick assessments in community-based health screenings.
Another important direction for future research involves assessing the sensitivity of the ABC in a falls risk screening context with more participants. Because this was a major limitation of this research, a more powerful study that replicates the study design would provide more evidence to determine whether the ABC was sensitive to detecting changes in balance confidence after experiencing a community-based falls risk screening. Further, additional research is needed to test the sensitivity of the ABC when examining the effectiveness of falls prevention interventions. Previous investigators have shown that multifactorial falls prevention interventions can reduce fear of falling and improve balance confidence (Brouwer, Walker, Rydahl, & Culham, 2003; Liu-Ambrose, Khan, Eng, Lord, & McKay, 2004; Tennstedt et al., 1998; Tinetti et al., 1994); however, more research is needed to determine the extent to which the ABC is sensitive to change following this type of intervention. Along these lines, more research is also needed to test the sensitivity of the ABC, and the sensitivity of instruments that measure other fall-related psychological constructs (i.e., falls efficacy, fear of falling, consequences of falling, etc.) in different contexts with a broad range of older adults from various racial and socioeconomic backgrounds.

Another potential future direction for research could be to test these instruments in a community-based falls risk screening setting after the community organizations have transitioned into collecting data on their own members. Because transitioning the community to take over the assessment process is the ultimate goal of conducting these falls risk screenings in a community-based setting, research efforts should be directed towards evaluating the data collected after the researchers have finished conducting their study. From there, multifactorial falls prevention interventions can be implemented to target physical and environmental risk factors, enhance balance confidence levels, increase activity, and ultimately decrease risk for falls and actual falls. Moreover, self-efficacy strategies including watching other older adults participate in physical activities such as Tai Chi, or talking with older adults who have fallen in the past and are now more confident in their balance ability, could be
incorporated into these interventions to target those with the most severe fall-related psychological issues who have severely restricted their activity and are at the highest risk for falls.

**General Implications and Conclusion**

The overall purpose of this dissertation was to evaluate the psychometric properties of several fall-related psychological measures for use among independent-living older adults in a community-based falls risk screening context. In so doing, the reliability and validity of four fall-related psychological instruments (Study 1, Chapter 3), and the responsiveness of one fall-related psychological instrument (Study 2, Chapter 4) were tested in a community-based falls risk screening. Collectively, the results from the dissertation studies (a) provide additional evidence to support the reliability and validity of the ABC, FES-I, mSAFFE, and CoF scales in a community-based falls risk screening context, (b) suggest that the ABC may be the better instrument to choose in this context based on its ability to detect differences in balance confidence levels between fallers and non-fallers and to explain a greater amount of variance in total falls risk score compared to the other instruments, and (c) show that the ABC is not sensitive to change in this setting. The results from the dissertation studies confirm prior findings regarding the measurement properties of these instruments and provide additional evidence to suggest that the ABC is not sensitive to change in a community-based setting. The findings from this research can aid researchers and health-care professionals in choosing a fall-related psychological instrument(s) to employ in a community-based falls risk-screening to assess psychological issues related to falls.
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LSU IRB
ACTION ON PROTOCOL APPROVAL REQUEST

TO:            Rebecca E. Gardner
               Kinesiology
FROM:          Robert C. Mathews
               Chair, Institutional Review Board for Research with Human Subjects
DATE:          March 14, 2007
C:             IRB# 2617
TITLE:         “Falls and Fracture Risk in Southeast Louisiana Seniors”

New Protocol/Modification: M
Review type: Full X Expedited Review date: 03/14/2007
Approved X Disapproved

Approval Date: 03/14/2007 Approval Expiration Date: 07/08/2008

Risk Assessment: Minimal X Uncertain Greater than Minimal

Re-review frequency: (annual unless otherwise stated)

Number of subjects approved: 1000

By: Robert C. Mathews

PRINCIPAL INVESTIGATOR: PLEASE READ THE FOLLOWING — Continuing approval is CONDITIONAL on:

1. Adherence to the approved protocol, familiarity with, and adherence to the ethical standards of the Belmont Report, and LSU’s Assurance of Compliance with DHHS regulations for the protection of human subjects*
2. Prior approval of a change in protocol, including revision of the consent documents or an increase in the number of subjects over that approved.
3. Obtaining renewed approval (or submittal of a termination report), prior to the approval expiration date, upon request by the IRB office (irrespective of when the project actually begins), notification of project termination.
4. Retention of documentation of informed consent and study records for at least 3 years after the study ends.
5. Continuing attention to the physical and psychological well-being and informed consent of the individual participants including notification of new information that might affect consent.
6. A prompt report to the IRB of any adverse event affecting a participant potentially arising from the study.
8. SPECIAL NOTE:

*All investigators and support staff have access to copies of the Belmont Report, LSU’s Assurance with DHHS, DHHS (45 CFR 46) and FDA regulations governing use of human subjects, and other relevant documents in print in this office or on our World Wide Web site at http://www.ccr.lsu.edu/csr/comply.html
Title of Study:
Falls and Fracture Risk in Southeast Louisiana Seniors

What you should know about a research study
- We give you this consent form so that you may read about the purpose, risks and benefits of this research study.
- The main goal of research studies is to gain knowledge that may help future patients.
- You have the right to refuse to take part, or agree to take part now and change your mind later on.
- Please review this consent form carefully and ask any questions before you make a decision.
- Your participation is voluntary.
- By signing this consent form, you agree to participate in the study as it is described.

1- Who is doing the study?
Principal Investigator: Rebecca Ellis Tel: 225-578-5954
J. M. Fabre

Co-Investigator: G. Tuuri, PhD
M. Kosma
K. McCarter
D. Sasser
F. Holton
I. Antikainen
D. Moore
S. Singh P. Page

We expect to enroll as many as 1000 participants in this study all over the age of 50.

2- Where is the study being conducted?
The falls risk screening in which you participate will require you to attend a 30 to 60-minute session at one of several locations where testing is provided. The testing sites will include several Councils on Aging offices, multiple chapters of the YMCA, community centers and residential living centers for older adults. A complete list of the testing sites will be provided upon request. Two follow-up phone calls or interviews will also be requested within 12 weeks of the screening.

3- What is the purpose of this study?
The purposes of this study are to evaluate the usefulness of a fall-risk screening tool, and to examine rate of self-reported falls and changes in fall and fracture risk over 5-years among older adults residing in Baton Rouge and the surrounding parishes.

4- Who is eligible to participate in the study? Who is ineligible?

Inclusion Criteria:
- This study requires that participants are 50 years of age or older.

Exclusion Criteria:
- Persons who are known to have severe memory problems
- Persons who are wheel-chair bound, or who are otherwise completely incapable of walking.

5- What will happen to you if you take part in the study?

The purpose of the study is to assess your falls-risk and to monitor your falls-risk on an annual basis over a 5-year period. Some of this information will be collected in person at the falls risk screenings and others will be obtained during follow-up phone calls.

The assessments will include:

- **Personal History Questionnaire**, which will include questions about age, race, gender, education level, income, marital status, and so on.
- **Medical History Questionnaire**, which will ask questions about any diseases or conditions that you have experienced, current medication usage, number of falls within recent years, injuries due to recent falls, alcohol consumption, use of assistive devices, etc.
- **Physical Activity Questionnaire**, which will require you to respond to questions about your activities of daily living, leisure-time physical activity, and any exercise in which you have been engaged.
- **Psychological-related Falls Questionnaires**, which will require you to answer questions about your confidence level with regard to performing certain activities without falling.
- **Home Safety Checklist**, which will ask you to respond to close-ended (yes or no) questions about certain items that may exist in your home and may pose a falls-risk.
- **Vision Tests**, that will include reading letters off of a standard vision-test chart from 20 feet, and reporting differences in shading of objects from a contrast vision-test chart.
- **Physical Function Tests**, which will include measuring your ability to reach forward without stepping, and your ability to get up from a chair with no arms, walk 10 meters, and return to the chair and sit.
- **Self-report of Physical Function**, which will require you to answer questions
describing your ability and comfort when performing activities of daily living.

- **Health-related Quality of Life**, which will require you to answer questions about your appraisal of your own health and how it impacts your quality of life.
- **Bone Stiffness Assessment**, which will require you to sit in a chair, remove a shoe and sock or stocking and place your heel on a small device that uses sound waves to assess your bone stiffness. The assessment is very brief, lasting only 30 seconds.

**6- What are the possible risks and discomforts?**

There are no known risks associated with any of the assessments. However, rising from a seated position may result in dizziness, and performing activities may also cause you to feel unsteady or lose your balance. You should report any such feelings to the tester, who will be with you throughout the screening to assist you. If you typically use assistive devices such as walkers or canes, you may use them during the screening.

**7- What are the possible benefits?**

While there are no particular health benefits to having the above procedures performed, the information gathered will allow us to provide you with some information about the extent to which you might be at risk for falling, and may assist you identifying steps to reduce your risk of falling. The information will also be used to further our understanding of falls-risk and falls so that we might improve falls prevention strategies.

**8- If you do not want to take part in the study, are there other choices?**

You have the right to withdraw from this research study at any time without penalty. If you choose not to participate in this study, this will not affect any rights or benefits to which you are otherwise entitled.

**9- If you have any questions or problems, whom can you call?**

If you have any questions about your rights as a research volunteer, you should call the Institutional Review Board Office at 225-578-8692. If you have any questions about the research study, contact Dr. Rebecca Ellis at 225-578-5954.
10- What information will be kept private?

Every effort will be made to maintain the confidentiality of your study records. Only those investigators listed on this consent form will be able to access your information. Results of the study may be published; however, we will keep your name and other identifying information private. Other than as set forth above, your identity will remain confidential unless law requires disclosure.

You may request a copy of your records for a period up to three years after the planned conclusion of the study (January 2011), and you may request that a copy of your records be sent to your physician.

11- Can your taking part in the study end early?

The investigators can withdraw you from the study for any reason or for no reason. You may withdraw from the study at any time without penalty. Possible reasons for withdrawal include inability or unwillingness to complete the required testing.

12- What if information becomes available that might affect your decision to stay in the study?

During the course of this study there may be new findings from this or other research, which may affect your willingness to continue participation. Information concerning any such new findings will be provided to you.

13- What charges will you have to pay?

None.

14- What payment will you receive?

You will be reimbursed $15.00 for completing the assessments.

15- Will you be compensated for a study-related injury or medical illness?

No form of compensation for medical treatment or for other damages (i.e., lost wages, time lost from work, etc.) is available from LSU A&M College. In the event of injury or medical illness resulting from the research procedures in which you participate, you will be referred to a treatment facility. Medical treatment may be provided at your expense or at the expense of
your health care insurer (e.g., Medicare, Medicaid, Blue Cross-Blue Shield, Dental Insurer, etc.), which may or may not provide coverage.

16- Healthy Insurance Portability and Accountability Act (HIPAA)

Records that you give us permission to keep, and that identify you, will be kept confidential as required by law. Federal Privacy Regulations provide safeguards for privacy, security, and authorized access. Except when required by law, you will not be identified by name, address, telephone number or any other direct personal identifier.

17- Signatures

The study has been discussed with me and all my questions have been answered. I understand that additional questions regarding the study should be directed to the study investigators. I agree with the terms above and acknowledge that I have been given a copy of the consent form.

With my signature I acknowledge that I have been given either today or in the past a copy of the Notice of Privacy Practices for Protected Health Information.

__________________________________                              _____________
Signature of Volunteer         Date

__________________________________
Date of Birth of Volunteer

__________________________________________             _____________
Signature of Person Administering Informed Consent             Date

The study volunteer has indicated to me that the volunteer is unable to read. I certify that I have read this consent form to the volunteer and explained that by completing the signature line above the volunteer has agreed to participate.

_________________________________                                ______________
Signature of Reader                                                                   Date
APPENDIX C
PARTICIPANT INFORMATION QUESTIONNAIRE

Participant Information

Identification

1. Name: ____________________ First: ____________________ Middle: ____________________

2. Marital Status: ☐ S ☐ M ☐ W ☐ D

3. Gender: ☐ Male ☐ Female

4. Social Security Number: ____________________

5. Address:

   Street/PO Box ____________________ Town ____________________ State __________ Zip __________

6. Do you use a walking aid such as a cane or walker? ☐ Yes ☐ No

   If so, what do you use most often? __________________________

   Have you fallen while using one? When? ______________________

   Have you fallen when you were not using one? ______________________

7. History of Diseases: __________________________

   __________________________

8. What is your race or ethnic background?
   a. _____ White or Caucasian
   b. _____ Black or African American
   c. _____ American Indian / Alaskan Native
   d. _____ Hispanic or Latino (Mexican, Puerto Rican, Cuban, Other)
   e. _____ Asian (Asian Indian, Chinese, Filipino, Japanese, Korean, Vietnamese, Other)
   f. _____ Native Hawaiian and Other Pacific Islander
   g. _____ Other (specify: __________________________)

9. Household Size:
   a. _____ 1 person
   b. _____ 2 people
   c. _____ 3 people
   d. _____ 4 people
   e. _____ 5 people

10. Education Level (check highest level):
    a. _____ Less than 9th grade
    b. _____ High school graduate/GED
    c. _____ Some college, no degree
    d. _____ Associated degree
    e. _____ Bachelor’s degree
    f. _____ Graduate or professional degree

11. Income:
    a. _____ $776 or less monthly
    b. _____ $1041 or less monthly
    c. _____ $1306 or less monthly
    d. _____ $1571 or less monthly
    e. _____ $1836 or less monthly
    f. _____ Annual $25,000 to $34,999
    g. _____ Annual $35,000 to $49,999
    h. _____ Annual $50,000 or greater

Emergency Contact Information

Relative / Friend:

   (Name) (Phone) (Phone)
APPENDIX D
HOME ASSESSMENT CHART

Name: ____________________     Date ________________

Please take a walk through your home with this checklist. Taking a few extra minutes to improve your home could prevent a fall and add years to your life.

Please bring this completed checklist with you for your screening visit.

1. Do you have handrails on both sides of all stairways in your home – including the outside stairs? □ Yes  □ No

2. Do the stair rails extend the full length of the stairway? □ Yes  □ No

3. Are stairways well lit with lights at the top and bottom of the stairs? □ Yes  □ No

4. Do you have nightlights to help light your bathrooms, bedrooms, and hallways during evening hours? □ Yes  □ No

5. Are you able to turn on a light immediately upon entering a room? □ Yes  □ No

6. Do you have grab bars in your bath and shower stalls as well as on the sides of the toilet? (Never use towel racks or soap dishes as grab bars, they can easily come loose, causing a fall) □ Yes  □ No

7. Do you have a non-slip mat or safety decals in your bath and shower? □ Yes  □ No

8. Do you remove soap build-up in the tub and shower on a regular basis to avoid slipping? □ Yes  □ No

9. If you have area rugs, do they have rug-liners underneath, dual-sided tape, or non-skid backs? □ Yes  □ No

10. Are your steps, landings, and floors clear of clutter? (Always keep these areas clear, and don’t forget to safely tuck telephone and electrical cords out of walkways) □ Yes  □ No

11. Do you keep floors clean by promptly wiping up grease, water, and other spills? □ Yes  □ No

12. Are things you use often stored on easy-to-reach shelves, so that you don’t need to reach too high or bend too low to get them? □ Yes  □ No
**APPENDIX E**

**MEDICATION LIST**

---

**My Medication List**

<table>
<thead>
<tr>
<th>Name of Medicine</th>
<th>What is it for?</th>
<th>Doctor who prescribed?</th>
<th>How &amp; When do I take it?</th>
<th>How much do I take?</th>
<th>Color, Shape?</th>
<th>Side Effects or Warning?</th>
</tr>
</thead>
</table>

**List your prescription and over the counter medicines as well as your dietary supplements**

Please bring this completed list with you for your screening visit.
APPENDIX F
FALLS EFFICACY SCALE-INTERNATIONAL (FES-I)

FES-I

Now we would like to ask some questions about how concerned you are about the possibility of falling. Please reply thinking about how you usually do the activity. If you currently don’t do the activity (e.g. if someone does your shopping for you), please answer to show whether you think you would be concerned about falling if you did the activity. For each of the following activities, please tick the box which is closest to your own opinion to show how concerned you are that you might fall if you did this activity.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Not at all concerned</th>
<th>Somewhat concerned</th>
<th>Fairly concerned</th>
<th>Very concerned</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Cleaning the house (e.g. sweep, vacuum or dust)</td>
<td>1 □</td>
<td>2 □</td>
<td>3 □</td>
<td>4 □</td>
</tr>
<tr>
<td>2 Getting dressed or undressed</td>
<td>1 □</td>
<td>2 □</td>
<td>3 □</td>
<td>4 □</td>
</tr>
<tr>
<td>3 Preparing simple meals</td>
<td>1 □</td>
<td>2 □</td>
<td>3 □</td>
<td>4 □</td>
</tr>
<tr>
<td>4 Taking a bath or shower</td>
<td>1 □</td>
<td>2 □</td>
<td>3 □</td>
<td>4 □</td>
</tr>
<tr>
<td>5 Going to the shop</td>
<td>1 □</td>
<td>2 □</td>
<td>3 □</td>
<td>4 □</td>
</tr>
<tr>
<td>6 Getting in or out of a chair</td>
<td>1 □</td>
<td>2 □</td>
<td>3 □</td>
<td>4 □</td>
</tr>
<tr>
<td>7 Going up or down stairs</td>
<td>1 □</td>
<td>2 □</td>
<td>3 □</td>
<td>4 □</td>
</tr>
<tr>
<td>8 Walking around in the neighbourhood</td>
<td>1 □</td>
<td>2 □</td>
<td>3 □</td>
<td>4 □</td>
</tr>
<tr>
<td>9 Reaching for something above your head or on the ground</td>
<td>1 □</td>
<td>2 □</td>
<td>3 □</td>
<td>4 □</td>
</tr>
<tr>
<td>10 Going to answer the telephone before it stops ringing</td>
<td>1 □</td>
<td>2 □</td>
<td>3 □</td>
<td>4 □</td>
</tr>
<tr>
<td>11 Walking on a slippery surface (e.g. wet or icy)</td>
<td>1 □</td>
<td>2 □</td>
<td>3 □</td>
<td>4 □</td>
</tr>
<tr>
<td>12 Visiting a friend or relative</td>
<td>1 □</td>
<td>2 □</td>
<td>3 □</td>
<td>4 □</td>
</tr>
<tr>
<td>13 Walking in a place with crowds</td>
<td>1 □</td>
<td>2 □</td>
<td>3 □</td>
<td>4 □</td>
</tr>
<tr>
<td>14 Walking on an uneven surface (e.g. rocky ground, poorly maintained pavement)</td>
<td>1 □</td>
<td>2 □</td>
<td>3 □</td>
<td>4 □</td>
</tr>
<tr>
<td>15 Walking up or down a slope</td>
<td>1 □</td>
<td>2 □</td>
<td>3 □</td>
<td>4 □</td>
</tr>
<tr>
<td>16 Going out to a social event (e.g. religious service, family gathering or club meeting)</td>
<td>1 □</td>
<td>2 □</td>
<td>3 □</td>
<td>4 □</td>
</tr>
</tbody>
</table>

FES-I: Prof Lucy Yardley and Prof Chris Todd
APPENDIX G
ACTIVITIES-SPECIFIC BALANCE CONFIDENCE (ABC) SCALE

The Activities-specific Balance Confidence (ABC) Scale

For each of the following activities, please indicate your level of self-confidence by choosing a corresponding number from the following rating scale:

<table>
<thead>
<tr>
<th>%</th>
<th>0%</th>
<th>10%</th>
<th>20%</th>
<th>30%</th>
<th>40%</th>
<th>50%</th>
<th>60%</th>
<th>70%</th>
<th>80%</th>
<th>90%</th>
<th>100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Confidence</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Completely</td>
</tr>
</tbody>
</table>

If you do not currently do the activity in question, try to imagine how confident you would be if you had to do the activity. If you normally use a walking aid or hold onto someone, rate your confidence as if you were using these supports. If you have any questions, please ask.

How confident are you that you can maintain your balance and remain steady when you…

1. walk around the house? _____%
2. walk up or down stairs? _____%
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 tip toes 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 the mall? _____%
11. walk up or down a ramp? _____%
12. walk in a crowded mall where people rapidly walk past you? _____%
13. are bumped into by people as you walk through the mall? _____%
14. step on or off an escalator while holding onto a railing? _____%
15. step on or off an escalator while holding parcels and cannot hold onto the railing? _____%
16. walk outside on icy sidewalks? _____%

Instructions for scoring:
Total the ratings (possible range = 0 to 1600) and divide by 16 (or the number of items completed) to get each person’s ABC score. If a person qualifies her response to items 2, 9, 11, 14, or 15, solicit separate ratings and use the lowest confidence of the two (as this will limit the entire activity, e.g., likelihood of using stairs). Total scores can be computed if at least 12 of the 16 items are answered and alpha does not decrease appreciably with the deletion of item 16-icy sidewalks-for administration in warmer climates.

Reference:
Now please circle the opinion closest to your own to show whether there are any things you avoid doing in case you fall over. For each activity below, please circle an answer to show whether you never avoid the activity, whether you sometimes try to avoid doing it in case you fall over, or if you always avoid doing the activity in case you fall. Please answer to show whether you think you WOULD do the activity even if you currently don’t need to do the activity (e.g. if someone else does your shopping for you).

Go to the shops. Would never avoid / sometimes avoid / always avoid
Clean your house. Would never avoid / sometimes avoid / always avoid
Prepare simple meals. Would never avoid / sometimes avoid / always avoid
Go to the doctor or dentist. Would never avoid / sometimes avoid / always avoid
Take a bath. Would never avoid / sometimes avoid / always avoid
Take a shower. Would never avoid / sometimes avoid / always avoid
Go for a walk. Would never avoid / sometimes avoid / always avoid
Go out when it is slippery. Would never avoid / sometimes avoid / always avoid
Visit a friend or relative. Would never avoid / sometimes avoid / always avoid
Go to a place with crowds. Would never avoid / sometimes avoid / always avoid
Go up and down stairs. Would never avoid / sometimes avoid / always avoid
Walk around indoors. Would never avoid / sometimes avoid / always avoid
Walk half a mile. Would never avoid / sometimes avoid / always avoid
Bend down to get something. Would never avoid / sometimes avoid / always avoid
Travel by public transport. Would never avoid / sometimes avoid / always avoid
Go out to a social event. Would never avoid / sometimes avoid / always avoid
Reach for something above your head. Would never avoid / sometimes avoid / always avoid
APPENDIX I
CONSEQUENCES OF FALLING (CoF) SCALE

CONSEQUENCES OF FALLING QUESTIONNAIRE

We want to know whether or not you have any worries about what might happen if you fell over. Please circle the answer which is closest to your own opinion. For example, if you think that you would not have any difficulty getting up if you fell over, then you should circle ‘disagree strongly’ for the first item.

I think that if I fall over ...

I will have difficulty getting up. disagree strongly / disagree / agree / agree strongly
I will cause a nuisance. disagree strongly / disagree / agree / agree strongly
I will lose my confidence. disagree strongly / disagree / agree / agree strongly
I cannot continue to be active. disagree strongly / disagree / agree / agree strongly
I will lose my independence. disagree strongly / disagree / agree / agree strongly
I will be embarrassed. disagree strongly / disagree / agree / agree strongly
I will be in pain. disagree strongly / disagree / agree / agree strongly
I will become disabled. disagree strongly / disagree / agree / agree strongly
I will feel foolish. disagree strongly / disagree / agree / agree strongly
I will be severely injured. disagree strongly / disagree / agree / agree strongly
I will be helpless. disagree strongly / disagree / agree / agree strongly
I will not be able to cope alone. disagree strongly / disagree / agree / agree strongly
PHYSICAL ACTIVITY SCALE
FOR THE ELDERLY

(P A S E)

For additional information about the PASE, contact:
Kevin W. Smith
New England Research Institutes, Inc.
9 Galen St.
Watertown, MA 02712

Telephone: (617) 923-7747
Fax: (617) 926-8246

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INSTRUCTIONS:

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

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

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

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

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

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

1a. What were these activities?

-------------------------------------------------------------------------------------------------

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

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

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

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

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

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

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

   [3.] 2-4 HOURS               [4.] MORE THAN 4 HOURS
3. Over the past 7 days, how often did you engage in light sport or recreational activities such as bowling, golf with a cart, shuffleboard, fishing from a boat or pier or other similar activities?

<table>
<thead>
<tr>
<th>[0.] NEVER</th>
<th>[1.] SELDOM</th>
<th>[2.] SOMETIMES</th>
<th>[3.] OFTEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>GO TO Q.#4</td>
<td>(1-2 DAYS)</td>
<td>(3-4 DAYS)</td>
<td>(5-7 DAYS)</td>
</tr>
</tbody>
</table>

3a. What were these activities?

|________________________________________|

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

<table>
<thead>
<tr>
<th>[1.] LESS THAN 1 HOUR</th>
<th>[2.] 1 BUT LESS THAN 2 HOURS</th>
</tr>
</thead>
<tbody>
<tr>
<td>[3.] 2-4 HOURS</td>
<td>[4.] MORE THAN 4 HOURS</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>[0.] NEVER</th>
<th>[1.] SELDOM</th>
<th>[2.] SOMETIMES</th>
<th>[3.] OFTEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>GO TO Q.#5</td>
<td>(1-2 DAYS)</td>
<td>(3-4 DAYS)</td>
<td>(5-7 DAYS)</td>
</tr>
</tbody>
</table>

4a. What were these activities?

|________________________________________|

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

<table>
<thead>
<tr>
<th>[1.] LESS THAN 1 HOUR</th>
<th>[2.] 1 BUT LESS THAN 2 HOURS</th>
</tr>
</thead>
<tbody>
<tr>
<td>[3.] 2-4 HOURS</td>
<td>[4.] MORE THAN 4 HOURS</td>
</tr>
</tbody>
</table>
5. Over the past 7 days, how often did you engage in strenuous sport and recreational activities such as jogging, swimming, cycling, singles tennis, aerobic dance, skiing (downhill or cross-country) or other similar activities?

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

5a. What were these activities?
_________________________________________

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

[1.] LESS THAN 1 HOUR  [2.] 1 BUT LESS THAN 2 HOURS
[3.] 2-4 HOURS  [4.] MORE THAN 4 HOURS

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

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

6a. What were these activities?
_________________________________________

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

[1.] LESS THAN 1 HOUR  [2.] 1 BUT LESS THAN 2 HOURS
[3.] 2-4 HOURS  [4.] MORE THAN 4 HOURS
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.

<table>
<thead>
<tr>
<th></th>
<th>NO</th>
<th>YES</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Home repairs like painting, wallpapering, electrical work, etc.</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>b. Lawn work or yard care, including snow or leaf removal, wood chopping, etc.</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>c. Outdoor gardening</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>d. Caring for an other person, such as children, dependent spouse, or an other adult</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>
WORK-RELATED ACTIVITY

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

[1.] NO [2.] YES

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

__________________ HOURS

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

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

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

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

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

9 Galen Street
Watertown, MA 02172
(617) 923-7747
THANK YOU FOR TAKING THE TIME AND EFFORT
TO COMPLETE THIS QUESTIONNAIRE!
LAAAP Falls and Fracture Risk in Southeast Louisiana Seniors

SF-36 Interview
<table>
<thead>
<tr>
<th>IF DID NOT PARTICIPATE (Circle one):</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Deceased</td>
</tr>
<tr>
<td>2</td>
<td>Refused to participate</td>
</tr>
<tr>
<td></td>
<td>Not interested/Doesn't want to get involved</td>
</tr>
<tr>
<td></td>
<td>Sick/poor health</td>
</tr>
<tr>
<td></td>
<td>Too busy/Takes too much time</td>
</tr>
<tr>
<td></td>
<td>Doesn't want to give out personal information</td>
</tr>
<tr>
<td></td>
<td>Doesn't do studies/surveys</td>
</tr>
<tr>
<td></td>
<td>Doesn't want to do physical assessments</td>
</tr>
<tr>
<td></td>
<td>Other</td>
</tr>
</tbody>
</table>

**SPECIFY**

<table>
<thead>
<tr>
<th>3</th>
<th>Other person refused participation</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Scheduled for return phone call</td>
</tr>
<tr>
<td>5</td>
<td>Scheduled for interview</td>
</tr>
<tr>
<td>6</td>
<td>Not Home/ Not Available</td>
</tr>
<tr>
<td>7</td>
<td>Other</td>
</tr>
</tbody>
</table>
“Hello. My name is __________________. I’m calling from the Department of Kinesiology at LSU to ask some follow-up questions to the falls risk screening. May I please speak with (NAME).”

IF DECEASED, End call with the following: “I’m sorry to hear that. Thank you very much for your time.”

IF NOT HOME: “When would be a good time for me to call back?” ______________ (RECORD CALL BACK TIME ON PAGE 2)

IF ANSWERING MACHINE: HANG UP AND TRY BACK LATER, DIFFERENT TIME OF DAY. (DO NOT LEAVE NAME, MESSAGE OR ANY INFORMATION).

IF ANSWERED THE PHONE, READ: “Hello, (PARTICIPANT NAME). I’m calling to ask you some follow-up questions to the recent falls risk screening at ______ (identify their location). At the screening, you indicated that you would be willing to answer some additional questions for us, is that still the case?

IF AT HOME AND DID NOT ANSWER THE PHONE, READ THE FOLLOWING WHEN THEY GET ON THE PHONE: “Hello, (NAME). My name is __________________. I’m calling from the Department of Kinesiology at LSU about the recent falls risk screening at ______ (identify their location). At the screening, you indicated that you would be willing to answer some additional questions for us, is that still the case?

IF YES, WILLING TO PARTICIPATE: Well, the interview will likely take about 20 minutes. Do you have time to answer these questions right now while I have you on the phone?”

IF YES: CONTINUE WITH INTERVIEW QUESTIONS. RECORD ANSWERS DIRECTLY ON QUESTIONNAIRES. REMEMBER TO RECORD PARTICIPANT ID # ON THE TOP OF EACH QUESTIONNAIRE. AT THE END OF INTERVIEW, THANK THEM FOR THEIR HELP.

IF NO: “Ok, then we’d like to set up an appointment to call you back.”

“What day and time is most convenient for an interview?”

DAY __________________

DATE __ __/__ __/__ __

TIME ___ : ___ AM/PM
“Thank you, again, for your time. We look forward to talking to you on (DAY, DATE, TIME) In the meantime, if you need to reach us or have any questions about the study, the interview, or this telephone call, please feel free to contact _______________.”

END TELEPHONE CALL.

IF NO, NOT WILLING TO PARTICIPATE: “Would you please tell me the reason you would not like to participate?”

(Listen to reason: and respond); List Reason___________________________________________

“I understand your concerns. We are trying to better understand how to prevent falls in older adults, and would truly value any help you can provide. I want to assure you that your responses will be kept confidential, and that you can refuse to answer any question that you do not want to answer.”

“Would you be willing to participate in this interview?” Y N

IF NO CONTINUES:

“Would you prefer for us to speak with you in person?” Y N

IF YES: “Ok, then we’d like to set up an appointment to meet with you.”

“What day and time is most convenient for an interview?”

DAY ________________ DATE __ __/ __/ __ __

TIME __ __ : __ __ AM/PM PLACE _________________________________

“Thank you, again, for your time. We look forward to meeting with you on (DAY, DATE, TIME). In the meantime, if you need to reach us or have any questions about the study, the interview, or this telephone call, please feel free to contact _______________.”

IF NO CONTINUES: “If you change your mind or you would like to talk with someone about the study at another time, please call us at 225-578-9142. Thank you for your time.”

END TELEPHONE CALL.

RECORD FINAL STATUS “REFUSED” AND REASONS ON PAGE 2.
VITA

Delilah Susanne Moore was born in August 1979, in Rochester, New York. She graduated from Capistrano Valley High School in Mission Viejo, California, in 1997. In 2001, Delilah graduated cum laude with a Bachelor of Arts degree in communications studies from the University of California at Los Angeles in Los Angeles, California. In 2002, Delilah was accepted to the graduate program at the University of Nevada, Las Vegas, and received her Master of Science in exercise physiology in the spring of 2004. Shortly after graduation, Delilah moved to Baton Rouge, Louisiana, with her husband Joey, to attend Louisiana State University to pursue her doctoral degree with a specialization in exercise psychology and health promotion and a minor in applied statistics. While at Louisiana State University, Delilah was recipient of the Don Frank’s Presidential Challenge Fellowship, College of Education Lilian Olson Scholarship, GRADS Travel Award, and the American Alliance for Health, Physical Education, Recreation and Dance (AAHPERD) Research Consortium Graduate Student Research Grant. Recently, Delilah has accepted a position as a financial analyst with the Louisiana Health Care (LHC) Group in Lafayette, Louisiana.