ENGAGEMENT WITH ACTIVITY AND FUNCTIONAL STATUS AMONG OLDER ADULTS.

by

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Presented to the Faculty of the Graduate School of

The University of Texas at Arlington in Partial Fulfillment

of the Requirements

for the Degree of

DOCTOR OF PHILOSOPHY

THE UNIVERSITY OF TEXAS AT ARLINGTON

May 2016

Acknowledgements

The author gratefully acknowledges a grant from the Ferne Kyba Endowed Fellowship at the University of Texas at Arlington College of Nursing and Health Innovation in support of this research. In addition, the author would like to acknowledge the help of many professors and mentors. In addition to his dissertation chair, Dr. Kathryn Daniel, and his committee members, Dr. Barbara Raudonis and Dr. Daisha Cipher, he would like to mention Dr. Jennifer Gray, Dr. Patricia Newcomb, Dr. Susan Baxley, and Dr. Nancy Burns.

ABSTRACT

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This study reports on the relationship between engagement with activity and functional status in a sample of 92 older adults. Engagement was found to be a significant predictor of functional status as measured by the Lawton-Brody Instrumental Activities of Daily Living Scale, but was not statistically significant when functional status was measured using the Katz Index of Independence in Activities of Daily Living. Age was found to be a significant covariate, but comorbidity, depression, and marital status were not statistically significant in the models tested.

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Overview of Functional Decline

Introduction

Functional decline is a problem for older adults (Simone & Haas, 2013), for their family members (Nichols et al., 2009), and for society itself (Kaye, Harrington, & LaPlante, 2010. As the proportion of older adults in society increases (United Nations, Department of Economic and Social Affairs, Population Division, 2013), the problem of functional decline in the elderly can be expected to grow. Previous research has identified activity as one of the factors which is associated with functional status (Everard et al., 2000)

This chapter includes a description of the significance of the problem of declining functional status in older adults in terms of magnitude of the problem and impact on patients, families, society, and the economy. Previous research on the relationship between functional status and activity is discussed. It also includes an overview of evidence to support a proposal for a study of the relationship between engagement with activity and functional status among older adults. A description of the framework for this study, which is based on activity theory, continuity theory, and role accumulation theory, is presented. The purpose of the study, the research questions, and the assumptions of the framework are also included.

Background and Significance

Functional status is the extent to which a person can perform activities of daily living (ADLs) and instrumental activities of daily living (IADLs) independently (Graf, 2008; Inouye, Bogardus, Baker, Leo-Summers, & Cooney, 2000). Ability to perform IADLs and intact mobility are considered to be more sensitive indicators of functional status than ability to do independent ADLs (Graf, 2008). Although only 2% of the general population requires assistance with ADLs, the proportion rises to 3.5% of those 65-74 years old, and to 9% for those 75 years and older (Adams, Lucas, & Barnes, 2008).

ADLs are the basic self-care activities required to maintain life, health, and comfort (Graf, 2008). Typically ADLs are considered to be eating, transfers, continence, toileting, bathing, and dressing. IADLs are the supportive activities which also contribute to maintaining life, health, and comfort. These activities include using the telephone, shopping, meal preparation, keeping house, doing laundry, using transportation, medication management, and money management.

Functional status is an important determinant of quality of life among older adults (Halvorsrud, Kirkevold, Diseth, & Kalfoss, 2010; Simone & Haas, 2013; Thanakwang, Soonthorndhada, & Mongkolprasoet, 2012). In a Canadian study of heart attack patients, those with prior functional decline had greater mortality than those with intact functional status (Decourcelle, Maréchaux, Pinçon, Barrailler, & Ennezat, 2013).

Functional status is also important to family members of older adults. When older adults' functional status declines, family members often become caregivers. Informal caregivers have higher rates of depression and anxiety than peers who are not caregivers and are often neglectful of their own health (Nichols et al., 2009; Willette-Murphy, Todero, & Yeaworth, 2006). Society also pays a price for declining functional status. Functional decline is a prime driver of the need for long-term care. The current annual cost of long-term care in the United States (US) is estimated to be 147.4 billion dollars (Kaye, Harrington, & LaPlante, 2010).

Population

There are presently about 40 million people older than 64 years of age in the US (12.9% of the population) (US Census Bureau, 2011). About one million of those people live in assisted living facilities (ALFs) (Aud & Rantz, 2005). Although only 2% of the adult population in general need assistance with at least one ADL, 9% of adults over 75 years of age require such assistance (Adams et al., 2008). About 74% of people living in ALFs receive help with at least one ADL. The typical ALF resident is a female (70%) with a median age of 85. She has an average of two or three chronic medical conditions, and requires assistance with two or three ADLs. No specific information was found about the level of IADL dependence of the typical ALF resident, but the decision to move into an ALF is a response to the perception of some level of dependence, and

level of dependence tends to increase with length of time in the ALF (Saunders & Heliker, 2007). The median length of stay in an ALF is 22 months (Caffrey et al., 2012). A decline in functional status is the most common reason for moving into an ALF (Samus et al., 2009).

Transitions

For older adults, transitions, whether between facilities or between levels of care within a single facility, involve disempowerment and social disengagement (Shippee, 2009). The initial decision to move into an ALF is frequently made following a frightening event such as a fall or a major hospitalization (Koenig, Lee, Macmillan, Fields, & Spano, 2014). The new ALF resident may have already experienced or may anticipate experiencing some functional decline. There is usually family involvement in the decision. The initial transition from independent community living to living in an ALF involves downsizing possessions, loss of one's previous social milieu, and some loss of independence (Carroll & Qualls, 2014). Once in the ALF, transitions from one level of care to another are driven by changes in functional status, mental status, and behavior (Shippee, 2009). The following risk factors for nursing home admission were found in a longitudinal study of 198 ALF residents: health decline, chronic pain, changes in appetite, and widow status (Rosenberg et al., 2006). In a four year study of 144 admissions to an ALF specializing in residents with dementia, 48% of the residents were discharged to other facilities (Kopetz et al., 2000). Of those residents who were discharged, 77% were discharged to nursing homes, and the most frequently cited reason was need for higher level of care.

Definitions

The terms assisted living facility (ALF) and residential care facility (RCF) are generally used interchangeably (Mollica, 2008). In the US, such facilities are licensed on a state by state basis. Even within states, facilities can vary greatly with some looking like apartment complexes, others looking like small group homes, and others looking more like traditional nursing homes. ALFs are frequently incorporated in continuing care retirement communities (CCRCs), which are comprehensive facilities offering a variety of levels of care such as independent living, assisted living, and even nursing home services (Spellman & Brod, 2014). The common factor is that

ALFs and RCFs are considered residences, not medical facilities, and, even though they may employ nurses and nursing assistants, they are not regulated as medical facilities nor are they usually eligible for Medicare reimbursement (Mollica, 2008).

Nursing homes are charged with providing comprehensive care for their residents, but ALF residents generally require a certain amount of informal care (Kemp, Ball, & Perkins, 2013). Family members of ALF residents report more burden than those of nursing home residents, most likely as a result of the demands of informal care giving. Estimates of average cost for nursing home care range from $72,270 a year to $79,935 annually, compared with $39,132 annually for ALF services (Roberts, Miller, & Hokenstad, 2012). Estimating the cost of CCRC residence is complicated because while monthly fees are generally lower than those of ALFs most CCRCs require a large entrance fee (Coe & Boyle, 2013)

Activity is classified in various ways. For example, Adams, Roberts and Cole (2011) developed an instrument which classifies activity as active social, active instrumental, passive social spiritual, and instrumental. The key point of this classification is that the active categories require some sort of physical action from the participant (Adams et al., 2011). Other classifications divide activity into social activity, productive activity, and leisure activity (Everard, Lach, Fisher, & Baum, 2000), physical activity, work, social activity, leisure activity, and religious activity (Stav, Hallenen, Lane, & Arbesman, 2012), and social activity, solitary activity, and productive activity (Menec, Nowicki, Blandford, & Veselyuk, 2009). Activity classification schemes are idiosyncratic and not clearly defined. For this paper, activity was divided into physical activity, solitary activity, social activity, and productive activity. This classification is not based on any theoretical consideration but simply because that seemed to be the best way to categorize the studies examined in the literature review. The following classification of activity was developed by the author for the purposes of this study. Physical activity is deliberate action which involves a significant increase in basal metabolic rate and which is undertaken for purposes of health or leisure. Productive activity is deliberate action which is undertaken not for its own sake but rather to attain goals outside the activity itself. The main types of productive

activity are paid work, volunteering, and informal care giving. Solitary activity is deliberate action not included in physical or productive activity and which is undertaken by the person alone. Social activity is deliberate action not included in physical or productive activity which is undertaken in community with others. It may be formal, in the case where it has some institutional sponsorship, or informal.

Engagement is motivation, commitment, and effort directed toward participation in an activity. As such, it is driven by the perceived benefits of participating in the activity as well as by self-efficacy for the activity (Lequerica & Kortte, 2010).

Functional Status

The following factors have been identified in previous research as being associated with functional status: age (Adams et al, 2008), comorbidity (Marengoni, Von Strauss, Rizzuto, Winblad, & Fratiglioni, 2009), mental status (Samus et al., 2009), depression (Tam & Lam, 2012), social support (Ertel, Glymour, & Berkman, 2008), and activity (Everard et al., 2000). Activities which have been shown to be associated with functional status include physical exercise (Hatch & Lusardi, 2010), cognitive activity (Treiber et al., 2011), social activity (Soubelet, 2013), and productive activity (Hsu, 2007).

Age

Functional status is inversely associated with age (Adams et al., 2008). Although only 0.5% of US adults aged 18 to 44 require assistance with one or more ADLs, the figure rises to 1.6% for those aged 45 to 64, 3.5% for those from 65 to 74, and 9% for those 75 years and older (Adams et al., 2008). Older people are also at greater risk for developing functional decline in response to events such as acute hospitalization (Volpato et al., 2007).

Comorbidity

Functional status is inversely associated with number of chronic conditions (Marengoni et al., 2009). Chronic conditions are long term diseases affecting major body systems. Examples include hypertension, heart failure, visual impairment, coronary artery disease, chronic

obstructive pulmonary disease, diabetes, cerebrovascular disease, cardiac arrhythmias, epilepsy, Parkinson's disease, arthritis, obesity, hip fracture, and cancer.

Psychosocial Factors

Turning to the psychosocial factors related to functional status, cognitive ability is directly associated with functional status (Samus et al., 2009), depression is inversely associated with functional status (Tam & Lam, 2012), and social support is associated with slower progression of dementia (Ertel, Glymour, & Berkman, 2008). Even the living environment itself is related to functional status in that older adults who live in communities with adequate parks, handicap parking, and public transportation are more likely to remain living independently than those who live in communities that lack such amenities (White et al., 2010).

Activity

Activity in general is associated with better functional status. Everard et al. (2000) found that 25.5% of the variance in functional health can be explained by activity and social support. Of the different types of activity, physical exercise is the most strongly linked with improved functional status. There have been several time series studies of exercise which resulted in the exercise group participants having better functional status than the control group participants (Hatch & Lusardi, 2010; Seeman & Chen, 2002; Sung, 2009). There have even been interventional studies resulting in better functional status among exercise group participants than among control group participants (Binder et al., 2002; Bonnefoy et al., 2012; Vreugdenhil, Cannell, Davies, & Razay, 2012). Participation in cognitive activity such as reading or doing puzzles has also been shown to be associated with better functional performance, although the results are not as dramatic as with physical activity (Jacobs, Hammerman-Rozenberg, Cohen, & Stessman, 2008; Treiber et al., 2011).

Social activity mediates the relationship between age and cognitive decline (Adams et al., 2011; Soubelet, 2013). The relationship between productive activity and functional status is complex. Although paid work is associated with higher functional status, informal caregiving is

associated with increased mortality (Hsu, 2007). Volunteering is associated with lower mortality (Ayalon, 2008) as well as less depression (Hao, 2008).

Engagement, the focus of this study, involves motivation, commitment, and effort directed toward an activity (Lequerica & Kortte, 2010). Engagement has been found to be correlated with better functional outcomes for rehabilitation patients (Kortte, Falk, Castillo, Johnson-Greene, & Wegener, 2007).

Although one study was found in which engagement was associated with better functional status, that single study involved rehabilitation patients (Kortte et al., 2007). No studies were found in which the relationship between activity engagement and functional status was examined in the older adult population who were not rehabilitation patients.

Framework

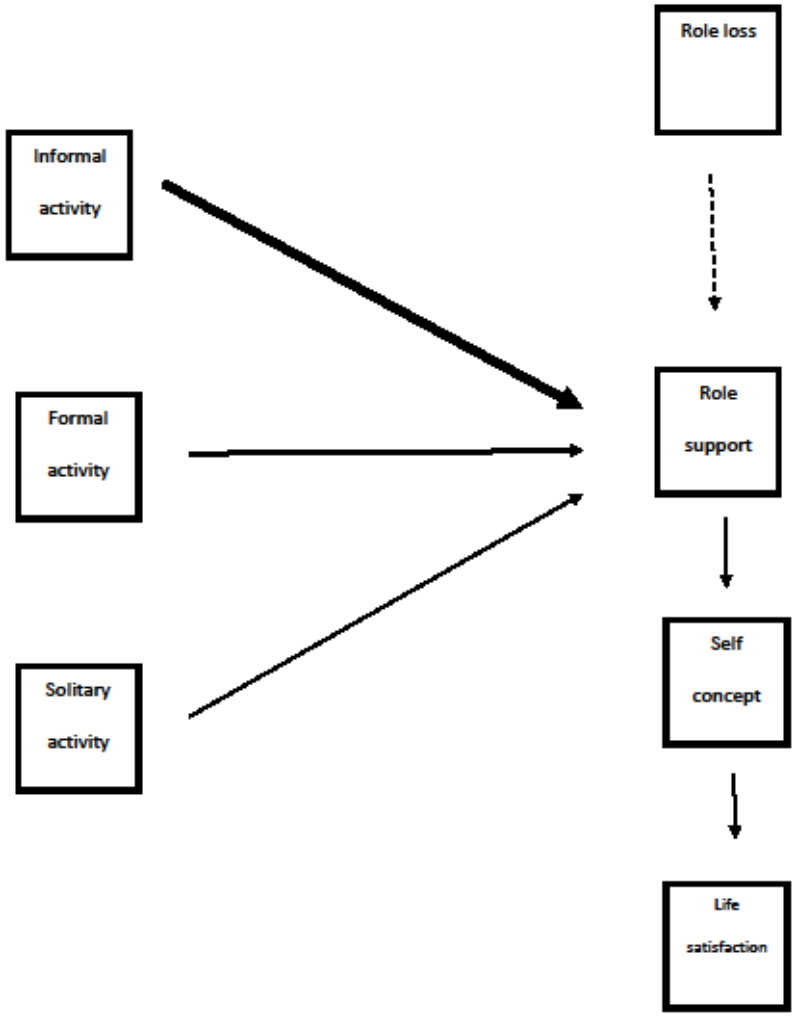
The framework for this study was based on activity theory. The following concepts were used in the conceptual framework: engagement, meaningful activity, role, and functional status. The concepts of engagement and meaningful activity were borrowed from occupational and physical therapy literature (Eakman, Carlson, & Clark, 2010a; Lequerica & Kortte, 2010). Although these concepts are not explicitly mentioned in activity theory, the concept of engagement captures a person's attitude toward participation in activity as well as the person's actual level of participation (Lequerica & Kortte, 2010). Meaningful activity is described as activity which is appropriate to one's skill level, promotes social relationships, is aligned with one's interests, and contributes to one's environment (Conti, Voelkl, & McGuire, 2008). This understanding of meaningful activity fits well with continuity theory, in that activities which meet these criteria are likely to be activities congruent with one's identity and habitual roles.

The concept of role, borrowed from role function theory, is used both in activity theory (Knapp, 1977) and in continuity theory (Burbank, 1986). Neither activity theory nor continuity theory directly focus on functional status; they both focus on life satisfaction. Nevertheless, since activity itself is linked to functional status (Everard et al., 2000), it seems reasonable to include the concept of functional status in the framework for this study.

There are three micro-level sociological theories of aging: disengagement theory, activity theory, and continuity theory. Disengagement theory was the first of these theories of aging (Street, 2007). Disengagement theory will not be used in the framework for the study proposed in this paper, but it is discussed here to provide background for activity theory and continuity theory. Disengagement theory holds that as people age, they disengage from society, and this disengagement is mutually beneficial to the older adult and to society (Burbank, 1986). The older adult is relieved of the stress of his/her previous roles, and society benefits by clearing the way for younger people to assume the place previously occupied by the older adult (Burbank, 1986).

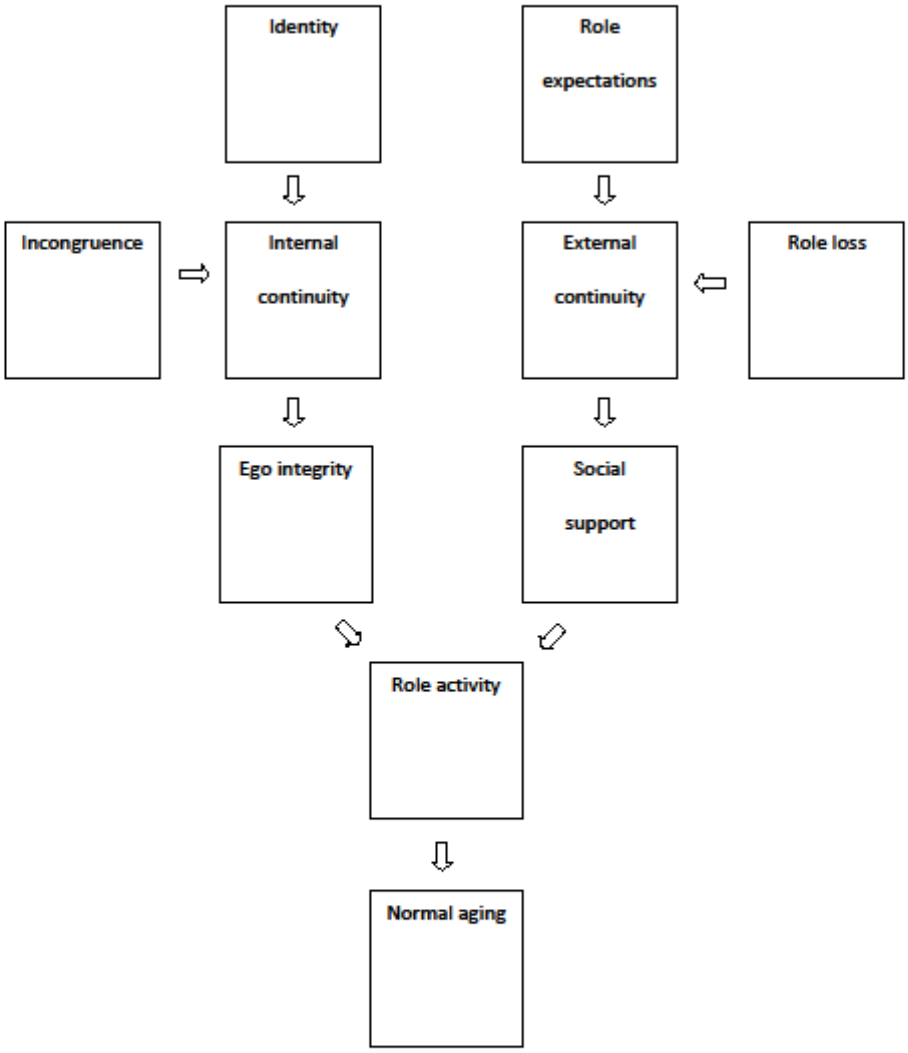
Activity theory emerged in reaction to disengagement theory. Activity theory proposes that healthy older adults wish to maintain their activity (Blace, 2012); and that increased levels of activity result in greater life satisfaction as well as better mental and physical health (Longino & Kart, 1982). Activity is defined in this theory as being patterned actions beyond those required for self-care (Burbank, 1986). The types of activities described in activity theory include informal, formal, and solitary activity. Role and self-concept are sometimes included in this scheme as mediators between activity and life satisfaction (Knapp, 1977). The concepts are linked in that activity is believed to support the accustomed role of the participant thus maintaining and enhancing self-concept. Role supports are affirmations of one's identity, either from social contacts (in the case of social activity) or from one's own introspection (Longino & Kart, 1982). Informal activity is believed to have the strongest influence on role support, because, being more intimate, the audience is better able to customize the role support offered (Lemon, Bengtson, & Peterson, 1972). Formal activity influences role support more than solitary activity because in solitary activity the audience is only imagined. Role loss is negatively associated with role support, and self-concept is positively associated with life satisfaction. These concepts and their relationships are diagrammed in figure 1-1.

Figure 1-1. Actvity Theory Schematic



Continuity theory is an attempt to resolve the differences between activity theory and disengagement theory (Street, 2007). Although aging results in much change, both internal and external continuities persist. Continuities are basic identity structures which tend to persist over time in spite of changes in the physical and social environment (Onega & Tripp-Reimer, 1997). These continuities are protective in nature. In continuity theory, discontinuity is seen as being mostly pathological (Atchley, 1989). Accustomed roles flow from one's identity (Burbank, 1986). If there is continuity between present activity and accustomed roles, life satisfaction is more likely. Figure 1-2 illustrates this theory as explained by Atchley (1989). Internal continuity refers to the continuation of psychological structures through various life stages. It is maintained by one's sense of identity, and it is threatened by experiences of incongruence. External continuity is the continuation of patterns of outward behavior. It is enhanced by role expectations held by other people, and it is threatened by role loss (e.g. retirement, widowhood). Internal continuity promotes ego integrity, and external continuity mobilizes social support, both of which enhance role activity. Role activity is positively related to normal aging.

Figure 1-2. Continuity Theory Schematic



Engagement

Engagement has been defined as “the act of beginning and carrying on of an activity with a sense of emotional involvement or commitment and the deliberate application of effort.” (Lequerica & Kortte, 2010, p. 416). Although the concept of engagement is not explicitly mentioned in activity theory, meaningful activity has been measured by assessing participants’ level of commitment to the activity, participants’ satisfaction with the activity, and the participants’ stated reasons for participation (Eakman, Carlson, & Clark, 2010a). The concepts of meaningful activity and engagement with activity are very similar.

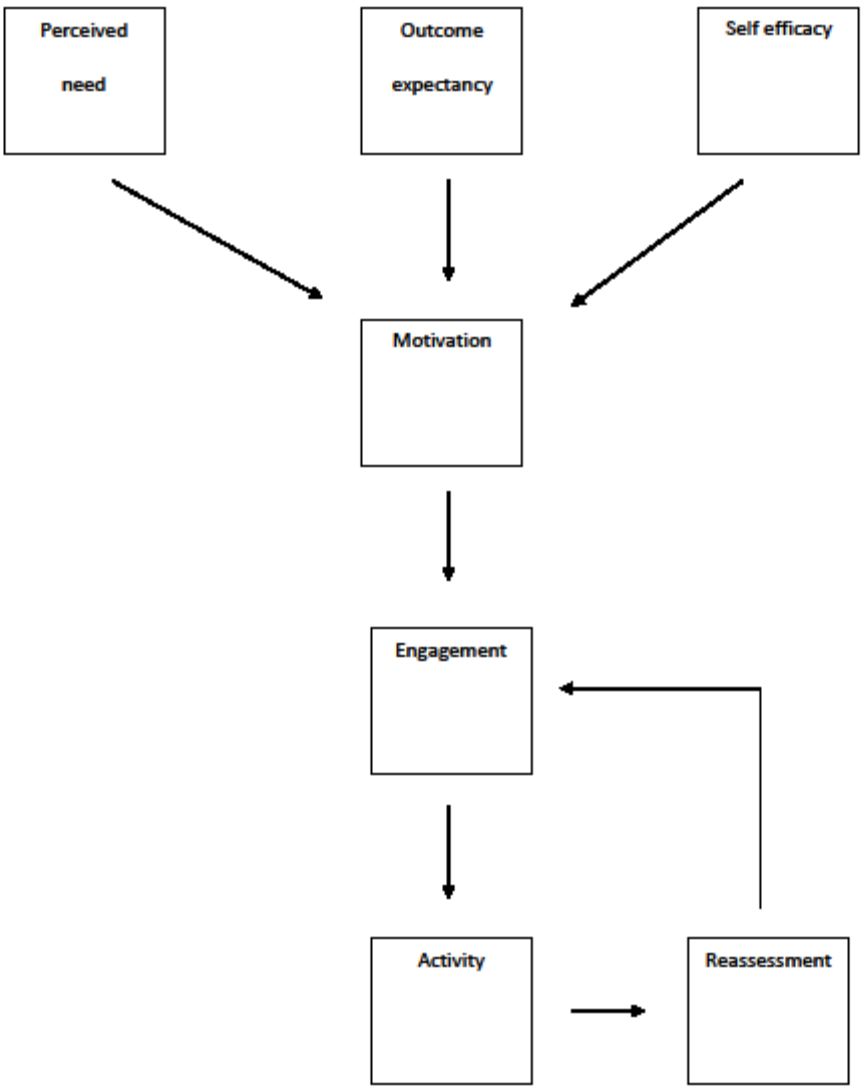
Engagement itself has been shown to correlate with better functional status in patients in rehabilitation for stroke, spinal cord injury, amputation, and orthopedic surgery (Kortte, Falk, Castillo, Johnson-Greene, & Wegener, 2007). Among nursing home residents with dementia, engagement has been found to vary by gender (women have greater duration of engagement), mental status, and functional status (Cohen-Mansfield, Marx, Regier, & Dakheel-Ali, 2009). In the population of nursing home patients with dementia, engagement does not vary with agreeableness (Hill, Kolanowski, & Kürüm, 2010). Agreeableness is a personality trait representing the tendency of a person to cooperate with others rather than to compete. Holding mental and functional status constant, residents with varying levels of agreeableness are equally engaged (Hill et al., 2010).

The concept of engagement thus represents a promising line of inquiry into the level of motivation, commitment, and effort which older adults bring toward their activities. Although one study was found which related engagement to functional status (Kortte et al., 2007), this study involved patients in acute rehabilitation. No studies were found relating engagement to functional status in the older adult population.

Lequerica and Kortte (2010) developed a theoretical model of engagement in rehabilitation which describes engagement as being primarily a function of motivation. Motivation represents mental energy directed toward a goal. In contrast, engagement is that energy in action. Motivation is influenced by perceived need, by outcome expectancy, and by one’s self-

efficacy. If motivation is strong enough, the person will become engaged. Based on the results of the activity, the person's engagement will then either be enhanced or diminished. A diagram of the dynamics of engagement is given in Figure 1-3.

Figure 1-3. Engagement Model



Engagement can be measured either by self-report or by observation. One approach to measurement of engagement is by measuring changes in the autonomic nervous system and the peripheral nervous system (Kushki, Andrews, Power, King, & Chau, 2012). The relevant changes in the autonomic nervous system include heart rate, respiration, and electrical response of the skin. The changes noted in the peripheral nervous system include changes in the tone of involuntary and voluntary movements of the extremities (Kushki et al., 2012). Another observational approach to measuring engagement involves using videotapes of activity, which are then observed by trained raters who look for any behavioral sign of positive response to the activity (Braddock & Phipps, 2010). Ratings of therapists who assess their patients on frequency of attendance at therapy sessions, need for prompts, patient expressed attitude toward therapy, acknowledgement of need for therapy, and extent of active participation in the session can also be used (Kortte et al., 2007). Using electro-encephalogram data, Tops and Boksem (2010) developed a measure of engagement which involves measuring indicators of emotional response to error in combination with asymmetry of frontal lobe activity.

Self-report methods of measuring engagement include surveys asking about participants' interest in and actual participation in specific activities (Bielak, Anstey, Christensen, & Windsor, 2012), activities performed and time spent in each activity (Hinterlong, Morrow-Howell, & Rozario, 2007), and type of activity and frequency of participation (Small, Dixon, McArdle, & Grimm, 2012). The Engagement in Meaningful Activities Survey, a twelve item Likert scale survey which includes questions about the meaningfulness, usefulness, identity congruence, value, difficulty, and agreeableness of the participant's habitual activities (Goldberg, Brintnell, & Goldberg, 2002), is one tool used to measure engagement. Another tool used to measure engagement is the Meaningful Activities Participation Assessment, which measures the meaningfulness and frequency of participation in 28 specific activities (Eakman, Carlson, & Clark, 2010b).

Meaningful Activity

Meaningful activity consists of voluntary actions which the participant perceives as being important (Eakman, Carlson, & Clark, 2010a). The importance of the activity may stem from

objective characteristics of the activity or from a subjective attitude of the participant. The personal meaning of an activity may have more influence on the wellbeing of the participant than the duration or frequency of the activity (Eakman, Carlson, & Clark, 2010b). Meaningful activity meets important needs, either for the participant or for others (Goldberg, Brintnell, & Goldberg, 2002). Meaningful activity is related to continuity theory in that activities which activate accustomed roles are more likely to be perceived as being meaningful (Onega & Tripp-Reimer, 1997).

Role

Roles are closely associated with social expectations. With life changes, expectations and roles change. Individuals ameliorate the stress of changing roles by a process of anticipatory socialization. Anticipatory socialization means thinking about the expected changes and discussing them with knowledgeable people (Curl & Ingram, 2013). In role theory, satisfaction in old age is primarily a matter of successfully transitioning from the roles of middle age to those of old age. One problem many people have with this transition is that the roles of old age are poorly defined in our society (Fry, 1992).

Functional Status

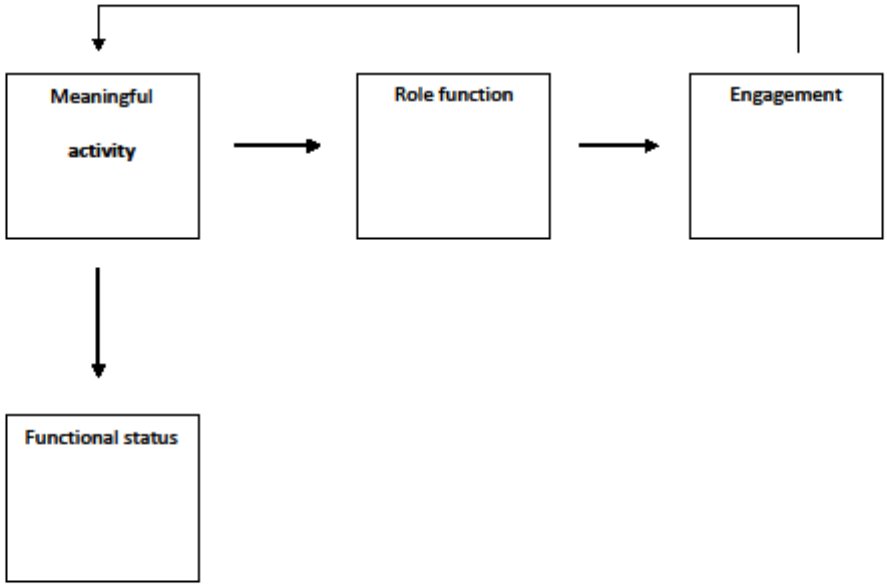
The World Health Organization defines functioning as the positive aspects of the interaction between the individual and environment. Function stands in contrast to disability, which means limitation or restriction in activity participation (World Health Organization., 2013). In a concept analysis of functional status, Wang (2004) concluded that functional status is "activities performed by an individual to realize needs of daily living in many aspects of life including physical, psychological, social, spiritual, intellectual, and roles. Level of performance is expected to correspond to normal expectation in the individual's nature, structure, and conditions." (Wang, 2004, p. 462).

Relationships between the Concepts

According to the framework used in this study, meaningful activity activates peoples' valued social roles. Such activation leads to engagement, motivating and encouraging the

person to participate more fully in the activity. Meaningful activity maintains or enhances functional status. The relationships between the concepts of the framework for this study are presented in Figure 1-4. Based on the conceptual framework, the association can be made that higher levels of engagement will translate into better functional status.

Figure 1-4. Activity Study Framework



Purpose and Research Question

The purpose of this study was to explore the relationship between engagement with activity and functional status among older adults. The research question was, "Controlling for depression, and comorbidity, are higher levels of engagement associated with higher functional status among older adults?"

Assumptions

One of the assumptions of the framework for this study is that meaningful activity activates salient roles which are habitual to the participant. Activation of salient roles then enhances engagement with the activity. The final assumption of the framework is that engagement with activity maintains and enhances functional ability.

Summary

This chapter included a description of the significance of the problem of declining functional status in older adults in terms of magnitude of the problem and impact on patients, families, society, and the economy. It also included an overview of the evidence to support a proposal for a study of the relationship between engagement with activity and functional status among older adults in assisted living facilities. A description of the framework for this study was presented. The purpose of the study and assumptions based on the framework were discussed.

Chapter II

Review of Literature

Introduction

This chapter includes statistics regarding the functional status of older adults in the United States. The human and financial costs of functional decline is presented. A discussion of factors believed to influence functional status is included with particular focus on evidence supporting the relationship between activity and functional status. Research evidence on activity in general, physical activity, mentally stimulating activities, social activity, and productive activity is also discussed. The chapter includes a discussion of the theoretical link between engagement and activity. The evidence provided in this chapter provides support for the need for a study to examine the relationship between engagement with activity and functional status in older adults.

Functional Status of Older Adults

There are currently about 40 million people age 65 or older living in the United States (US), or 12.9% of the population (US Census Bureau, 2011). By the year 2050, the population of the US is expected to be about 400 million, 27% of whom will be over 60 years of age (United Nations, Department of Economic and Social Affairs, Population Division, 2013). Although about 2% of the adult population requires assistance with at least one activity of daily living (ADL), 3.5% of the US population 65-74 years old requires such assistance, and for those 75 and older the number rises to 9% (Adams, Lucas, & Barnes, 2008). The numbers for those who need assistance with at least one instrumental activity of daily living (IADL) are 3.5% of the adult population, 5.9% of those 65-74 years old, and 17.9% of those 75 and older.

Of the 40 million older adults currently living in the US, about 1 million live in assisted living facilities (ALFs) (Aud & Rantz, 2005), and another 1.3 million live in nursing homes (Centers for Disease Control and Prevention [CDC], 2006). The number of Americans who live in CCRCs is estimated at 628,000 (PR Newswire, 2014). Frequently, the motivation for moving into an assisted living facility is a decline in functional status. Samus et al. (2009) found that 62% of ALF residents cited such a decline as their primary motive for entering the facility. Another 26% cited

medical problems. The ALF population thus contains a larger proportion of older adults who are in the beginning stages of a trajectory of functional decline (Opoku et al., 2006), so this population is located in an ideal setting in which to study the dynamics of functional decline.

In some cases, ALFs are part of larger CCRCs, which offer a variety of care options ranging from independent living to nursing home care (Anderson & Tom, 2005). Motivations of people entering CCRCs are complex, but generally people enter these facilities while they are still able to care for themselves but anticipate that in the future they may not be able to do so (Shippee, 2012). Moving to a CCRC is often seen as a way of maintaining control of one's living situation while one is still able to do so as well as a form of long term care insurance.

Functional Status

Functional status is important to the quality of life of older adults (Halvorsrud, Kirkevold, Diseth, & Kalfoss, 2010; Simone & Haas, 2013; Thanakwang, Soonthorndhada, & Mongkolprasoet, 2012). Functional status is defined as the degree of dependence in performing ADLs and IADLs (Graf, 2008; Inouye, Bogardus, Baker, Leo-Summers, & Cooney, 2000). The ADLs typically measured are eating, transfers, continence, toileting, bathing, and dressing. Mobility and IADLs (using telephones, shopping, preparing meals, housekeeping, doing laundry, using transportation, managing medications, and handling finances) are considered more sensitive measures of functional decline than decline in ADLs (Graf, 2008). According to Rowe and Kahn (1998), along with active social engagement and the absence of disease, intact functional status is one of the essentials for successful aging. Simone and Haas (2013), in a study of 95 community dwelling older adults in California, found that there was a strong association between functional status and subjective sense of well-being.

Functional status has also been found to be strongly related to the physical health of older adults. In a hospital based study of 272 Canadians who experienced an acute coronary event (Decourcelle et al., 2013), researchers found that those with functional decline were more likely to die than those who did not have functional decline. The hazard ratios for death for those with functional decline over those with no functional decline were 3.63 at six months and 2.69 at

greater than six months. This means that those who had functional decline were 3.63 times more likely to die than those with intact functional status during the first six months of the study and 2.69 times more likely to die thereafter.

From a financial point of view, the current annual cost of long-term care in the US is estimated to be 147.4 billion dollars (Kaye, Harrington, & LaPlante, 2010). Zhu et al. (2008), in a multicenter hospital based study of 204 US Alzheimer's patients, found that for each one point increase in the Blessed Dementia Rating Scale (a scale which measures difficulty in ADLs and IADLs) the annual cost of direct medical care increased by $1406 on average, and the total cost of care, including costs for caregivers increased by $3333 annually. Gillespie, O'Shea, Cullinan, Lacey, Gallagher, and Ni (2013) studied 100 Irish community dwelling older adults with mild cognitive impairment and found that each decrease of one point on the Katz Activities of Daily Living Scale increased six month healthcare costs by 796 Euros, while each one point increase reduced those costs by 417 Euros. The findings of a Danish study of community dwelling older adults were that both progression of dementia and of functional decline predicted significantly greater healthcare costs (Andersen, Lauridsen, Andersen, & Kragh-Sørensen, 2003).

In addition to its effect on the individuals who undergo functional decline and its economic impact on society, functional decline also affects family members. Close family members often become informal caregivers and may suffer increased stress as a result. Nichols et al. (2009) studied 165 informal caregivers recruited from primary practice offices in the Memphis area and found that initially the caregivers requested information about the procedural aspects of caring for their relatives, but that as time went on, their concerns focused more on the emotional aspects of care giving. The caregivers as a group suffered high rates of depression and they were neglectful of their own health. Willete-Murphy, Todero, and Yeaworth (2006), in a study comparing 37 caregivers with matched controls recruited from outpatient centers, found that the caregivers had more depression and anxiety than the controls and they had lower feeling of belonging, less positive affect, and worse sleep efficiency.

Functional decline brings significant burdens and costs to those who undergo it, to their families, and to society at large. As the number and proportion of older adults in society increases, these burdens can only be expected to grow, unless there are scientific breakthroughs which enable us to reduce the rate of functional decline in older adults.

Trajectories of Functional Decline

Trajectories of functional decline have been studied for hospitalized older adults (Chen, Wang, & Huang, 2008; Huang, Chang, Liu, Lin, & Chen, 2013; Wakefield & Holman, 2001) and for older adults in the long term care setting (Chen, Chan, Kiely, Morris, & Mitchell, 2007). Trajectories of decline have been identified for older adults with advanced dementia, cancer, and multiple organ failure. A functional trajectory is a change in functional status over time. Functional trajectories may be characterized as abrupt sudden death, rapid functional decline, slow decline, and frailty, which involves a slow steady decline ending in death (Menec, Nowicki, Blandford, & Veselyuk, 2009).

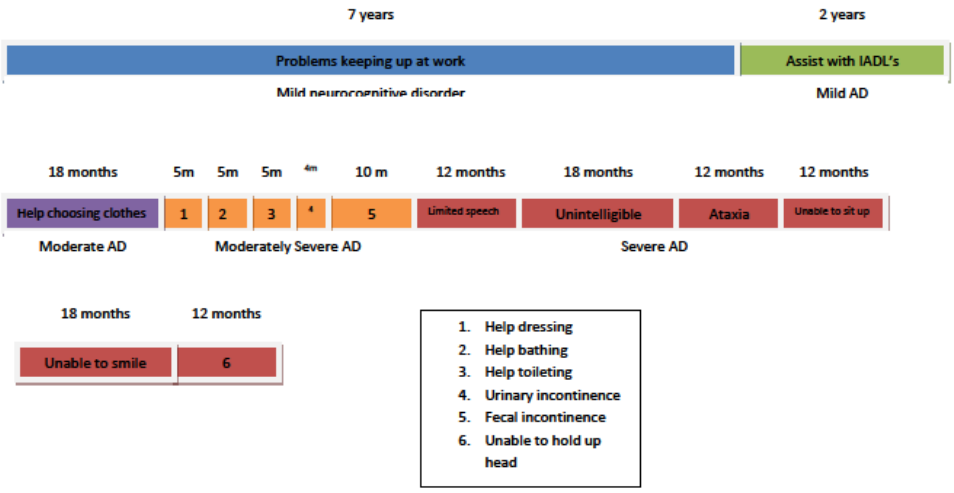
A retrospective study in a Boston ALF compared deaths in patients with cancer, multi-organ failure, and advanced dementia (Chen et al., 2007). The residents with cancer started out their final year of life with a fairly high level of functioning but suffered rapid decline over the year. Residents with advanced dementia started out the year with already low functional status and gradually declined to worse levels. Those with organ failure had an intermediate course.

Reisberg (1986) defined a trajectory for Alzheimer's disease patients with seven stages:

Stage 1: Objective and subjective functional ability is the same as five to ten years ago.
Stage 2: Subjective decline, such as reporting forgetting names, but the decline is not discerned by others.
Stage 3: Objective decline sufficiently severe as to interfere with complex social or occupational activity.
Stage 4: Difficulty performing complex functions of daily living.
Stage 5: Difficulty with basic functions of daily living.
Stage 6: Progressive difficulty with independent dressing, bathing, and toileting.
Stage 7: Difficulty with speech, ambulation, and loss of consciousness

The stages and average time for each stage are displayed in figure 2-1,

Figure 2-1. Timeline for Functional Decline



One of the main uses of research into trajectories of decline is to know the expected rate of decline so that deviations can be identified (Slaughter, Morgan, & Drummond, 2011). For example, if a patient with Alzheimer's disease is declining faster than the timelines would predict, she may be suffering from some other undiagnosed co-morbid condition, such as occult infection or neoplasm.

Factors Associated with Functional Status

Various factors have been found to be associated with functional status. These factors include age (Volpato et al., 2007), comorbidity (Marengoni, Von Strauss, Rizzuto, Winblad, &

Fratiglioni, 2009), mental status (Samus et al., 2009), depression (Tam & Lam, 2012), social support (Crooks, Lubben, Petitti, Little, & Chiu, 2008), and activity (Horowitz & Vanner, 2010).

Age

Bennett et al. (2002) did a hospital based longitudinal study of 77 patients with vascular dementia and found that age predicted both decrease in ADL and IADL ability. Age was significant both as a unique variable and in multivariate models. The effect of age was not great, with risk ratios of 1.13 for ADL decline and 1.08 for IADL decline. For each extra year of age, participants were 1.13 times as likely to have decline in their ADL function and 1.08 times as likely to have decline in their IADL function. Volpato et al. (2007), in a hospital based study of factors related to new onset of ADL dysfunction after acute hospitalization, found odds ratios for age on functional decline of 1.76 for patients 75-84 years old and 2.24 for those over 84. The reference group was patients 65-74 years old. This means that the odds of being hospitalized were 1.76 times as great as those of 65-74 year olds for those in the 75-84 year old group and 2.24 times as great as the 65-74 year olds for those over 84 years of age.

Comorbidity

Comorbidity is a predictor of functional decline. In a longitudinal study of 1099 community dwelling Swedish older adults, Marengoni et al. (2009) found an odds ratio of 1.5 for those with one comorbidity and 6.2 for those with four or more. Older adults with four or more comorbidities thus had 6.2 times the odds of experiencing functional decline as those without comorbidities.

Dunlop et al. (2005) studied 5715 community dwelling older adults with arthritis and found the following conditions to be associated with worsening functional status (conditions listed in order of association with functional decline, from strongest to weakest):cognitive impairment, visual impairment, stroke, diabetes, and depression. Infections, whether respiratory or urinary, are associated with functional decline. In a study of 1364 Swiss nursing home residents, Büla et al. (2004) found that any type of infection increased the odds of the residents' experiencing functional decline.

Dementia

Using data from the Maryland Assisted Living Study, Burdick et al. (2005) found greater impairment both in ADLs and in IADLs for those residents who had some dementia. The final model, which explained 43.4% of the variance in functional status, included these variables: dementia, depression, and general health status. In another analysis of data from the same study, Samus et al. (2009) found that demented residents were more impaired for all measures of functional status except for mobility. In a clinic based longitudinal study of 7717 community dwelling older women, Johnson, Lui, and Yaffe (2007) found that executive function was the specific element of mental function most closely associated with functional status.

The incidence of falls and mobility problems is greater in older adults with dementia than in their cognitively intact peers (McGough, Logsdon, Kelly, & Teri, 2013), but a longitudinal study of 435 cognitively intact community dwelling older adults showed that those with mildly impaired function were at greater risk for subsequent development of Alzheimer's disease (Wilkins, Roe, Morris, & Galvin, 2013). Given the long prodromal period of Alzheimer's disease (Reisberg, 1986), it is difficult to say whether the functional decline or the dementia comes first.

Mayo et al. (2013) accessed data from the National Alzheimer's Coordinating Center Universal Data Set, a large database of newly diagnosed dementia patients, to explore the relationship between functional status and problem solving ability. The authors found that cognitive status and functional status together predicted 56% of the score on problem solving. For participants at lower cognitive levels, functional status was a more important predictor of problem solving ability.

Chen, Lin, Chan, and Liu (2014) used statistical equation modeling techniques to explore the relationships between cognitive function, depression, functional ability, pain, and agitation. The study involved 405 Taiwanese nursing home residents. The final model suggested that cognitive ability and pain directly affected functional status. Functional ability, in turn influenced depression. Both functional ability and depression had a direct effect on agitation.

Depression

Using data from a national prospective cohort study of 5697 older adults, Mehta, Yaffe, and Covinsky (2002) found that depression was a risk factor for decline in functional status for those participants who were independent at the outset of the study. Among those who were already dependent, depression was not a risk factor. Tam and Lam (2012) studied 105 community dwelling older adults diagnosed with depression and found that the level of depression was associated with decreased cognitive ability and decreased functional ability. Espiritu et al. (2001) studied 141 clinic based Alzheimer's patients and found that results on the Geriatric Depression Scale (GDS) were negatively correlated with IADL ability. Higher scores on the GDS mean more depression, and higher scores on the IADL scale mean more IADL impairment.

Social Support

There have been several studies with results suggesting that having a large social network is associated with slower progression of dementia (Crooks et al., 2008; Ertel, Glymour, & Berkman, 2008; Fratiglioni, Wang, Ericsson, Maytan, & Winblad, 2000). The populations where this finding has been validated include older women patients of the Kaiser Permanente system (Crooks et al., 2008), community dwelling US adults over fifty years old (Ertel, Glymour, & Berkman, 2008), and community based Swedish older adults (Fratiglioni et al., 2000). The living environment itself is also associated with functional status. In a cross-sectional study of 436 community dwelling older adults, White et al. (2010) found that features of the neighborhoods in which older adults lived were associated with the participants' functional status. Specifically, older adults who lived in neighborhoods without parks or safe walking spaces were less likely to participate in exercise, and those who lived in neighborhoods without easy access to public transportation and handicap parking felt more limited in IADL ability and social engagement.

Activity

Research has been done on the relationships between activity in general and functional status (Everard, Lach, Fisher, & Baum, 2000), as well as between specific types of activities and

functional status. The specific types of activity that have been studied include physical activity (Seeman & Chen, 2002), solitary nonphysical activity (Treiber et al. 2011), social activity (Adams, Roberts, & Cole, 2011), and productive activity (Ayalon, 2008).

Activity in general

Activity itself, without specifying the type of activity, is believed to be beneficial for older adults. In a cross-sectional study of 244 community dwelling older adults, Everard et al. (2000) found that 25.5% of the variance in functional health could be attributed to a combination of activity and social support, and 14.7% of the variance in mental health could be attributed to the same variables. The study measured activity by means of a ratio between numbers of activities the participants currently engaged in and the number of activities they had engaged in earlier in life. The activity measure was thus essentially a measure of change in activity level over the life course of the participant. This, along with survey data about social support, was related to the functionally oriented physical and mental health variables. Horowitz and Vanner (2010) used a modified version of the same method in a later study of 131 assisted living residents. The focus of the study was the relationships between activity and quality of life and functional status. Outcomes were measured with the SF-36v2, a tool which measures functionally oriented quality of life on various health dimensions, and the Life Satisfaction Index-Z, which measures participants' perceptions of their life satisfaction. The findings were that the relationships between the number of activities continued from middle age, life satisfaction, and physical functioning were significant. The number of activities continued was also associated with other domains such as the physical health, role-physical, and mental health domains of the SF-36v2 (Horowitz & Vanner, 2010).

A secondary analysis of Aging in Manitoba data, a large database of residents of Manitoba ALFs, focused on the relationship between activity and quality of life, function, and mortality (Menec, Nowicki, Blandford, & Veselyuk, 2009). The original data were gathered in 1990 with repeat measures in 1996. The sample size varied between 1208 and 2291 depending on the specific variables examined. The authors examined the relationship between the number

of activities the participants engaged in and the outcome variables. Activities were grouped into the categories of social activity, productive activity, and solitary activity. Other predictor variables such as demographics, baseline functional status, cognitive impairment, physical difficulties, health, life-satisfaction, and comorbidity were included in the model. Controlling for all these variables, the authors noted that increased activity level in 1990 was related to higher functional status and less mortality in 1996. Activity was also positively related to happiness. The relationship between activity and life satisfaction was not significant. Specific activities at the baseline which were related to higher function at follow up included church activity; mass social activity; music, art, and theater; volunteering; yard work; and heavy housework.

Physical activity

Participation in physical activity is linked to a variety of positive health outcomes including lower mortality and morbidity as well as increased functional ability (Stav, Hallenen, Lane, & Arbesman, 2012). Using data from the MacArthur Study of Successful Aging, a longitudinal study of community dwelling older adults, Seeman and Chen (2002) showed that older adults who engaged in regular physical activity had less decline in functional status than those who did not. This was true for all disease subgroups in the study except for those with diabetes and those with fractures at the onset.

Baker, Meisner, Logan, Kungl, and Weir (2009) used data from the Canadian Community Health Survey, cycle 2.1, to examine the relationship between level of physical activity and meeting successful aging criteria. The Canadian Community Health Survey is a large population based survey representative of all Canadians. For this study, a subset of the data were taken involving those participants over 60 years old whose answers to the questions under study were complete. Physical activity was measured by calculating estimated energy expenditure for all the types of activity reported in the survey thus creating a physical activity score. Only 11% of the participants were classified as aging successfully, and 11.4% were unsuccessful. The other 77.6% were classified as moderately successful. Controlling for covariates, those who were

physically active were twice as likely to be aging successfully as those who were physically inactive.

Physical exercise has been used as an intervention in several studies. A randomized controlled trial of an exercise intervention with 160 community based older adults resulted in a difference in mortality at two years of 16.7% for the treatment group participants and 28.2% for the control group participants (Gitlin et al., 2009). The treatment group participants had up to 3.5 years longer survival than the control group participants. In a smaller study of 40 assisted living residents, a cluster randomization approach was used, and the findings were that participants in the exercise group improved in lower body strength, hip flexibility, balance, and self-esteem compared with the control group participants (Sung, 2009). A crossover study conducted in a long term care facility which combined ALF residents and nursing home residents compared an exercise group with recreational therapy (Baum, Jarjoura, Polen, Faur, & Rutechi, 2003). The findings were that the participants had significantly better balance, stamina, and cognitive function after participating in the exercise arm of the study. In an exercise program offered in a 71 bed ALF, 36 residents chose to participate in an evaluation of the program (Hatch & Lusardi, 2010). Nineteen of these residents were regular participants in the program, and the other 17 exercised sporadically. Although the two groups did not differ initially in balance, walking endurance, or cognitive function, at twelve months the regular exercisers had maintained their balance and walking endurance, but the sporadic participants had declined. Even though both groups of participants declined in cognitive function, the regular exercisers declined less.

In a randomized controlled study of a formal home exercise program with 115 community dwelling older adults, Binder et al. (2002) reported improved ADL function among the exercise group participants as evidenced by improvement in the Functional Status Questionnaire by an average of 4.9 points (compared with 1.6 points for the controls). Using a secondary analysis of National Institutes of Health data on community dwelling older adults, Mobily (2013) showed that amount and intensity of exercise are linearly related to better functional status. The author failed to find a minimum effective dose of exercise. Any exercise was better than none at all. In

contrast, Lêng and Wang (2013) used data from a longitudinal population based survey of Taiwanese older adults to find that exercise of greater than 30 minutes duration per session was significantly associated with better functional status. Neither exercise of less than 30 minutes duration per session nor frequency of exercise were significant predictors of functional status in that study. The findings of a small (40 subjects) clinic based randomized controlled trial (RCT) of an exercise program for community dwelling older adults were that the exercise group had better mental status as well as improved IADL scale scores after four months compared with the controls (Vreugdenhil, Cannell, Davies, & Razay, 2012). Another RCT targeted hospitalized older adults, reasoning that they were at greater risk of functional decline (Courtney et al., 2012). The treatment group participants received a home exercise program and had better IADLs and ADLs than the control group participants at each measurement point (every four months). The results were sustained up to 24 months, at which time the study ended (Courtney et al., 2012). Bonnefoy et al. (2012 conducted a trial of a home exercise program combined with a protein supplement administered by home health aides and found that the treatment group participants had less decline in IADL function than the control group participants. In a secondary analysis of data from the AHEAD study, a study of community dwelling older adults, Wolinsky et al. (2011) found that regular physical activity was protective against declines in ADL ability, IADL ability, and mobility.

Hatch and Lusardi (2010) studied 36 participants in an exercise program in an ALF and found that those who participated regularly maintained their ability to balance and their endurance at twelve months after the program began, as opposed to the non-regular participants who declined on both those factors. The non-regular participants also had more falls over the year. The findings of a pilot study of thirteen ALF residents enrolled in an exercise program were that at eight weeks the residents improved significantly over baseline on balance but not on ADLs (Wallmann, Schuerman, Kruskall, & Alpert, 2009).

Solitary nonphysical activity

Cognitive activity is associated with less functional decline (Treiber et al., 2011). Participants in the Cache County Dementia Progression Study (community dwelling older adults) who engaged in cognitive activities such as reading, listening to music, solving puzzles, and similar solitary activities were less likely to experience cognitive decline and more likely to have better functional ability than those who did not. Slower cognitive decline was particularly notable in those participants who engaged in cognitive activity during the early stages of dementia. On the other hand, the positive effect on functional status was more apparent for those participants in later stages of dementia (Treiber et al., 2011). Male participants in the Jerusalem Longitudinal Cohort Study (community dwelling older adults) who read daily had decreased mortality, but this was not observed among the women (Jacobs, Hammerman-Rozenberg, Cohen, & Stessman, 2008).

Social activity

A cross sectional study of 178 Ohio ALF residents was done to examine the proposition that older adults disengage from active instrumental activity as they grow older but that passive social spiritual activity levels would be the same among older and younger adults (Adams, Roberts, & Cole, 2011). Active instrumental activities are productive activities which require physical action from the participant (Adams & Sanders, 2010). Examples include working on hobbies or keeping a garden. Passive social spiritual activities are social or spiritual activities which do not require the participant to engage in any particular physical action. Examples of this category are visiting with friends or attending church services (Adams & Sanders, 2010). Adams, Roberts, and Cole (2011) hypothesized that changes in subtypes of activity (active instrumental, active social, and passive social spiritual) would mediate the effect of age, poor health, and functional decline on depression. The results supported the hypothesis of disengagement with increasing age. The only mediator variable found was active social activity, low levels of which were found to mediate the relationship between poor health and increased depression (Adams et al., 2011).

Using a sample of 150 community dwelling adults recruited from volunteers who responded to an advertisement, Soubelet (2013) tested the relationship between social activity and cognitive function to determine whether it is a moderating or a mediating variable for the relationship between cognitive function and age. A moderator variable influences the relationship between an independent variable and the dependent variable. In contrast, a mediator variable does not influence the relationship, but rather explains part of it. The results did not support the moderating variable hypothesis, but they did support that social activity is a mediator between cognitive decline and age. In other words, part of the difference observed in cognitive function by age is explained by differences in social activity by age. The mediating effect was more pronounced at more advanced ages, a relationship the author describes as moderated mediation (Soubelet, 2013).

In a four year longitudinal study of community dwelling older adults in Alabama, Park et al. (2008) found that participation in formal religious activity predicted less decline in IADL function over the course of the study. No effect was noted on ADL function. The authors believe that this was because IADL function is a more sensitive indicator of functional status than ADL function. Religious activity was also found to be associated with lower mortality among community dwelling Taiwanese older women (Hsu, 2007).

Productive activity

Productive activity includes paid work, volunteering, and informal caregiving. The findings of a longitudinal study of 4049 community dwelling Taiwanese older adults were that although paid work was protective against mortality, for women, unpaid productive activity, such as informal care giving of grandchildren, was associated with higher mortality (Hsu, 2007). Men who actively participated in formal political organizations at the outset of the study had less mental decline than those who did not. Ayalon (2008) reported on a study of 5005 community dwelling Israeli older adults and found that volunteers had a lower adjusted death rate than those who did not volunteer (12.2% vs. 24.8%). The researcher controlled for comorbidity, functional status, physical exercise, employment, and attendance at religious services, but it is possible that

the volunteers may have differed from the non-volunteers on some subtle indicator of frailty at the outset.

A study framed as a test of activity theory was focused on the relationship between productive activity, both paid work and volunteer activity, and psychological well-being (Hao, 2008). The data came from the Health and Retirement Study. The sample consisted of 7830 community dwelling adults in late middle-age. The findings were that paid full time work was slightly protective against depression. Participants who volunteered at the onset of the study also had lower rates of depression as well as slower progression of depression. Engaging in both paid work as well as volunteer activity was protective against depression, but only for those participants who engaged in both activities at the beginning of the study and maintained their participation over time. The conclusion was that this result supports role accumulation theory.

One possible mechanism whereby productive activity may benefit older adults is by enhancing their feeling of usefulness toward others. Using data from the MacArthur Study of Successful Aging, Gruenewald, Karlamangla, Greendale, Singer, and Seeman (2009) found that feeling useful to others was linked with lower mortality (Gruenewald et al., 2009) and less disability (Gruenewald, Karlamangla, Greendale, Singer, & Seeman, 2007).

Other factors

Other factors which have been found to be associated with functional decline include fear of falling, which can lead to voluntary self-limitation of activity (Resnick, Galik, Gruber-Baldini, & Zimmerman, 2012). Institutional residents who fall may sometimes face institutionally mandated restrictions on their subsequent activity (Elazzazi, 2003). Poor sleep quality has also been linked with functional decline (Martin, Fiorentino, Jouldjian, Josephson, & Alessi, 2010). Individual characteristics of facilities have been linked to functional status (Young, Inamdar, & Hannan, 2010). There are two payment models commonly used in ALFs. In one model, residents pay a basic fee, but if their condition changes requiring a higher level of care they pay more. In the other model they pay a set fee from the outset and the fee does not change as their needs

change. Young et al. (2010) showed that residents in the all-inclusive fee model maintain their functional status better than those in facilities using the tiered fee model.

Engagement

Engagement is the degree of motivation, commitment, and participation which a person brings to an activity (Lequerica & Kortte, 2010). The critical elements to measure in assessing engagement are expressed attitude toward the activity, the participant's acknowledgement of need, and the extent to which the participant actually participates in the activity (Kortte et al., 2007). Engagement may be measured either directly, using an observational rating scale (Cohen-Mansfield, Shmotkin, & Goldberg, 2010), or by use of questionnaires (Bielak, Anstey, Christensen, & Windsor, 2012; Hinterlong, Morrow-Howell, & Rozario, 2007; Small, Dixon, McArdle, & Grimm, 2012).

Activity theory holds that increased levels of activity result in better levels of health (Longino & Kart, 1982). Engagement by definition includes extent of participation (Lequerica & Kortte, 2010), so, if engagement theory is valid, enhanced engagement should also result in better levels of physical and mental health.

Summary

Functional status is related to several factors: age, comorbidity, mental status, affect, social support, and activity. There are varying levels of support in the healthcare literature for the relationships between various specific activities and functional status. Support for the beneficial effect of physical activity on functional status is stronger than support for the beneficial effect of productive activity. There is less evidence supporting the relationships of functional status with social activity and solitary nonphysical activity. The concept of engagement may help explain differing levels of benefit from activity by illuminating differences in older adults' motivation, commitment, and participation. No studies were found relating engagement to functional status in the older adult population.

Chapter III

Methods and Procedures

Introduction

In this chapter, an outline of the method used in this study is described, and advantages and disadvantages of the method are discussed. Threats to validity are identified, as well as methods for attenuating those threats. The sampling method and the setting are described, and the conceptual and operational definitions of the principal concepts are given. A discussion of each tool used in the study follows. The procedure, ethical concerns, and the data analysis plan are explained. The chapter concludes with the study's known delimitations.

Research Design

The method used for this study was a correlational design. There were two variables of interest: engagement with activity (the predictor variable) and functional status (the outcome variable). Other variables known to be related to functional status, including age (Volpato et al., 2007), comorbidity (Marengoni, Von Strauss, Rizzuto, Winblad, & Fratiglioni, 2009), and depression (Tam & Lam, 2012) were also measured. The correlational design method can be used to explore relationships between variables in situations where it is unethical or impractical to control the variables (Burns & Grove, 2009). Although cognitive status is an important predictor of functional status (Burdick et al., 2005), the nature of the study required that participants have fairly high levels of cognitive function, so it was not included as a variable in this study. Instead, cognitive status was controlled by only recruiting participants who were able to complete the survey instruments. One weakness of this design is the possibility of obtaining spurious results (Newman, Browner, & Hulley, 2007). Spurious results can come about due to chance or bias. Aside from the danger of spurious results, the results may also be real but misleading. For example, the two factors may be related, but the relationship may actually be a function of a hidden third variable.

This was an exploratory study intended to examine relationships between variables in a natural setting. There was no manipulation of the variables. A pilot study of this nature is useful

for testing the feasibility of doing a larger study on the same theme, as well as for refining study procedures (Burns & Grove, 2009).

Sample

The study focused on the relationship between engagement with activity and functional status among older adults. The inclusion criteria were adults 65 years or older who are living in private accommodations or who are in the independent living or assisted living sections of a CCRC. Participants had to be capable of filling out forms in English either by themselves or with someone reading the form to them. Participants had to be able to demonstrate sufficient understanding of the consent as to be able to state the purpose, expected activities, and risks of the study in their own words after reading the consent or having it read to them.

Convenience sampling was used to recruit participants. The generalizability of convenience samples can be improved by systematically approaching everyone who meets inclusion criteria (Hulley, Newman, & Cummings, 2007) and by comparing the characteristics of the sample with known characteristics of the target population, (Burns & Grove, 2009).

Participants were asked to respond to several questionnaires, thus they needed to be able to understand English. Because the study activities required a high level of cognitive functioning, older adults who have impaired decisional capacity or severe cognitive deficits were excluded.

There is little research about the relationship between engagement with activity and functional status, so it was difficult to predict an appropriate effect size. Because this was an exploratory pilot study, a sampling target of 100 participants was set for recruitment and the power of the study was assessed on a post hoc basis. See table 3-1 for the details of possible values of R^2 and the corresponding power. The power calculations given are for increase in R^2 attributable to the engagement with activity variable assuming a linear fixed model using five predictors, but only testing for the significance of one predictor, and assuming a sample of 100 and an alpha level of 0.05.

Table 3-1.

Power for Various Effect Sizes

R2	0.02	0.04	0.06	0.08	0.10	0.12
Power	29%	52%	71%	83%	91%	95%
(Faul, 2012)						

Setting

Participants for this study were recruited from a university pool of older adult volunteers who have participated in previous studies and from CCRCs in the Dallas-Ft. Worth area. Directors of CCRCs were approached and invited to allow the residents of their facilities to be recruited for the study. If the facility director agreed to participate, a time and place was arranged for recruitment of participants and this information was communicated to the residents of the facility. Participants met with the researcher in a common area of the facility where they were screened, and if eligible, completed the study. Characteristics of participating facilities such as licensure class and size of facility as well as type of ownership (nonprofit or commercial) were also collected for the description of settings in the final report.

Participants recruited for the community dwelling cohort of the study were recruited from a pool of older adults participating in an exercise program offered by the university. The exercise program is part of other research being conducted at the university. Participants were approached either in groups or individually after exercise sessions, screened for eligibility, and recruited for the study if they were eligible.

Measurement

Variables measured in this study include engagement with activity, age, affect, comorbidity, functional status, and living situation. Dimensions of engagement with activity include meaningful activity, commitment to activity, and participation in activity. Dimensions of functional status include activities of daily living (ADLs) and instrumental activities of daily living (IADLs). These concepts, together with their conceptual and operational definitions are presented in table 3-2.

Table 3-2.

Conceptual/Operational Definitions

Variable	Conceptual definition	Operational definition
Engagement with activity	Motivation, participation, and commitment directed toward a type of action (Lequerica & Kortte, 2010)	Scores on Engagement with Meaningful Activity Survey (EMAS) (Eakman, Carlson, & Clark, 2010a)
Affect	State of emotional well-being	Score on Geriatric Depression Scale Short Form (GDS-SF) (Aikman & Oehlert, 2001)
Functional status	Ability to perform activities related to maintaining the physical, social, and role aspects of daily living (Wang, 2004)	Scores for the Katz Index of Independence in Activities of Daily Living (Katz ADL Index) (Katz & Akpom, 1976), and the Lawton Brody Instrumental Activities of Daily Living Scale (Lawton-Brody IADL Scale) (Lawton & Brody, 1969)
ADLs	Basic self care activities required to maintain life, health, and comfort (Graf, 2008)	Score on Katz ADL Index
IADLs	Supportive activities which contribute to maintaining life, health and comfort (Graf, 2008)	Score on Lawton-Brody IADL Scale
Comorbidity	Chronic disease burden borne by an individual	Score on the Functional Comorbidity Index (FCI)
Living situation	The type of housing accommodation where the participant currently resides	A categorical value of community dwelling, independent living, or assisted living based on the participant's current accommodations.

The concept of engagement with activity was measured using scores on the EMAS (Eakman, et al., 2010a). The EMAS (see appendix A) is a 12 item Likert scale test which measures users' agreement with statements about the activities they normally do (Goldberg, Brintnell, & Goldberg, 2002). It had a Cronbach's alpha of 0.84 and test retest reliability of 0.69. Criterion related validity of the EMAS has been demonstrated by significant positive correlations with tests of life satisfaction and purpose in life, as well as a negative correlation with depression (Eakman, et al., 2010a). Scoring of the EMAS is done by giving each item a score from 1 to 4 and totaling the ratings for each item, thus resulting in a score ranging from 12 to 48, with higher numbers indicating more engagement with meaningful activities (Eakman & Eklund, 2012).

The GDS-SF (see appendix B) is a 15 item screening tool for depression in older adults (Chiang, Green, & Cox, 2009; Sheikh & Yesavage, 1986). The items ask for a yes/no response based on the participant's feelings over the past week. Internal consistency measurements for the instrument over several studies ranged from 0.76 to 0.83, and test retest reliability averaged 0.85. Responses consistent with depression are scored at one and negative responses at zero, giving a possible range of 0 to 15. In a study of 313 hospital patients, it was found that the GDS-SF had a sensitivity of 78.8% and a specificity of 93.9% for depression as documented in the patients' medical records (Wall, Lichtenberg, MacNeill, Walsh, & Deshpande, 1999). The demographic data collection form (see Appendix E) includes information on participant age, gender, race and ethnicity, and marital status.

Functional status was measured using the Katz ADL Index and the Lawton –Brody IADL Scale. The Katz ADL Index (see appendix C) is a rating scale that measures six ADLs: bathing, dressing, toileting, transferring, continence, and feeding (Wallace & Shelkey, 2008). Participants who are independent on an activity get one point, while those who need any sort of supervision or assistance get no points. The total score ranges from 0 to 6, with 6 being the highest score. Criterion validity for the Katz ADL Index has been established by demonstrating its ability to predict discharge to home, and construct validity has been established by correlating it with measurements of house confinement and mobility (Hartigan, 2007). In a recent study of community dwelling older adults with cancer, internal consistency for the Katz ADL scale was calculated for various cohorts of participants (Ivanova et al., 2013). Cronbach's alpha was found to range from 0.62 to 0.87 in this study. Test retest reliability at various phases of the study ranged from 0.44 to 0.84. It should be noted that there was a year between surveys, so some of the differences in test retest ratings might reflect actual changes in function. Although the Katz ADL Index is generally an assessment performed by a health care provider, it has also been used as a self-report instrument (Beckett et al., 1996).

The Lawton-Brody IADL Scale (see appendix D) is an assessment of eight abilities: telephone use, shopping, preparing food, keeping house, doing laundry, travel outside the home,

medication management, and management of finances (Wallace & Shelkey, 2008). Different levels of ability are listed in order from most independent to least independent, and participants are given a score of one or zero on each item, with a score of one indicating higher function (Wallace & Shelkey, 2008). Women are scored on all eight items, but the laundry, food preparation, and housekeeping items are sometimes omitted for men, thus women can score from 0 to 8 and men from 0 to 5 (Conde-Martel, Hemmersbach-Miller, Marchena-Gomez, Saavedra-Santana, & Betancor-Leon, 2012). Inter rater reliability for the Lawton-Brody Scale is 0.85. Concurrent validity of the scale was established by comparison with other tools that measure IADLs, health, mental status, and social adjustment (Alosco et al., 2014).

Comorbidity is a measure of the aggregated impact of all clinical conditions a person has aside from her/his primary condition (Schneeweiss et al., 2004). There is no gold standard for measuring this construct, so comorbidity measures are evaluated by their ability to predict death, hospitalization, medical expenditures, or some other clinical outcome. Reasons for measuring comorbidity include prediction (Bhavnani et al., 2013), evaluation of the impact of specific treatments and policies (Elixhauser, Steiner, Harris, & Coffey, 1998), and controlling for variability in study samples (Needham, Scales, Laupacis, & Pronovost, 2005; Schneeweiss & Maclure, 2000; Schneeweiss et al., 2001).

There are two broad approaches to comorbidity measurement. One may use the presence or absence of specific diseases as variables, or one may use a summary index of comorbidities (Austin, Wong, Uzzo, Beck, & Egleston, 2013). Well known comorbidity indexes include the Charlson Comorbidity Index (CCI) (Charlson, Pompei, Ales, & MacKenzie, 1987), both in its original form and in several modifications (D'Hoore, Sicotte, & Tilquin, 1993; Deyo, Cherkin, & Ciol, 1992), the Elixhauser Index (Elixhauser et al., 1998), and the Kaplan-Feinstein Index (Extermann, 2000).

Comorbidity measurement may be done by chart review (Olomu, Corser, Stommel, Xie, & Holmes-Rovner, 2012), by self-report (Okura, Urban, Mahoney, Jacobsen, & Rodeheffer, 2004), or by using databases of diagnostic (Leal & Laupland, 2010) or pharmacy data (Malone,

Billups, Valuck, & Carter, 1999). The CCI is a weighted index of nineteen different disease categories (Charlson et al., 1987). It was developed from a sample of 685 breast cancer patients based on one year mortality data from this group. It was originally intended to be calculated using chart data, but self-report data (Habbous et al., 2013) and administrative data (Needham et al., 2005) have also been used. Although it was designed to predict mortality (Charlson et al., 1987), it has also been used to predict surgical complications (Whitmore et al., 2014), use of medical services (Susser, McCusker, & Belzile, 2008), and functional decline (di Bari et al., 2006; Jiménez Caballero, López Espuela, Portilla Cuenca, Ramírez Moreno, Pedrera Zamorano, & Casado Naranjo, 2013a; Olomu et al., 2012; Susser et al., 2008).

The Elixhauser Index was developed using data from a large sample of hospital patients in California (Elixhauser et al., 1998). It uses thirty different items and was constructed using data from administrative databases rather than chart reviews. The endpoints of interest in the original study were length of stay, medical costs and mortality.

The Kaplan-Feinstein Index is the oldest of the tools discussed here (Extermann, 2000). It groups conditions into 12 broad groups and requires a rating of the severity of the subject's condition in each category. Although it is comparable to the CCI in its ability to predict mortality (Charlson et al., 1987), the requirement that the investigator assess the severity of each condition renders it more difficult to use than the CCI.

Although some studies linking comorbidity with functional status have used the CCI as their measure of comorbidity (Bravo, Dubois, Hébert, De Wals, & Messier, 2002; Jiménez Caballero, López Espuela, Portilla Cuenca, Ramírez Moreno, Pedrera Zamorano, & Casado Naranjo, 2013b; Mansilla Francisco et al., 2012; Tessier, Finch, Daskalopoulou, & Mayo, 2008), most have used individual morbidities as separate variables (Aguero-Torres et al., 1998; Arnold et al., 2009; Brinkley et al., 2009; de Rekeneire et al., 2003; Dekker, van Dijk, & Veenhof, 2009; Dunlop et al., 2005; Figaro et al., 2006; Gregg et al., 2002; Shlipak et al., 2004). Specific comorbidities associated with functional status include dementia (Aguero-Torres et al., 1998), heart failure (Arnold et al., 2009; de Rekeneire et al., 2003; Dekker et al., 2009; Shlipak et al.,

2004), anemia (Arnold et al., 2009; Shlipak et al., 2004), depression (Arnold et al., 2009), impaired vision (de Rekeneire et al., 2003; Dekker et al., 2009; Dunlop et al., 2005; Gregg et al., 2002), cognitive impairment (Dekker et al., 2009; Dunlop et al., 2005), obesity (Dekker et al., 2009; Gregg et al., 2002), osteoarthritis, chronic obstructive pulmonary disease (Dekker et al., 2009), coronary artery disease (de Rekeneire et al., 2003; Gregg et al., 2002), hypertension (de Rekeneire et al., 2003; Shlipak et al., 2004), urinary incontinence, current smoking (de Rekeneire et al., 2003), diabetes (Dunlop et al., 2005; Figaro et al., 2006; Gregg et al., 2002), stroke, physical limitation (Dunlop et al., 2005), chronic renal insufficiency, claudication, and cancer (Shlipak et al., 2004).

The Functional Comorbidity Index (FCI) (see appendix E) was developed using physical function as its primary outcome (Groll, To, Bombardier, & Wright, 2005). A list of possible medical diagnoses was assembled from multidisciplinary focus groups. Diagnoses which were significantly associated with functional status were identified using data from the Canadian Multi Centre Osteoporosis Study, a data set of 9,423 community dwelling adults recruited from the general population by random phone dialing. A second database was also used, the 28,349 participant National Spine Network database. The final product was an index of 18 different comorbidities. Although a weighted version of the index explained slightly more of the variation in physical function as measured by the physical function subscale of the SF-36, the difference was only slight, so the authors opted for an unweighted version to provide greater simplicity of use. This decision was questioned by Resnik, Gozalo and Hart (2011), who found that while the unweighted version performed almost as well as the weighted one for patients with some injuries, the weighted version made an important difference for other groups of patients, particularly those with neurological impairment (Resnik, Gozalo, & Hart, 2011).

Fan et al. (2012) found that the inter-rater reliability of the FCI as measured by intraclass correlation coefficient was 0.91. They also found that while the use of admission and discharge summaries significantly underestimates comorbidity as compared with full chart review, all

methods give comparable results when regressed to predict physical functioning at one year follow-up (Fan et al., 2012).

Although the FCI has only been used in a few studies so far, it has generally performed better than the CCI when the outcome of interest is physical functioning. Fortin et al. (2005) compared the performance of the FCI, the CCI, and the Cumulative Illness Rating Scale (CIRS) using a sample of 238 adults recruited from primary care practices. Their primary outcomes of interest were the physical and mental quality of life subscales of the SF-36. They found that for all domains the CIRS outperformed the FCI, and the FCI outperformed the CCI. The CIRS is more difficult to use than the FCI, because it requires an assessment of the severity of each condition. The authors' conclusion was that while the CIRS is clearly superior to the FCI for evaluating comorbidity in studies focusing on the mental health aspects of quality of life, the FCI, due to its ease of use, is a viable alternative for studies focusing on the physical aspects of quality of life, and that the FCI is clearly superior to the CCI for predicting functionality. Overall the FCI explained 9.53% of the variation in the physical domain of the SF-36, 5.21% of the role physical domain, 6.8% of the bodily pain domain, and 7.96% of the general health domain. Also of note, the authors obtained an inter-rater reliability coefficient of 0.92 for use of the FCI in their study (Fortin et al., 2005).

Other studies comparing the FCI with the CCI include the initial study for the development and testing of the FCI (Groll et al., 2005) and a subsequent study with the same lead author comparing the performance of the FCI with the CCI in a group of 73 acute respiratory distress syndrome (ARDS) patients (Groll, Heyland, Caeser, & Wright, 2006). The findings of the ARDS patient study were that the FCI was better correlated with the physical function and physical component subscales of the SF-36 than was the CCI. Levine and Weaver (2014) compared the FCI with the CCI using a cohort of 233 sleep apnea patients. Their outcome of interest was general physical health. The authors found that the FCI was a better predictor of the physical function and the physical component domains of the SF-36 than was the CCI (Levine & Weaver, 2014).

One study was found which showed little difference between the FCI and the CCI as a predictor of physical function (Gabbe, Harrison, Lyons, Edwards, & Cameron, 2013). It was based on registry data from the Victorian Orthopaedic Trauma Outcomes Registry. The outcome of interest was physical function at discharge as measured by the Glasgow Outcome Scale. The results of the study were that the area under curve for the CCI was 0.70 and that for the FCI was 0.69. Some sample characteristics which may help explain this result were that the sample was generally younger and healthier than the population as a whole.

In conclusion, although the FCI is a fairly new tool and has not been widely used, it is superior to the CCI for predicting functional outcomes. Attention should be paid to the individual comorbidities which make up the index as well to determine which of those comorbidities are most closely related to the outcome of interest, functional status.

Procedure

The principal investigator visited each recruitment site periodically to enroll new participants. Each person thought to be eligible was approached and asked screening questions (see appendix G). The participant's decisional capacity to give consent was confirmed by giving the person the opportunity to read the consent and then asking the potential participant to verbalize understanding of the nature, benefits, and risks of the study as explained in that document. After the participant consented, she/he was be asked to fill out the EMAS and the demographic form. Information for the Katz ADL Index, the Lawton-Brody IADL Scale, the FCI and the GDS was obtained by the researcher interviewing the resident. In order to complete the FCI, the researcher asked the participant about each of the diagnoses on the scale and also asked the participant to list her/his current medications. The researcher remained in the recruitment site until the surveys are completed. The participants were thanked for their participation and given a gift card worth ten dollars at a local store.

Ethical Considerations

Because this study relies on data collection from surveys, the main risks to participants was potential loss of confidentiality and the risk of negative emotional responses to the content of

the study questions (Lo, 2007). During the consent process, the nature, duration, potential risks, and burden of the study were discussed. The participant was asked to verbalize her/his understanding of the explanation prior to giving consent (Burns & Grove, 2009). A sample of the consent form is provided in appendix H.

Approval was obtained from the Institutional Review Board (IRB) at the University of Texas at Arlington before any data collection procedures begin. Data collection instruments did not have any identifying information. The only place where identifying information of participants appeared was on the consent forms, which were not linked or stored with the survey tools. Participants were informed of the name and contact information of the principal researcher. Data will be stored on encrypted computers for three years and will then be destroyed. All paper data and consents will be stored in a locked box until they are no longer required, at which time they will also be destroyed.

In order to address the possibility that screening with the GDS-SF might uncover previously undiagnosed depression in a participant, a plan was put in place that in such a case the researcher would tell participants scoring greater than five on the GDS-SF and the participant was not being treated for depression the researcher would review the results of the GDS-SF with the participant. The researcher would tell the participant that she/he scored high on a screening tool for depression and would recommend that the participant discuss this with his/her primary healthcare provider. The participant would also be given a copy of the brochure *Depression* from the National Institute on Aging (National Institute on Aging, 2013). It was only necessary to implement this plan one time.

Data Analysis

Descriptive statistics were calculated to analyze the demographics of the sample. Regression analysis were done to explore the relationship between engagement with activity and functional status while controlling for the covariates of age, comorbidity, and affect. Levels of engagement with activity were calculated for the different demographic groups represented in the sample.

Multiple regression assumes that the different values of the outcome variable are independent and come from a randomly selected sample (Zar, 2010). The values are also assumed to be normally distributed and homoskedastic. Another assumption is that there is not excessive multicollinearity among the predictor variables. These assumptions were tested by calculating the Shapiro Wilk test for normality, and the Levene test for homoscedasticity. Since the normality assumption was not met, logistic regression was performed on dichotomized versions of the dependent variables.

Delimitations

This is an exploratory pilot study. It will not be used to confirm any hypothesis. It was limited to high functioning older adults living in the community or in the independent living or assisted living sections of a CCRC. Results should not be generalized to lower functioning older adults or to older adults in other settings. The study relies heavily on self-report data. Self-report data may be less reliable than objective assessments. In this study self report data were used because it is less intrusive and is likely to be better accepted by the participants.

Summary

The method, sample, and setting for a proposed correlational study of engagement with activity and functional status among older adults were described. Definitions were given for the main concepts. A discussion of the reliability and validity of the tools to be used followed. The procedure was detailed, and ethical concerns were addressed. A data collection plan was also presented.

Chapter IV

Findings

Introduction

The purpose of this study was to explore the relationship between engagement with activity and functional status among older adults. The research question was, "Controlling for depression, and comorbidity, are higher levels of engagement associated with higher functional status among older adults?" According to the operational definitions used, EMAS scores served as a measure of engagement, GDS-SF scores as a measure of affect, and FCI scores for comorbidity. Both the Katz and Lawton-Brody scores were used as measures of functional status. Demographic data collected included age, gender, marital status, Hispanic origin, race, and living situation. Two other variables identified in chapter 2 as being important for functional status were not measured: mental status and social support. Mental status was controlled for by limiting participation to those who were able to verbalize understanding of the study purpose. Although social support was unmeasured, data for marital status and living situation (retirement center or community) were collected.

Settings

Participants were recruited from three different senior living communities and from a university based exercise group for older adults. The senior living communities are given pseudonyms here: Riverview Village, Woodside Senior Living Center, and St. Joseph's Village. Riverview Village is part of a small chain of faith based facilities sponsored by a group of independent churches. St. Joseph's Village is a stand-alone Roman Catholic institution. Woodside Senior Living Center is part of a nationwide chain of corporate owned senior living centers. Riverview Village includes independent living and assisted living areas, but the other two facilities only have independent living. The participants in the university based exercise program were community dwelling older adults.

Research days were scheduled with contact people at each recruitment site and potential participants were informed by means of flyers posted in the facility. On the designated day the

potential participants were informed that the researcher was in the building, and those who were interested in participating came to a central location to learn more about the study and for data collection at that time if they consented.

Description of Sample

Total enrollment for the study was 95 participants. Three participants were excluded for failing to meet the age criterion. Eight participants were lacking some predictor or outcome variable data, so they were excluded from analyses dependent on those data, resulting in a total of 84 participants with complete data.

The mean age for the sample was 80.18 (SD 8.01) years. The sample consisted of 68 women and 24 men. The majority of the sample self-identified as White/Caucasian (96%), followed by African American/Black (2%), and Native American (1%). One participant identified as Hispanic. Twenty-two participants did not answer the question about Hispanic identity. Demographic characteristics of the sample are summarized in Table 4-1.

Table 4-1.

Sample demographics

Characteristic	n	%	Characteristic	n	%
Female	68	74%	Assisted living	2	2%
Male	24	26%	Independent living (senior center)	57	62%
White	88	96%	Community dweller	33	36%
Black	2	2%	Divorced	17	18%
American Indian	1	1%	Married	42	46%
Did not answer race question	1	1%	Single	4	4%
Hispanic	1	1%	Widowed	37	40%
Not Hispanic	69	75%	No answer to marital question	2	2%
No answer to Hispanic question	22	24%			

Fifty-seven participants lived in the independent living sections of senior communities, two lived in assisted living, and 33 were community dwellers. Thirty-two participants were married, 17 were divorced, 37 widowed, and four were single. Two participants did not answer the question about marital status. For a summary of how the variables compared by facility, see Table 4-2. The n value for some variables differs due to incomplete data. The same data are

presented according to participant living situation in Table 4-3. Standard deviations are given in parentheses. Note that independent living refers to residents in an independent living section of an adult retirement community and community dwelling means participants recruited from the university based exercise program.

Table 4-2.

Main variables by facility

Facility	n	Age	EMAS	FCI	GDS-SF	Katz	Lawton Brody
Riverview	26	84.69 (8.67) n=26	39.58 (4.1) n=24	3.85 (2.24) n=26	1.85 (1.59) n=25	5.54 (0.76) n=25	6.96 (1.4) n=26
Woodside	18	83.22 (7.57) n=18	39.71 (4.58) n=17	4.5 (1.92) n=18	2 (2.61) n=18	5.78 (0.43) n=18	7.11 (0.83) n=18
St. Joseph's	15	78.33 (6.14) n=15	38.33 (5.52) n=15	4.73 (2.71) n=15	1.6 (1.72) n=15	5.73 (0.46) n=15	7.6 (1.3) n=15
University Exercise	33	75.82 (5.82) n=33	40.06 (4.46) n=32	3.7 (2.14) n=33	1.1 (1.16) n=32	5.69 (0.47) n=33	8 (0) n=33
Total	92	80.18 (8.01) n=92	39.57 (4.54) n=88	4.07 (2.23) n=92	1.61 (1.76) n=88	5.67 (0.56) n=91	7.47 (1.06) n=92

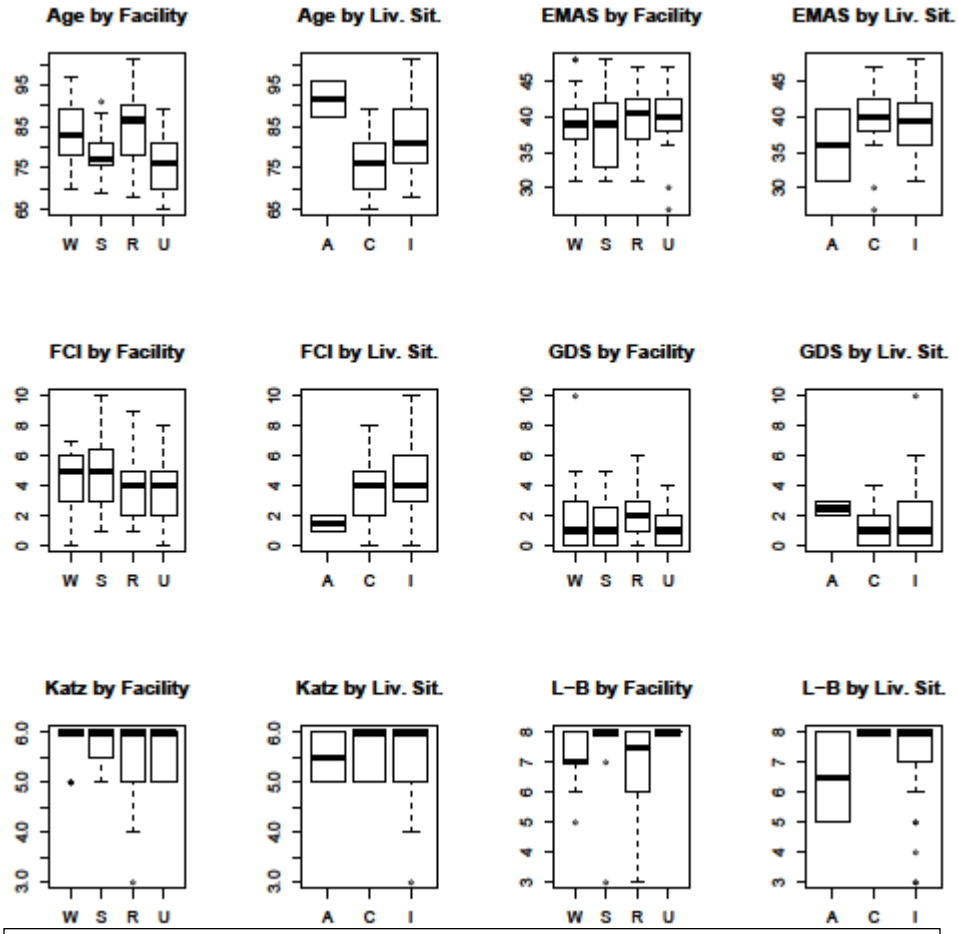
Table 4-3.

Main variables by living situation

Situation	n	Age	EMAS	FCI	GDS-SF	Katz	Lawton Brody
Assisted living	2	91.5 (6.36) n=2	38.65 (5.65) n=2	1.5 (0.71) n=2	1.81 (1.97) n=2	5.5 (0.71) n=2	6.5 (2.12) n=2
Independent living	57	82.32 (7.99) n=57	39.41 (4.55) n=54	4.37 (2.25) n=57	1.84 (1.99) n=56	5.67 (0.61) n=57	7.19 (1.22) n=57
Community dweller	33	75.82 (5.82) n=33	40.06 (4.46) n=32	3.7 (2.14) n=33	1.1 (1.16) n=30	5.69 (0.47) n=32	8 (0) n=33
Total	92	80.18 (8.01) n=92	39.57 (4.54) n=88	4.07 (2.23) n=92	1.61 (1.76) n=88	5.67 (0.56) n=91	7.47 (1.06) n=92

These summary data are presented in visual form in Figure 4-1.

Figure 4-1. Box Plots of Summary Data



Data Analysis

ANOVA were performed to identify differences in the main variables by facility and by living situation. ANOVA testing relies on the assumptions of independence of observations, normal distribution of independent variables, and homoscedasticity of independent variables (Zar, 2010). Normality was tested using the Shapiro-Wilk test, and homoscedasticity with the Levene test The Shapiro-Wilk test was computed using R core software (R Core Team, 2014) and the Levene test using the lawstat package for R (Gastwirth et al., 2015). At a significance level of

0.05, only the age and EMAS score data were found to be normally distributed. All data were homoscedastic except for the Lawton-Brody scores, which were heteroskedastic when factored both by facility and by living situation. Results of the Shapiro-Wilk test for the independent variables as well as possible transformations are given in Table 4-4. Results for the Levene tests are given in table 4-5. Results for the ANOVA tests are presented in Table 4-6.

Table 4-4.

Normality tests for major variables

	Raw value	Squared	Square root	Log
Age	W = 0.986, p = 0.434	W = 0.976, p = 0.081	W = 0.989, p =0.592	W = 0.989, p =0.615
EMAS	W = 0.952, p =0.002	W = 0.982, p =0.211	W = 0.924, p <0.001	W = 0.885, p <0.001
FCI	W = 0.969, p =0.022	W = 0.844, p <0.001	W = 0.931, p <0.001	W = 0.362, p < 0.001
GDS	W = 0.810, p <0.001	W = 0.455, p < 0.001	W = 0.888, p <0.001	W = 0.810, p <0.001
Katz	W = 0.593, p <0.001	W = 0.606, p <0.001	W = 0.580, p <0.001	W = 0.562, p <0.001
Lawton-Brody	W = 0.567, p <0.001	W = 0.605, p <0.001	W = 0.539, p <0.001	W = 0.506, p <0.001

Table 4-5.

Homoscedasticity tests for major variables factored by group and facility

	Facility	Living Situation
Age	p =0.313	p =0.263
EMAS	p =0.548	p =0.490
FCI	p =0.503	p =0.381
GDS	p =0.270	p =0.180
Katz	p =0.469	p =0.899
Lawton-Brody	p <0.001	p <0.001

Table 4-6.

ANOVA results for age and squared EMAS score by facility and living situation

Variables	DF	F	p	Variables	df	F	p
Age, Facility	3,88	9.033	<0.001	Age, Liv. Sit.	2,89	10.84	<0.001
EMAS^2 , Facility	3,84	0.428	0.733	EMAS^2, Liv. Sit.	2,85	0.774	0.464

Table 4-7.

Kruskal-Wallis tests of skewed variables

Variables	DF	Chisq	p	Variables	df	Chisq	p
FCI, Facility	3	3.394	0.335	FCI, Liv. Sit.	2	4.745	0.093.
GDS, Facility	3	3.474	0.324	GDS, Liv. Sit.	2	3.619	0.164
Katz, Facility	3	1.147	0.766	Katz, Liv. Sit.	2	0.397	0.820
Lawton-Brody, Facility	3	30.264	<0.001	Lawton-Brody, Liv. Sit.	2	20.678	<0.001

Table 4-8.

Statistically significant group differences

Variable	Groups (Group with greater mean listed first)	Adjusted p
Age	Woodside vs. University Exercise	0.003
Age	St. Joseph's vs. Riverview	0.035
Age	Riverview vs. University Exercise	<0.001
Age	Assisted living vs. Community	0.011
Age	Independent living vs. Community	<0.001

Table 4-5 shows that the Lawton-Brody data were not normally distributed and was heteroskedastic when factored by facility or living situation, so ANOVA could not be performed. The EMAS score data were not normally distributed, but this could be ameliorated by using the square of the value. Distributions of the FCI score, the GDS score, and the Katz score were not normally distributed and could not be ameliorated by transformations. Kruskal-Wallis tests were performed to detect differences in FCI, GDS, Katz, and Lawton-Brody scores factored by facility and living situation (see table 4-7). Pearson chi-square tests were performed to identify differences in Lawton-Brody score by specific facility. Differences were found between Woodside and St. Joseph's X^2 (1, N = 33) = 8.204, p = 0.004, Woodside and the university based exercise group X^2 (1, N = 51) = 27.908, p < 0.001, St. Joseph's and Riverview X^2 (1, N = 41) = 4.045, p = 0.0443, and Riverview and the university exercise group X^2 (1, N = 59) = 19.358, p < 0.001. Mean Lawton-Brody scores for the facilities were 6.96 for Riverview, 7.11 for Woodside, 7.6 for St. Joseph's, and 8.0 for the university exercise group. Statistically significant ANOVA results were followed by the Tukey Honestly Significant Difference Test (HSD), results for which are presented in table 4-8.

The data analysis plan was to fit two multiple regression models using Katz score and Lawton-Brody score respectively as the dependent variables, and using age, EMAS score, FCI score, and GDS score as the independent variables for each model. Multiple regression analysis is based on the assumptions that the dependent variable observations are randomly drawn and independent, that the distribution of the dependent variable is normal, that there is minimal error, and that there is homoscedasticity of the independent variables (Zar, 2010). Because the dependent variables (Katz and Lawton-Brody scores) were not normally distributed, logistic regression was used. The two dependent variables (Katz score and Lawton-Brody score) were dichotomized to new variables equal to one for the maximum score and zero for anything less than the maximum. The distribution of values using these new variables is shown in table 4-9. Two logistic regression models were then fit using the dichotomized Katz and Lawton-Brody

scores as the dependent variables (see Table 4-10 and Table 4-11). Logistic regression does not depend on the assumptions of normality of dependent variables and homoscedasticity of independent variables. One assumption for logistic regression is that the outcome can be dichotomized into two mutually exclusive categories (Reed & Wu, 2013). These two exclusive categories must be comprehensive for all possible outcomes of the data. Although the independent variables are not in a linear relationship with the dependent variable itself, they are assumed to be in a linear relationship with the logit of the dependent variable. There should also be a sufficient number of dependent variable events (Ottenbacher, Ottenbacher, Tooth, & Ostir, 2004).

Table 4-9.

Distribution of dichotomized outcome variables

	n	0 scores (%)	1 scores (%)	Mean score
Dichotomized Katz	91	27 (29.7%)	64 (70.3%)	0.703
Dichotomized Lawton-Brody	92	27 (29.3%)	65 (70.7%)	0.707

Table 4-10.

Logistic regression model with dichotomized Katz score as dependent variable

	Crude OR	Adjusted OR	p
Age	1.002 (0.947-1.062)	0.985 (0.923-1.053)	0.660
EMAS.Score	0.926 (0.826-1.030)	0.922 0.814-1.035)	0.180
FCI.Score	0.850 (0.685-1.043)	0.837 (0.664-1.040)	0.115
GDS.Score	1.063 (0.818-1.439)	1.204 (0.883-1.766)	0.286

Table 4-11.

Logistic regression model with dichotomized Lawton-Brody score as dependent variable

	Crude OR	Adjusted OR	p
Age	0.860 (0.793-0.922)	0.847 (0.767-0.919)	<0.001
EMAS.Score	1.087 (0.980-1.212)	1.183 (1.037-1.376)	0.018
FCI.Score	0.927 (0.755-1.134)	0.889 (0.681-1.147)	0.370
GDS.Score	0.902 (0.696-1.172)	1.090 (0.794-1.521)	0.587

Goodness of fit for the models was tested using the difference between the residuals of the null models and the observed models and the difference in degrees of freedom for the null model and the observed model. For the dichotomized Katz score model the chi-square value for these differences was X^2 (4, N = 86) = 5.549, p = 0.235, and for the dichotomized Lawton-Brody model it was X^2 (4, N = 86) = 22.471, p < 0.001. This means that the dichotomized Lawton model was statistically a better predictor than the null model, but the dichotomized Katz model is not. There were no statistically significant predictors of Katz score. There are two statistically significant predictors of Lawton-Brody score: EMAS score (p=0.018) and age (p=<0.001). Both of these models were computed using listwise deletion.

Missing Data

Four participants were missing parts of the EMAS score. In two cases this appeared to be the result of failure to turn over the page. In one of the other cases, the answer to the first question was missing. Given the layout of the page, this could be due to mistakenly taking the second question to be the first. In the other instance the second question was missing, a situation for which there is no obvious explanation. The FCI score data were incomplete for one participant because there was no answer to the question of upper gastrointestinal disease. This

was likely due to random error on the part of the data collector. In four cases questions in the GDS were not answered. In three of those cases question nine was missing, and in one it was question ten. Question nine reads “Do you prefer to stay at home rather than going out and doing things?” It was noted that many of the participants had difficulty answering this question, and needed encouragement to do so. Although difficulty answering the question likely relates to participant characteristics, there is no reason to suppose that difficulty answering the question is related to the answer itself. When encouraged to choose, participants ended up answering either way. One participant was missing an answer for the Katz scale. This was probably a clerical data collection error. Missing data for the EMAS, FCI, and Katz scores are thus likely missing completely at random and missing data for the GDS score are likely missing at random (Peyre, Leplège, & Coste, 2011).

Two imputed models were fitted for the dependent variables of dichotomized Katz score and dichotomized Lawton-Brody score. The missing values were imputed using predictive mean matching, a method whereby ordinary least squares regressions are calculated from the other variables in the data frame to impute the missing value. Each model was run five times, and the results were pooled. This was performed using the mice package to the R language (van Buuren & Groothuis-Oudshoorn, 2011). Results for these two models are presented in Table 4-12 and Table 4-13. There is little difference between the listwise deletion models in tables presented in tables 4-10 and 4-11 and the imputed models presented in tables 4-12 and 4-13.

Table 4-12.

Dichotomized Katz model with multiple imputation

	p	nmis	fmi	lambda	Odds ratio
Age	0.825	0	0.032	0.009	1.007 (0.947-1.070)
EMAS.Score	0.316	4	0.073	0.049	0.947 (0.850-1.054)
FCI.Score	0.162	1	0.051	0.028	0.860 (0.695-1.064)
GDS.Score	0.683	4	0.101	0.077	1.064 (0.788-1.437)

Table 4-13.

Dichotomized Lawton-Brody model with multiple imputation

	p	nmis	fmi	lambda	Odds ratio
Age	0.001***	0	0.028	0.006	0.838 (0.769-0.914)
EMAS.Score	0.003**	4	0.028	0.005	1.147 (1.011-1.302)
FCI.Score	0.287	1	0.024	0.001	0.871 (0.674-1.126)
GDS.Score	0.620	4	0.105	0.079	1.082 (0.789-1.484)

Instruments

Two relatively new instruments were used in this study; the EMAS and the FCI. The EMAS performed with good internal consistency as demonstrated by a Cronbach's alpha score of 0.83. Mean scores for the EMAS were similar across groups. See table 4-2, Main variables by facility and table 4-3, main variables by living situation. The FCI also had similar means for all groups except for the assisted living group, but that group consisted of only two participants. See Table 4-14.

Table 4-14.

Cronbach's alpha of instruments

Instrument	n	K-R-20 coefficient	Instrument	n	K-R-20 coefficient
EMAS	88	0.83	GDS	88	0.63
FCI	91	0.49	Katz	91	0.3
			Lawton-Brody	92	0.66

Summary

In this chapter results from the study were presented. The settings were described, and descriptive statistics for the sample were given. The results of two logistic regression models were presented. Alternative logistic regression models using multiple imputation were also presented, as well as Cronbach's alpha results for the instruments used in the study.

Chapter V

Discussion

Introduction

The principal findings of this study, as presented in Chapter 4, were that the EMAS score is positively related and age is negatively related to the odds of achieving the maximum score on the Lawton-Brody IADL Scale. The implications of these findings are discussed in this chapter. The problems of ceiling effects for both the Katz Index of Independence in ADL and the Lawton-Brody IADL Scale are also discussed. Two other variables in the model for this study; depression, measured by the GDS, and marital status (as a proxy for social support) warrant comment. Although these variables were thought to be important for functional status, data from this study do not support this. Limitations of the study are explored. The chapter concludes with implications for practice, theory, and future research.

Engagement

The concept of engagement has three dimensions: motivation, participation, and commitment to a type of action (Lequerica & Kortte, 2010). The EMAS focuses mainly on motivation, with some items measuring commitment. It does not measure participation. Although the developers of the EMAS reported that the survey correlated negatively with depression (Eakman, Carlson, & Clark, 2010a), in this study the correlation between EMAS score and GDS-SF score was only $r = -0.026$. The EMAS also had little relationship to comorbidity as measured by the FCI score in this study ($r = 0.026$). Cronbach's alpha for the EMAS in this study was 0.83, which is close to the value of 0.84 obtained by the developers of the instrument (Goldberg, Brintnell, & Goldberg, 2002). Despite the virtues of the EMAS, it would have been helpful to have supplemented it with another tool such as the MAPA (Eakman, Carlson, & Clark, 2010b) to more fully measure the commitment and the participation dimensions of engagement.

Age

In the present study a small effect was found in the dichotomized Lawton-Brody model for age. The odds ratio for this effect was 0.847. It is easier to understand this result if it is

converted to the odds ratio for getting an imperfect score on the Lawton-Brody. This reverses the relationship such that each year of age increases the odds of getting an imperfect score and the odds ratio is 1.181. Each year of age results in a 18% increase in the odds for getting an imperfect score. Bennet et al. (2002) found a risk ratio of 1.08 for IADL function decline for each year of age and a 1.13 risk ratio for decline in ADL function (Bennett et al., 2002). This means that the risk of decline in IADL function increased 8% and that for ADL function increased 13% for each year of age. Odds ratios and relative risk ratios are not directly comparable. Relative risk measures ratios between probabilities, but the odds ratio measures ratios between odds. For low frequency events, the ratios are close, but as the frequency of the event increases they diverge with the odds ratio becoming much greater than the corresponding risk ratio (Long, 1997).

FCI score was found to be a predictor of the dichotomized Katz score, but the effect was not statistically significant. This finding contrasts with the finding by Marengoni et al. (2009). They found that one comorbidity increased the odds of functional decline by a factor of 1.5 and four or more comorbidities increased the odds by a factor of 6.2. It should be noted that the Marengoni et al. study was a longitudinal study with a larger sample and a better sampling procedure than the study reported here (Marengoni, Von Strauss, Rizzuto, Winblad, & Fratiglioni, 2009).

The FCI itself had a Cronbach's alpha result of only 0.49 in this study. This is not very high. Cronbach's alpha is a measure of the homogeneity of the items in an instrument. It is designed to measure how well an instrument is focused on a single construct. As such, it may not be a very appropriate assessment for a tool to measure comorbidity. The purpose of the FCI is to predict functional status based on a participant's comorbidities. For this reason, comorbidities thought to have a high impact on functional status belong in such a tool regardless of whether or not they correlate well with other comorbidities in the tool.

Ceiling effects of the Katz and the Lawton-Brody

The two dependent variables, dichotomized Katz score and dichotomized Lawton-Brody score, both exhibited pronounced ceiling effects. The ceiling effects for the underlying raw Katz

and Lawton-Brody scores were even more notable resulting in sharply skewed distributions for those variables. This was the primary reason for the decision to use logistic regression. There were 64 participants who scored one on the dichotomized Katz score variable and only 27 who scored zero. There were 65 participants who scored 1 on the dichotomized Lawton-Brody score variable and 27 who scored zero. Looking at the raw Katz scores, 64 participants scored 6 (the maximum), 25 scored 5, one participant scored 4, and one scored 3. All of those who scored 5 did so because they reported incontinence. Raw Lawton-Brody scores ranged from 3-8, but most of the participants were clustered at the high end. Only eleven participants scored less than 7.

Negative findings

A surprising finding of the study was the lack of significance of the GDS score in either model. Table 5-1 shows the r values for GDS score with each of the other interval level variables. The strongest relationship is between the GDS and age, followed by its relationship with FCI score. As can be seen from the table, GDS score has a small negative relationship to Lawton-Brody score. This was not apparent in any of the logistic regression models that were fitted. Most likely the effect of age accounts for the GDS effect. As mentioned in the literature review, Mehta, Yaffe, and Covinsky (2002) found that depression was a risk factor for the development of functional dependence for those who were functionally intact at the beginning of their study, but not for those who were already functionally dependent. Since the study being reported here was cross sectional, the more depressed participants could be at greater risk for developing depression in the future, but might still be functionally intact.

Table 5-1.

Correlations for GDS score

	Age	*EMAS*	*FCI*	*Katz*	*Lawton-Brody*
GDS	*0.222*	*-0.026*	*0.158*	*0.012*	*-0.082*

Although none of the literature reviewed in Chapter 2 suggested a relationship between marital status and functional status, the model for the study included social support as an

influence on functional status. Social support itself was not measured, but marital status could be considered a proxy. Chi-square tests of marital status were performed with both the dichotomized Katz and the dichotomized Lawton-Brody variables. Marital statuses were combined to create two categories; married and not married, because otherwise some cell sizes would have been too small to use the chi-square test. For the dichotomized Katz score, the results were $X2$ (1, $N = 89$) = 1, $p = 0$, and for the dichotomized Lawton-Brody the results were $X2$ (1, $N = 90$) = 0.718, $p = 0.397$. Marital status was not found to be associated with a statistically significant difference for either the dichotomized Katz or the dichotomized Lawton-Brody.

Limitations

Limitations of this study include the lack of randomized sampling, the cross sectional nature of the study, and limitations of the tools used. The study relied on self-report data. There were also difficulties in reaching and recruiting subjects in assisted living sections of CCRCs. Since this was a pilot study, it is hoped that lessons learned from these difficulties can be incorporated in future studies.

This study made use of convenience samples. The bias inherent in convenience samples can be ameliorated by systematically approaching everyone thought to be eligible (Grove, Burns, & Gray J. R., 2013). In this study, the procedure was to go to participating facilities and set up in a central location. Potential participants had previously been informed that a study was to take place, and those who were interested came to a central location. The principal investigator became aware of possible selection bias during the course of this study. For example, one woman in the independent living section of a CCRC mentioned that she had to leave soon in order to take a meal to her husband. She described him as being dependent and as seldom leaving the couple's room. Some potential participants were observed using walkers and wheelchairs, and when approached said that they probably would not be able to contribute much because they were not very active.

The study design was cross sectional. There may be differences over time in functional status predicted by differences in the values of the independent variables at baseline, but none of these would be captured in a cross sectional design. The most obviously deficient tools were the Katz ADL Index and the Lawton-Brody IADL Scale. The primary problem with both of these tools was the ceiling effect. There were very few participants with a Katz score below 5, and the majority of participants had a score of 6, a perfect score. This effect was not quite so pronounced with the Lawton-Brody, but it was still a problem. The EMAS and the FCI performed well. With the GDS-SF, the investigator sometimes got the feeling that participants were giving the perceived socially acceptable response.

The original plan was to recruit equal numbers of participants for the community dwelling, independent living, and assisted living cohorts. In fact, only two assisted living residents were recruited. Two issues came up frequently with assisted living residents: the feeling that their helplessness made them unable to contribute anything of value, and the feeling that participating would not do any good because it would not solve their problem of being stuck in an assisted living facility. It was notable that while the residents of the independent living section seemed to be happy with the facility and feel that they were there by choice, those in the assisted living section seemed unhappy and expressed the idea that they were there because they had no choice. This observation is congruent with the findings of Shippee, who lived in a CCRC as a participant observer and did a qualitative study on the meaning of transitions within the facility (Shippee, 2009). Although an outsider would have difficulty distinguishing the independent living and assisted living sections of a CCRC based on the physical facilities, the difference in the attitude of the residents is palpable.

Implications

The principal finding of this study is that engagement with activity is a predictor for functional status, at least for that aspect of functional status measured by the Lawton-Brody IADL Scale. This finding has implications for practice, theory, and future research.

Practice

One of the concerns of nursing practice is early identification of patients at risk for negative outcomes so as to intervene early with those patients with preventative measures. The finding that engagement is associated with worse functional status suggests that nurses should consider engagement with activity in their screening for older patients at risk for functional decline. This is particularly the case for nurses working in long term care environments.

Nurses in long term care should also consider the meaningfulness of various activities to the individual when planning activities for their patients. Activity which is meaningful to the patient is likely to be better received and may be more therapeutic than equivalent activities which are not meaningful to the patient.

Theory

The finding that increased engagement with activity is linked to better functional status supports activity theory and continuity theory and casts doubt on disengagement theory. As mentioned in Chapter 1, disengagement theory holds that as people get older they naturally disengage from previously valued roles and activities and that this disengagement is mutually beneficial to the older adult and to society (Burbank, 1986). In contrast, activity theory holds that older adults generally prefer to maintain their accustomed activity (Blace, 2012), and that doing so is good for their mental and physical health (Longino & Kart, 1982). On the surface, activity theory and disengagement theory appear to be completely opposite. Should older people retire to a beach front home or should they stay on their jobs as long as they can? It is easy to think of examples from experience which support both options. Continuity theory is an attempt to resolve this conflict (Street, 2007). Continuity identifies role function as the key element in maintaining life satisfaction through activity (Atchley, 1989). To be meaningful, activity need not be exactly the same as the activity of former years, but it should activate accustomed roles. Activity which activates those accustomed roles is likely to be meaningful and therapeutic.

If decreased engagement is associated with worse functional status, it seems imprudent to recommend that older people disengage from activity, as proposed by disengagement theory.

Nevertheless, life changes and older peoples' own preferences often force some modification in activity. Continuity theory would suggest that the activities chosen for a given older adult should be congruent with that older adults own most treasured social roles.

Research

One question left open by the present study is which phenomenon comes first. Are engaged people more functionally independent because they are engaged, or are they more engaged because they are more functionally independent? This question cannot be settled with a cross sectional study. Even a longitudinal study would not completely resolve it. A finding that increased engagement at baseline was associated with better functional status on follow-up would certainly support such a hypothesis, but there would still be the doubt that perhaps subtle precursors of functional decline not picked up by the assessment tool were already present at baseline. The best design for settling this question would be an interventional study where a randomly selected treatment group received interventions designed to improve engagement and a control group received a dummy intervention.

Other lines for research involve further testing of both engagement and activity theory. Are increased levels of engagement associated with increased levels of life satisfaction, and does life satisfaction have any relationship to functional status? Is increased engagement really related to activation of valued roles?

Finally, if engagement is indeed found to be a driver of improved functional status, there will be a need for interventions to improve engagement levels. There will also be a need to incorporate engagement in routine assessments, particularly in the long term care setting. The next step is to determine whether engagement is a driver of functional status or merely an epiphenomenon of high functional status.

Summary

In this chapter, predictors of functional status from the two logistic regression models were discussed. Negative findings for variables which were expected to be predictors were also identified. Problems with the tools used for the dependent variable; the Katz ADL Index and the

Lawton-Brody IADL Scale were also described. This was followed by mention of some of the limitations of the present study and a section on the implications of this study for practice, theory, and future research.

Appendix A
Engagement in Meaningful Activity Survey (EMAS)

Not included due to lack of copyright permission.

Appendix B
Geriatric Depression Scale – Short Form (GDS-SF)

Geriatric Depression Scale (short form)
Ask the participant how he/she felt over the past week and circle the answer

Are you basically satisfied with your life?	yes no
Have you dropped many of your activities and interests?	yes no
Do you feel that your life is empty?	yes no
Do you often get bored?	yes no
Are you in good spirits most of the time?	yes no
Are you afraid that something bad is going to happen to you?	yes no
Do you feel happy most of the time?	yes no
Do you often feel helpless?	yes no
Do you prefer to stay at home, rather than going out and doing things?	yes no
Do you feel that you have more problems with memory than most?	yes no
Do you think it is wonderful to be alive now?	yes no
Do you feel worthless the way you are now?	yes no
Do you feel full of energy?	yes no
Do you feel your situation is hopeless?	yes no
Do you think that most people are better off than you are?	yes no
Total Score_____	

Sheikh JI, Yesavage JA: Geriatric Depression Scale (GDS): Recent evidence and development of a shorter version. *Clinical Gerontology : A Guide to Assessment and Intervention* 165-173, NY: The Haworth Press, 1986.

APPENDIX C
Katz Index of Independence in Activities of Daily Living

Not included due to lack of copyright permission.

Appendix D
Lawton-Brody Instrumental Activities of Daily Living Scale

Not included due to lack of copyright permission.

Appendix E
Functional Comorbidity Index (FCI)

1. Arthritis (rheumatoid and osteoarthritis)
2. Osteoporosis
3. Asthma
4. Chronic obstructive pulmonary disease (COPD), acquired respiratory distress syndrome (ARDS), or emphysema
5. Angina
6. Congestive heart failure (or heart disease)
7. Heart attack (myocardial infarct)
8. Neurological disease (such as multiple sclerosis or Parkinson's)
9. Stroke or TIA
10. Peripheral vascular disease
11. Diabetes types I and II
12. Upper gastrointestinal disease (ulcer, hernia, reflux)
13. Depression
14. Anxiety or panic disorders
15. Visual impairment (such as cataracts, glaucoma, macular degeneration)
16. Hearing impairment (very hard of hearing, even with hearing aids)
17. Degenerative disc disease (back disease, spinal stenosis, or severe chronic back pain)
18. Obesity and/or body mass index > 30 (weight in kg/height in m^2)

height_____(cm or inches?)
weight_____(kg or lbs?) BMI=

Fan, E., Gifford, J. M., Chandolu, S., Colantuoni, E., Pronovost, P. J., & Needham, D. M. (2012). The Functional Comorbidity Index had high inter-rater reliability in patients with acute lung injury. BMC Anesthesiology, 12, 21-21. doi:10.1186/1471-2253-12-21

Appendix F
Demographic Data Collection Form

Age ☐

Gender Male ☐ Female ☐

Marital Status Single ☐ Married ☐ Widowed ☐ Divorced ☐

Hispanic, Latino or Spanish origin? Yes ☐ No ☐

Race White ☐ Black ☐ American Indian ☐ Asian ☐ Other ☐

Living situation

Community dweller ☐

Independent living ☐

Assisted living ☐

Other ☐ Explain_____

Appendix G
Data Collection Procedure

Obtain a list of eligible residents from the designated facility liason.
Screening Questions
How old are you?
(exclude if < 65 years)

Give the participant the consent and briefly inform her/him of the following points:
You are being asked to participate in research.
The purpose of this study is to investigate activity among older adults in assisted living facilities.
Precautions will be taken to protect your privacy, such as identifying you only on the consent form, which is kept separate from the data, but there is a small risk of your personal data falling into unauthorized hands.
You might find the questions distressing. If this happens, let the investigator know. Your participation is voluntary, and you can stop any time you want.
You will be asked to fill out pencil and paper surveys as well as answer interview questions. This takes about 30 minutes.
There is no direct benefit to you. Your participation might help us learn to better help older adults in assisted living facilities.
The name of the principal investigator is Thomas Dombrowsky. He can be reached at 817-282-9773. His faculty adviser is Dr. Kathy Daniel. She can be reached at 817-272-2776.
The study is approved by the Institutional Review Board of the University of Texas at Arlington. If you have questions or concerns about your rights as a research participant you may call the Office of Research Administration, Regulatory Services at 817-272-2105 or email them at regulatoryservices@uta.edu

Ask the participant to verbalize back her/his understanding of these points and assess her/his understanding and judgment.
Clear up any misunderstandings.
Administer the consent form.
Verbally obtain the information for the demographic form, the FCI, the GDS-SF, the Katz ADL Index, and the Lawton-Brody IADL Scale
Give the participant the EMAS.
Stay in the facility long enough to collect the completed form unless the participant indicates a desire to complete the forms later. In that case, make an appointment to return and collect the completed forms.
Thank the resident for her/his participation and give her/him a gift card.

Appendix H
Informed Consent Document

PRINCIPAL INVESTIGATOR
The name of the principal investigator is Thomas Dombrowsky. He is a PhD student in the College of Nursing at the University of Texas at Arlington. He may be contacted at 817 282-9773

FACULTY ADVISOR
The name of the faculty advisor for this study is Dr. Kathy Daniel. She may be reached at the College of Nursing at the University of Texas at Arlington. Her contact number is 817-272-2776

TITLE OF PROJECT
Engagement with Activity and Functional Status among Older Adults.

INTRODUCTION
You are being asked to participate in a research study about activities and self-care ability among older adults. Your participation is voluntary. Refusal to participate or stopping your participation at any time will involve no penalty or loss of benefits to which you are otherwise entitled. Please ask questions if there is anything you do not understand.

PURPOSE
The purpose of this research is to study the link between the activities people do in their daily lives and their ability to take care of themselves.

DURATION
You will be fill out a written survey and to answer some questions. Your participation will last about 30 minutes.

NUMBER OF PARTICIPANTS
It is expected that 100 people will be enrolled in this study.

PROCEDURES
The procedures which will involve you as a research participant include:
1. Filling out survey forms about the activities you usually participate in.
2. Answering verbal questions about your mood, your ability to take care of yourself, your medical problems, the medications you take, your age, and your housing.

POSSIBLE BENEFITS
There are no direct benefits to you as a participant, but what is learned from this research may help in developing better programs of activities for older adults

POSSIBLE RISKS/DISCOMFORTS
There is a small risk that your personal information might be divulged. To prevent this, only this consent will have information which could identify you. It will be kept in a locked box for 3 years and will then be destroyed. You may be uncomfortable with some of the questions asked. If this happens, you may refuse to answer the questions. You may stop your participation at any time. If you feel any discomfort about the study after the researcher is finished, please contact the researcher or his adviser at the numbers provided. You have a right to quit this study at any time with no penalty or loss of benefits to you. Any new information which develops during the study which may affect your willingness to continue participation will be communicated to you.

COMPENSATION
As compensation for your time and trouble, you will be given a gift card worth ten dollars after the visit is done.

ALTERNATIVE PROCEDURES
No alternative procedures are offered for this study. You may choose not to participate, or to quit the study at any time, with no penalty or loss of benefits.

VOLUNTARY PARTICIPATION
Your participation is totally voluntary. You are free to quit the study at any time with no penalty or loss of benefits. If you quit before all study procedures are done you will still receive your gift card.

CONFIDENTIALITY
All paper records with personal identifying information will be kept in a locked box for three years and will then be destroyed. All forms except this consent will not have any personal identification information. Data forms will be kept in the locked box at the College of Nursing of the University of Texas at Arlington. Computerized data will be stored on an encrypted computer system. The results of this study may be published and/or presented at meetings without naming you as a participant. Additional research studies could evolve from the information you have provided, but your information will not be linked to you in any way; it will be anonymous.
Your study data will be kept as confidential as possible, with the exception of certain information we must report for legal or ethical reasons (such as elder abuse or neglect).

Evidence of abuse or neglect will be reported to the Texas Department of Family and Protective Services.
Although your rights and privacy will be maintained, the Secretary of the Department of Health and Human Services, the UTA Institutional Review Board (IRB), and personnel particular to this research have access to the study records. Your records will be kept completely confidential according to current legal requirements. They will not be revealed unless required by law. The IRB at UTA has reviewed and approved this study and the information within this consent form. If in the unlikely event it becomes necessary for the Institutional Review Board to review your research records, the University of Texas at Arlington will protect the confidentiality of those records to the extent permitted by law.

CONTACT FOR QUESTIONS
Questions about this research study may be directed to

Thomas Dombrowsky 817 272-2776
Or
Kathy Daniel 817-272-2776

Any questions you may have about your rights as a research participant or a research-related injury may be directed to the Office of Research Administration; Regulatory Services at 817-272-2105 or regulatoryservices@uta.edu.

As a representative of this study, I have explained the purpose, the procedures, the benefits, and the risks that are involved in this research study:

_____

Signature and printed name of principal investigator or person obtaining consent Date

CONSENT

By signing below, you confirm that you are 18 years of age or older and have read or had this document read to you. You have been informed about this study's purpose, procedures, possible benefits and risks, and you have received a copy of this form. You have been given the opportunity to ask questions before you sign, and you have been told that you can ask other questions at any time.

You voluntarily agree to participate in this study. By signing this form, you are not waiving any of your legal rights. Refusal to participate will involve no penalty or loss of benefits to which you are otherwise entitled. You may discontinue participation at any time without penalty or loss of benefits, to which you are otherwise entitled.

_____

SIGNATURE OF VOLUNTEER **DATE**

Appendix I
Permissions to Use Instruments

From: Eakman,Aaron <Aaron.Eakman@ColoState.EDU>
Sent: Monday, March 24, 2014 10:01 AM
To: Dombrowsky, Thomas A
Subject: RE: Permission to use EMAS and MAPA

Thomas,

Yes – of course. EMAS and MAPA. I have attached my dissertation which emphasized the MAPA if that helps.

Best,

Aaron

From: Dombrowsky, Thomas A [mailto:thomas.dombrowsky@mavs.uta.edu]
Sent: Monday, March 24, 2014 8:58 AM
To: Eakman,Aaron
Subject: RE: Permission to use EMAS and MAPA

Dr. Eakman,

Thank you for your help and attention. I wanted to clarify. Do I have permission to use the MAPA in my study as well as the EMAS?

"The past is never dead. It's not even past." William Faulkner

---

From: Eakman,Aaron <Aaron.Eakman@colostate.edu>
Sent: Monday, March 24, 2014 9:53 AM
To: Dombrowsky, Thomas A
Subject: RE: Permission to use EMAS and MAPA

Hello Thomas,

I wish you all the best in using the instruments. Attached is information on the EMAS that I update regularly and including the latest version of the instrument. If I can be of any assistance, please don't hesitate to contact me.

Best,

Aaron

Aaron M. Eakman, PhD, OTR
Assistant Professor
Director of Research, New Start for Student Veterans
Department of Occupational Therapy
Campus Delivery 1573
College of Health and Human Sciences
Colorado State University
Fort Collins, CO 80523
Aaron.Eakman@colostate.edu
+1.970.631.2211

From: Dombrowsky, Thomas A [mailto:thomas.dombrowsky@mavs.uta.edu]
Sent: Wednesday, March 19, 2014 1:40 PM
To: Eakman,Aaron
Subject: Permission to use EMAS and MAPA

Dr. Eakman,

I would like to use the Engagement with Meaningful Activity Survey and the Meaningful Activity Participation Assessment in a PhD dissertation for the University of Texas at Arlington College of Nursing. The study involves the relationship between engagement with activity and functional status in assisted living dwelling older adults. It will have 150 to 200 participants. Thank you for your time and attention.

From: Dombrowsky, Thomas A [adthomas@uta.edu]
Sent: Thursday, September 04, 2014 7:51 PM
To: tomasdom@sbcglobal.net
Subject: FW: Permission to use the FCI

From: Dianne Groll [grolld@queensu.ca]
Sent: Thursday, September 04, 2014 12:38 PM
To: Dombrowsky, Thomas A
Subject: RE: Permission to use the FCI

Thank you for your e-mail. You are more than welcome to use the FCI, and if I can be of any assistance, feel free to ask.

Cheers, Dianne Groll

From: Dombrowsky, Thomas A [adthomas@uta.edu]
Sent: September 4, 2014 12:48 PM
To: Dianne Groll
Subject: Permission to use the FCI

Greetings,
I am a student in the PhD program in nursing at the University of Texas at Arlington. I am requesting permission to use the Functional Comorbidity Index in a study on the relationship between engagement with activity and functional status among older adults in assisted living facilities. Thank you for your time and attention.

References

Adams, K. B., & Sanders, S. (2010). Measurement of developmental change in late life: A validation study of the Change in Activities and Interests Index. Clinical Gerontologist, 33, 92-108. doi:10.1080/07317110903552172

Adams, K. B., Roberts, A. R., & Cole, M. B. (2011). Changes in activity and interest in the third and fourth age: Associations with health, functioning and depressive symptoms. Occupational Therapy International, 18, 4-17. doi:10.1002/oti.304

Adams, P. F., Lucas, J. W., & Barnes, P. M. (2008). Summary health statistics for the U.S. population: National health interview survey, 2006. Vital Health Statistics, 10(236), 1-104. Retrieved from http://www.cdc.gov/nchs/products/series/series10.htm

Aguero-Torres, H., Fratiglioni, L., Guo, Z., Viitanen, M., von Strauss, E., & Winblad, B. (1998). Dementia is the major cause of functional dependence in the elderly: 3-year follow-up data from a population-based study. *American Journal of Public Health, 88*, 1452-1456. doi:10.2105/AJPH.88.10.1452

Aikman, G. G., & Oehlert, M. E. (2001). Geriatric depression scale: Long form versus short form. *Clinical Gerontologist, 22*(3), 63-70. doi:10.1300/J018v22n03_07

Alosco, M., L., Spitznagel, M., Beth, Raz, N., Cohen, R., Sweet, L., H., Colbert, L., H., . . . Gunstad, J. (2014). Executive dysfunction is independently associated with reduced functional independence in heart failure. *Journal of Clinical Nursing, 23*, 829-836. doi:10.1111/jocn.12214

Andersen, C. K., Lauridsen, J., Andersen, K., & Kragh-Sørensen, P. (2003). Cost of dementia: Impact of disease progression estimated in longitudinal data. *Scandinavian Journal of Public Health, 31*, 119-125. Retrieved from http://sjp.sagepub.com/

Anderson, B. J., & Tom, L. (2005). Transition through the continuum of care in a continuing care retirement community: Can a functional rating scale be a decision-making tool? *Journal of the American Medical Directors Association, 6*, 205-208. doi:10.1016/j.jamda.2005.03.008

Arnold, S. V., Alexander, K. P., Masoudi, F. A., Ho, P. M., Xiao, L., & Spertus, J. A. (2009). The effect of age on functional and mortality outcomes after acute myocardial infarction. *Journal of the American Geriatrics Society, 57*, 209-217. doi:10.1111/j.1532-5415.2008.02106.x

Atchley, R., C. (1989). A continuity theory of normal aging. *The Gerontologist, 29*, 183-190. Retrieved from http://gerontologist.oxfordjournals.org/

Aud, M. A., & Rantz, M. J. (2005). Admissions to skilled nursing facilities from assisted living facilities. *Journal of Nursing Care Quality, 20*, 16-25. doi: 10.1097/00001786-200501000-00005

Austin, S. R., Wong, Y., Uzzo, R. G., Beck, J. R., & Egleston, B. L. (2013). Why summary comorbidity measures such as the Charlson Comorbidity Index and Elixhauser Score work. *Medical Care, 00.* Retrieved from http://www.lww-medicalcare.com

Ayalon, L. (2008). Volunteering as a predictor of all-cause mortality: What aspects of volunteering really matter? *International Psychogeriatrics, 20*, 1000-1013. doi:10.1017/S1041610208007096

Baker, J., Meisner, B. A., Logan, A. J., Kungl, A., & Weir, P. (2009). Physical activity and successful aging in Canadian older adults. *Journal of Aging & Physical Activity, 17*, 223-235. Retrieved from http://journals.humankinetics.com/japa

Baum, E. E., Jarjoura, D., Polen, A. E., Faur, D., & Rutechi, G. (2003). Effectiveness of a group exercise program in a long-term care facility: A randomized pilot trial. *Journal of the American Medical Directors Association, 4*, 74-80. doi:10.1016/S1525-8610(04)70279-0

Beckett, L. A., Brock, D. B., Lemke, J. H., Mendes de Leon, C. F., Guralnik, J. M., Fillenbaum, G. G., . . . Evans, D. A. (1996). Analysis of change in self-reported physical function among older persons in four population studies. *American Journal of Epidemiology, 143*, 766-778. doi:10.1093/oxfordjournals.aje.a008814

Bennett, H. P., Corbett, A. J., Gaden, S., Grayson, D. A., Kril, J. J., & Broe, G. A. (2002). Subcortical vascular disease and functional decline: A 6-year predictor study. *Journal of the American Geriatrics Society, 50*, 1969-1977. doi:10.1046/j.1532-5415.2002.50608.x

Bhavnani, S., P., Coleman, C., I., Guertin, D., Yarlagadda, R., K., Clyne, C., A., & Kluger, J. (2013). Evaluation of the Charlson Comorbidity Index to predict early mortality in implantable cardioverter defibrillator patients. *Annals of Noninvasive Electrocardiology, 18*, 379-388. doi:10.1111/anec.12045

Bielak, A. A., Anstey, K. J., Christensen, H., & Windsor, T. D. (2012). Activity engagement is related to level, but not change in cognitive ability across adulthood. *Psychology & Aging, 27*, 219-228. doi: 10.1037/a0024667

Binder, E. F., Schechtman, K. B., Ehsani, A. A., Steger-May, K., Brown, M., Sinacore, D. R., . . . Holloszy, J. O. (2002). Effects of exercise training on frailty in community-dwelling older adults: Results of a randomized, controlled trial. *Journal of the American Geriatrics Society, 50*, 1921-1928. doi:10.1046/j.1532-5415.2002.50601.x

Blace, N. P. (2012). Functional ability, participation in activities and life satisfaction of the older people. *Asian Social Science, 8*(3), 75-87. doi:10.5539/ass.v8n3p75

Bonnefoy, M., Boutitie, F., Mercier, C., Gueyffier, F., Carre, C., Guetemme, G., . . . Cornu, C. (2012). Efficacy of a home-based intervention programme on the physical activity level and functional ability of older people using domestic services: A randomised study. *Journal of Nutrition, Health & Aging, 16*, 370-377. doi:10.1007/s12603-011-0352-6

Braddock, B., A., & Phipps, E. (2010). Activity engagement in dementia care: A student-delivered home program. *American Journal of Recreation Therapy, 9*(4), 19-30. Retrieved from http://www.pnpco.com/pn10000.html

Bravo, G., Dubois, M., Hébert, R., De Wals, P., & Messier, L. (2002). A prospective evaluation of the Charlson Comorbidity Index for use in long-term care patients. *Journal of the American Geriatrics Society, 50*, 740-745. doi:10.1046/j.1532-5415.2002.50172.x

Brinkley, T. E., Leng, X., Miller, M. E., Kitzman, D. W., Pahor, M., Berry, M. J., . . . Nicklas, B. J. (2009). Chronic inflammation is associated with low physical function in older adults across multiple comorbidities. *Journals of Gerontology Series A: Biological Sciences & Medical Sciences, 64A*, 455-461. doi:10.1093/gerona/gln038

Büla, C. J., Ghilardi, G., Wietlisbach, V., Petignat, C., & Francioli, P. (2004). Infections and functional impairment in nursing home residents: A reciprocal relationship. *Journal of the American Geriatrics Society, 52*, 700-706. doi:10.1111/j.1532-5415.2004.52205.x

Burbank, P. M. (1986). Psychosocial theories of aging: A critical evaluation. *ANS.Advances in Nursing Science, 9*, 73-86. Retrieved from http://journals.lww.com/advancesinnursingscience/pages/default.aspx

Burdick, D. J., Rosenblatt, A., Samus, Q. M., Steele, C., Baker, A., Harper, M., . . . Lyketsos, C. G. (2005). Predictors of functional impairment in residents of assisted-living facilities: The

Maryland Assisted Living Study. *The Journals of Gerontology.Series A, Biological Sciences and Medical Sciences, 60,* 258-264. doi:10.1093/gerona/60.2.258

Burns, N., & Grove, S. K. (2009). *The practice of nursing research: Appraisal, synthesis, and generation of evidence* (6th ed.). St. Louis, MO: Saunders.

Caffrey, C., Sengupta, M., Park-Lee, E., Moss, A., Rosenoff, E., & Harris-Kojetin, L. (2012). Residents living in residential care facilities: United States, 2010. *NCHS data brief*. (No. 91). Hyattsville, MD: National Center for Health Statistics. Retrieved from http://www.cdc.gov/nchs/data/databriefs/db91.htm

Carroll, J., & Qualls, S. H. (2014). Moving into senior housing: Adapting the old, embracing the new. Generations: *Journal of the American Society on Aging, 38*, 42-47. Retrieved from http://www.asaging.org/generations-journal-american-society-aging

Centers for Disease Control and Prevention. (2006). Nursing home facilities. Retrieved from http://www.cdc.gov/nchs/data/nnhsd/nursinghomefacilities2006.pdf

Charlson, M. E., Pompei, P., Ales, K. L., & MacKenzie, C. R. (1987). A new method of classifying prognostic comorbidity in longitudinal studies: Development and validation. *Journal of Chronic Diseases, 40*, 373-383. doi:10.1016/0021-9681(87)90171-8

Chen, C. C., Wang, C., & Huang, G. (2008). Functional trajectory 6 months posthospitalization: A cohort study of older hospitalized patients in Taiwan. *Nursing Research, 57*(2), 93-100. doi:10.1097/01.NNR.0000313485.18670.e2

Chen, J., Chan, D., Kiely, D. K., Morris, J. N., & Mitchell, S. L. (2007). Terminal trajectories of functional decline in the long-term care setting. *Journals of Gerontology Series A: Biological Sciences & Medical Sciences, 62A*, 531-536. doi.org/10.1093/gerona/62.5.531

Chen, Y., Lin, L., Chen, K., & Liu, Y. (2014). Validation of a causal model of agitation among institutionalized residents with dementia in Taiwan. *Research in Nursing & Health, 37*(1), 11-20. doi:10.1002/nur.21573

Chiang, K. S., Green, K. E., & Cox, E. O. (2009). Rasch analysis of the Geriatric Depression Scale-Short Form. *The Gerontologist, 49*, 262-275. doi:10.1093/geront/gnp018

Coe, N. B., & Boyle, M. A. (2013). The Asset and Income Profiles of Residents in Seniors Housing and Care Communities: What Can Be Learned From Existing Data Sets. *Research On Aging, 35*(1), 50-77. doi:10.1177/0164027511434331

Cohen-Mansfield, J., Marx, M. S., Regier, N. G., & Dakheel-Ali, M. (2009). The impact of personal characteristics on engagement in nursing home residents with dementia. International *Journal of Geriatric Psychiatry, 24*, 755-763. doi:10.1002/gps.2192

Cohen-Mansfield, J., Shmotkin, D., & Goldberg, S. (2010). Predictors of longitudinal changes in older adults' physical activity engagement. *Journal of Aging & Physical Activity, 18*, 141-157. Retrieved from http://journals.humankinetics.com/japa

Conde-Martel, A., Hemmersbach-Miller, M., Marchena-Gomez, J., Saavedra-Santana, P., & Betancor-Leon, P. (2012). Five-year survival and prognostic factors in a cohort of hospitalized nonagenarians. *European Journal of Internal Medicine, 23*, 513-518. doi:10.1016/j.ejim.2012.02.007

Conti, A., Voelkl, J. E., & McGuire, F. A. (2008). Efficacy of meaningful activities in recreation therapy on passive behaviors of older adults with dementia. *Annual in Therapeutic Recreation, 16*, 89-101. Retrieved from http://js.sagamorepub.com/trj

Courtney, M., D., Edwards, H., E., Chang, A., M., Parker, A., W., Finlayson, K., Bradbury, C., & Nielsen, Z. (2012). Improved functional ability and independence in activities of daily

living for older adults at high risk of hospital readmission: A randomized controlled trial. *Journal of Evaluation in Clinical Practice, 18*, 128-134. doi:10.1111/j.1365-2753.2010.01547.x

Crooks, V. C., Lubben, J., Petitti, D. B., Little, D., & Chiu, V. (2008). Social network, cognitive function, and dementia incidence among elderly women. *American Journal of Public Health, 98*, 1221-1227. doi:10.2105/AJPH.2007.115923

Curl, A., L., & Ingram, J., G. (2013). Anticipatory socialization for retirement: A multilevel dyadic model. *Clinical Gerontologist, 36*, 375-393. doi:10.1080/07317115.2013.788117

de Rekeneire, N., Resnick, H. E., Schwartz, A. V., Shorr, R. I., Kuller, L. H., Simonsick, E. M., . . . Harris, T. B. (2003). Diabetes is associated with subclinical functional limitation in nondisabled older individuals: The health, aging, and body composition study. *Diabetes Care, 26*, 3257-3263. doi:10.2337/diacare.26.12.3257

Decourcelle, V., Maréchaux, S., Pinçon, C., Barrailler, S., H., & Ennezat, P. V. (2013). Impact of functional decline on outcome in elderly patients with acute coronary syndromes. *American Journal of Critical Care, 22*, e1-e11. doi:10.4037/ajcc2013451

Dekker, J., van Dijk, G., & Veenhof, C. (2009). Risk factors for functional decline in osteoarthritis of the hip or knee. *Current Opinion in Rheumatology, 21*, 520-524. doi:10.1097/BOR.0b013e32832e6eaa

Deyo, R. A., Cherkin, D. C., & Ciol, M. A. (1992). Adapting a clinical comorbidity index for use with ICD-9-CM administrative databases. *Journal of Clinical Epidemiology, 45*, 613-619. doi:10.1016/0895-4356(92)90133-8

D'Hoore, W., Sicotte, C., & Tilquin, C. (1993). Risk adjustment in outcome assessment: The Charlson Comorbidity Index. *Methods of Information in Medicine, 32*, 382-387. Retrieved from http://www.schattauer.de/en/magazine/subject-areas/journals-a-z/methods.html

di Bari, M., Virgillo, A., Matteuzzi, D., Inzitari, M., Mazzaglia, G., Pozzi, C., . . . Pini, R. (2006). Predictive validity of measures of comorbidity in older community dwellers: The Insufficienza Cardiaca Negli anziani Residenti a Dicomano Study. *Journal of the American Geriatrics Society, 54*, 210-216. doi:10.1111/j.1532-5415.2005.00572.x

Dunlop, D. D., Semanik, P., Song, J., Manheim, L. M., Shih, V., & Chang, R. W. (2005). Risk factors for functional decline in older adults with arthritis. *Arthritis & Rheumatism, 52*, 1274-1282. doi: 10.1002/art.20968

Eakman, A. M., Carlson, M. E., & Clark, F. A. (2010a). Factor structure, reliability, and convergent validity of the engagement in meaningful activities survey for older adults. *OTJR: Occupation, Participation & Health, 30*, 111-121. doi:10.3928/15394492-20090518-01

Eakman, A. M., Carlson, M. E., & Clark, F. A. (2010b). The Meaningful Activity Participation Assessment: A measure of engagement in personally valued activities. International *Journal of Aging & Human Development, 70*, 299-317. doi:10.2190/AG.70.4.b

Eakman, A., M., & Eklund, M. (2012). The relative impact of personality traits, meaningful occupation and occupational value on meaning in life and life satisfaction. *Journal of Occupational Science, 19*, 165-177. doi:10.1080/14427591.2012.671762

Elazzazi, A. M. (2003). An investigation of elderly women's physical performance and risk for falling. (Doctoral dissertation). Available from Proquest Dissertations and Theses database. (UMI Order AAI3084177.)

Elixhauser, A., Steiner, C., Harris, D. R., & Coffey, R. M. (1998). Comorbidity measures for use with administrative data. *Medical Care, 36*, 8-27. doi:10.1097/00005650-199801000-00004

Ertel, K. A., Glymour, M., & Berkman, L. F. (2008). Effects of social integration on preserving memory function in a nationally representative US elderly population. *American Journal of Public Health, 98*, 1215-1220. doi:10.2105/AJPH.2007.113654

Espiritu, D. A., Rashid, H., Mast, B. T., Fitzgerald, J., Steinberg,.J., & Lichtenberg, P. A. (2001). Depression, cognitive impairment and function in Alzheimer's disease. *International Journal of Geriatric Psychiatry, 16*, 1098-1103. doi:10.1002/gps.476

Everard, K. M., Lach, H. W., Fisher, E. B., & Baum, M. C. (2000). Relationship of activity and social support to the functional health of older adults. *Journals of Gerontology Series B: Psychological Sciences & Social Sciences, 55B*, S208-212. doi:10.1093/geronb/55.4.S208

Extermann, M. (2000). Measuring comorbidity in older cancer patients. *European Journal of Cancer (Oxford, England: 1990), 36*, 453-471. doi:10.1016/S0959-8049(99)00319-6

Fan, E., Gifford, J. M., Chandolu, S., Colantuoni, E., Pronovost, P. J., & Needham, D. M. (2012). The Functional Comorbidity Index had high inter-rater reliability in patients with acute lung injury. *BMC Anesthesiology, 12*, 21-21. doi:10.1186/1471-2253-12-21

Faul, F. (2012). G*Power (Version 3.1.5) [Software]. Available from http://www.gpower.hhu.de/en.html

Figaro, M. K., Kritchevsky, S. B., Resnick, H. E., Shorr, R. I., Butler, J., Shintani, A., . . . Harris, T. B. (2006). Diabetes, inflammation, and functional decline in older adults: Findings from

the health, aging and body composition (ABC) study. *Diabetes Care, 29*, 2039-2045. doi:10.2337/dc06-0245

Fortin, M., Hudon, C., Dubois, M., Almirall, J., Lapointe, L., & Soubhi, H. (2005). Comparative assessment of three different indices of multimorbidity for studies on health-related quality of life. *Health and Quality of Life Outcomes, 374*. Retrieved from http://www.hqlo.com/

Fratiglioni, L., Wang, H., Ericsson, K., Maytan, M., & Winblad, B. (2000). Influence of social network on occurrence of dementia: A community-based longitudinal study. *Lancet, 355*, 1315-1319. doi:10.1016/S0140-6736(00)02113-9

Fry, P. S. (1992). Major social theories of aging and their implications for counseling concepts and practice: A critical review. *The Counseling Psychologist, 20*, 246-329. doi:10.1177/0011000092202002

Gabbe, B. J., Harrison, J. E., Lyons, R. A., Edwards, E. R., & Cameron, P. A. (2013). Comparison of measures of comorbidity for predicting disability 12-months post-injury. *BMC Health Services Research, 13*, 30-30. Doi:10.1186/1472-6963-13-30

Gastwirth, J. L., Gel, Y. R., Hui, W. L. W., Lyubchich, V., Miao, W., & Noguchi, K. (2015). Lawstat: Tools for biostatistics, public policy, and law. R package version 3.0.

Gillespie, P., O'Shea, E., Cullinan, J., Lacey, L., Gallagher, D., & Ni, M. A. (2013). The effects of dependence and function on costs of care for Alzheimer's disease and mild cognitive impairment in Ireland. International Journal of Geriatric *Psychiatry, 28*, 256-264. doi:10.1002/gps.3819

Gitlin, L. N., Hauck, W. W., Dennis, M. P., Winter, L., Hodgson, N., & Schinfeld, S. (2009). Long-term effect on mortality of a home intervention that reduces functional difficulties in older

adults: Results from a randomized trial. *Journal of the American Geriatrics Society, 57*, 476-481. doi:10.1111/j.1532-5415.2008.02147.x

Goldberg, B., Brintnell, E. S., & Goldberg, J. (2002). The relationship between engagement in meaningful activities and quality of life in persons disabled by mental illness. *Occupational Therapy in Mental Health, 18*(2), 17-44. doi:10.1300/J004v18n02_03

Graf, C. (2008). The Lawton Instrumental Activities of Daily Living Scale*. American Journal of Nursing, 108*(4), 52-63. doi:10.1097/01.NAJ.0000314810.46029.74

Gregg, E. W., Mangione, C. M., Cauley, J. A., Thompson, T. J., Schwartz, A. V., Ensrud, K. E., & Nevitt, M. C. (2002). Diabetes and incidence of functional disability in older women. *Diabetes Care, 25*, 61-67. doi:10.2337/diacare.25.1.61

Groll, D. L., Heyland, D. K., Caeser, M., & Wright, J. G. (2006). Assessment of long-term physical function in acute respiratory distress syndrome (ARDS) patients: Comparison of the Charlson Comorbidity Index and the Functional Comorbidity Index. *American Journal of Physical Medicine & Rehabilitation, 85*, 574-581. doi:101097/01.phm.0000223220.91914.61

Groll, D. L., To, T., Bombardier, C., & Wright, J. G. (2005). The development of a comorbidity index with physical function as the outcome. *Journal of Clinical Epidemiology, 58*, 595-602. doi:10.1016/j.jclinepi.2004.10.018

Gruenewald, T. L., Karlamangla, A. S., Greendale, G. A., Singer, B. H., & Seeman, T. E. (2007). Feelings of usefulness to others, disability, and mortality in older adults: The MacArthur Study of Successful Aging. *Journals of Gerontology Series B: Psychological Sciences & Social Sciences, 62B*, P28-37. doi:10.1093/geronb/62.1.P28

Gruenewald, T. L., Karlamangla, A. S., Greendale, G. A., Singer, B. H., & Seeman, T. E. (2009). Increased mortality risk in older adults with persistently low or declining feelings of usefulness to others. *Journal of Aging & Health, 21*, 398-425. doi:10.1177/0898264308329023

Habbous, S., Chu, K., P., Harland, L. T. G., La Delfa, A., Fadhel, E., Sun, B., . . . Liu, G. (2013). Validation of a one-page patient-reported Charlson Comorbidity Index questionnaire for upper aerodigestive tract cancer patients. *Oral Oncology, 49*, 407-412. doi:10.1016/j.oraloncology.2012.11.010

Halvorsrud, L., Kirkevold, M., Diseth, A., & Kalfoss, M. (2010). Quality of life model: Predictors of quality of life among sick older adults. *Research & Theory for Nursing Practice, 24*, 241-259. doi:10.1891/1541-6577.24.4.241

Hao, Y. (2008). Productive activities and psychological well-being among older adults. *Journals of Gerontology Series B: Psychological Sciences & Social Sciences, 63B*, S64-72. doi:10.1093/geronb/63.2.S64

Hartigan, I. (2007). A comparative review of the Katz ADL and the Barthel Index in assessing the activities of daily living of older people. *International Journal of Older People Nursing, 2*, 204-212. doi:10.1111/j.1748-3743.2007.00074.x

Hatch, J., & Lusardi, M. M. (2010). Impact of participation in a wellness program on functional status and falls among aging adults in an assisted living setting. *Journal of Geriatric Physical Therapy, 33*, 71-77. Retrieved from http://journals.lww.com/jgpt/pages/default.aspx

Hill, N. L., Kolanowski, A., & Kürüm, E. (2010). Agreeableness and activity engagement in nursing home residents with dementia. *Journal of Gerontological Nursing, 36*, 45-52. doi:10.3928/00989134-20100330-10

Hinterlong, J. E., Morrow-Howell, N., & Rozario, P. A. (2007). Productive engagement and late life physical and mental health: Findings from a nationally representative panel study. *Research on Aging, 29*, 348-370. doi:10.1177/0164027507300806

Horowitz, B. P., & Vanner, E. (2010). Relationships among active engagement in life activities and quality of life for assisted-living residents. *Journal of Housing for the Elderly, 24*, 130-150. doi:10.1080/02763891003757056

Hsu, H. C. (2007). Does social participation by the elderly reduce mortality and cognitive impairment? *Aging & Mental Health, 11*, 699-707. doi:10.1080/13607860701366335

Huang, H., Chang, C., Liu, L., Lin, H., & Chen, C. (2013). Trajectories and predictors of functional decline of hospitalised older patients. *Journal of Clinical Nursing, 22*, 1322-1331. doi:10.1111/jocn.12055

Inouye, S. K., Bogardus, S., J., Baker, D. I., Leo-Summers, L., & Cooney, L., J. (2000). The hospital elder life program: A model of care to prevent cognitive and functional decline in older hospitalized patients. *Journal of the American Geriatrics Society, 48*, 1697-1706. Retrieved from http://onlinelibrary.wiley.com/journal/10.1111/%28ISSN%291532-5415

Ivanova, J. I., Mytelka, D. S., Duh, M. S., Birnbaum, H. G., Cummings, A. K., San Roman, A.,M., . . . Swindle, R. W. (2013). Evaluating the utility of existing patient-reported outcome scales in novel patient populations with pancreatic cancer, lung cancer, and myeloproliferative neoplasms using medicare current beneficiary survey data. *The Patient, 6*, 189-200. doi:10.1007/s40271-013-0018-z

Jacobs, J. M., Hammerman-Rozenberg, R., Cohen, A., & Stessman, J. (2008). Reading daily predicts reduced mortality among men from a cohort of community-dwelling 70-year-olds. *Journals of Gerontology Series B: Psychological Sciences & Social Sciences, 63B*, S73-80. doi:10.1093/geronb/63.2.S73

Jiménez Caballero, P. E., López Espuela, F., Portilla Cuenca, J. C., Ramírez Moreno, J. M., Pedrera Zamorano, J. D., & Casado Naranjo, I. (2013a). Charlson Comorbidity Index in ischemic stroke and intracerebral hemorrhage as predictor of mortality and functional outcome after 6 months. *Journal of Stroke & Cerebrovascular Diseases, 22*, e214-8. doi:10.1016/j.jstrokecerebrovasdis.2012.11.014

Johnson, J. K., Lui, L. Y., & Yaffe, K. (2007). Executive function, more than global cognition, predicts functional decline and mortality in elderly women. *Journals of Gerontology Series A: Medical Sciences, 62A*, 1134-1141. doi:10.1093/gerona/62.10.1134

Katz, S., & Akpom, C. A. (1976). Index of ADL. *Medical Care, 14*(5), 116-118. doi:10.1097/00005650-197605001-00018

Kaye, H. S., Harrington, C., & LaPlante, M. P. (2010). Long-term care: Who gets it, who provides it, who pays, and how much? [corrected] *Health Affairs, 29*, 11-21. doi:10.1377/hlthaff.2009.0535 (published erratum appears in HEALTH AFF 2010, Health Affairs, 29, 567).

Kemp, C. L., Ball, M. M., & Perkins, M. M. (2013). Convoys of care: Theorizing intersections of formal and informal care. *Journal of Aging Studies, 27*, 15-29 doi.org/10.1016/j.jaging.2012.10.002

Knapp, M. R. (1977). The activity theory of aging: An examination in the English context. *The Gerontologist, 17*, 553-559. doi:10.1093/geront/17.6.553

Koenig, T. L., Lee, J. H., Macmillan, K. R., Fields, N. L., & Spano, R. (2014). Older adult and family member perspectives of the decision-making process involved in moving to assisted living. *Qualitative Social Work, 13*, 335-350. doi:10.1177/1473325013475468

Kopetz, S., Steele, C. D., Brandt, J., Baker, A., Kronberg, M., Galik, E., … Lykestos, C. G. (2000). Characteristics and outcomes of dementia residents in an assisted living facility. *International Journal of Geriatric Psychiatry, 15*, 586-593. doi:10.1002/1099-1166(200007)15:7<586::AID-GPS148>3.0.CO;2-D

Kortte, K. B., Falk, L. D., Castillo, R. C., Johnson-Greene, D., & Wegener, S. T. (2007). The Hopkins Rehabilitation Engagement Rating Scale: Development and psychometric properties. *Archives of Physical Medicine & Rehabilitation, 88*, 877-884. doi:10.1016/j.apmr.2007.03.030

Kushki, A., Andrews, A. J., Power, S. D., King, G., & Chau, T. (2012). Classification of activity engagement in individuals with severe physical disabilities using signals of the peripheral nervous system. *PLoS ONE, 7*(2), e30373. doi:10.1371/journal.pone.0030373

Lawton, M. P., & Brody, E. M. (1969). Assessment of older people: Self-maintaining and instrumental activities of daily living. *The Gerontologist, 9*, 179-186. doi:10.1093/geront/9.3_Part_1.179

Leal, J. R., & Laupland, K. B. (2010). Validity of ascertainment of co-morbid illness using administrative databases: A systematic review. *Clinical Microbiology and Infection: The Official Publication of the European Society of Clinical Microbiology and Infectious Diseases, 16*, 715-721. doi:10.1111/j.1469-0691.2009.02867.x

Lemon, B. W., Bengtson, V. L., & Peterson, J. A. (1972). An exploration of the activity theory of aging: Activity types and life satisfaction in movers to a retirement community. *Journal of Gerontology, 27*, 511-523.

Lêng, C. H., & Wang, J. (2013). Long term determinants of functional decline of mobility: An 11-year follow-up of 5464 adults of late middle aged and elderly. *Archives of Gerontology and Geriatrics, 57*, 215-220. doi:10.1016/j.archger.2013.03.013

Lequerica, A. H., & Kortte, K. (2010). Therapeutic engagement: A proposed model of engagement in medical rehabilitation. *American Journal of Physical Medicine & Rehabilitation, 89*, 415-422. doi:10.1097/PHM.0b013e3181d8ceb2

Levine, C., & Weaver, E. (2014). Functional Comorbidity Index in sleep apnea. *Otolaryngology—Head and Neck Surgery: Official Journal of American Academy of Otolaryngology-Head and Neck Surgery, 150*, 494-500. doi:10.1177/0194599813518164

Lo, B. (2007). Addressing ethical issues. In S. B. Hulley, S. R. Cummings, W. S. Browner, D. G. Grady & T. B. Newman (Eds.), *Designing clinical research* (3rd ed., pp. 225-239). Philadelphia: Lippincott.

Long, J. S. (1997). *Regression models for categorical and limited dependent variables*. Thousand Oaks, CA: Sage.

Longino, C. F., J., & Kart, C. S. (1982). Explicating activity theory: A formal replication. *Journal of Gerontology, 37*, 713-722. Retrieved from http://www.geron.org/Publications/The%20Journal%20of%20Gerontology:%20Psychological%20Sciences

Malone, D. C., Billups, S. J., Valuck, R. J., & Carter, B. L. (1999). Development of a chronic disease indicator score using a Veterans Affairs Medical Center medication database. *Journal of Clinical Epidemiology, 52*, 551-557. doi:10.1016/S0895-4356(99)00029-3

Mansilla Francisco, J. J., De, l. R., Azaña, S., Cabrera, Torres, J., Cortés, López, J., Macías, González Castillo, J. A., & Ferreras Duarte, J. L. (2012). Impact of incident comorbidity on functional loss in elderly chronic kidney disease patients undergoing hemodialysis. *CANNT Journal, 22*, 25-29. Retrieved from http://www.cannt.ca/en/cannt_journal/

Marengoni, A., Von Strauss, E., Rizzuto, D., Winblad, B., & Fratiglioni, L. (2009). The impact of chronic multimorbidity and disability on functional decline and survival in elderly persons. A community-based, longitudinal study. *Journal of Internal Medicine, 265*, 288-295. doi:10.1111/j.1365-2796.2008.02017.x

Martin, J. L., Fiorentino, L., Jouldjian, S., Josephson, K. R., & Alessi, C. A. (2010). Sleep quality in residents of assisted living facilities: Effect on quality of life, functional status, and depression. *Journal of the American Geriatrics Society, 58*, 829-836. doi:10.1111/j.1532-5415.2010.02815.x

Mayo, A., M., Wallhagen, M., Cooper, B., A., Mehta, K., Ross, L., & Miller, B. (2013). The relationship between functional status and judgment/problem solving among individuals with dementia. *International Journal of Geriatric Psychiatry, 28*, 514-521. doi:10.1002/gps.3854

McGough, E., L., Logsdon, R., G., Kelly, V., E., & Teri, L. (2013). Functional mobility limitations and falls in assisted living residents with dementia: Physical performance assessment and quantitative gait analysis. *Journal of Geriatric Physical Therapy, 36*, 78-86. doi:10.1519/JPT.0b013e318268de7f

Mehta, K. M., Yaffe, K., & Covinsky, K. E. (2002). Cognitive impairment, depressive symptoms, and functional decline in older people. *Journal of the American Geriatrics Society, 50*, 1045-1050. doi:10.1046/j.1532-5415.2002.50259.x

Menec, V. H., Nowicki, S., Blandford, A., & Veselyuk, D. (2009). Hospitalizations at the end of life among long-term care residents. *Journals of Gerontology Series A: Biological Sciences & Medical Sciences, 64A*, 395-402. doi:10.1093/gerona/gln034

Mobily, K., E. (2013). Exercise and functional disability in older adults. *Therapeutic Recreation Journal, 47*(1), 47-60. Retrieved from http://js.sagamorepub.com/trj

Mollica, R. L. (2008). Trends in state regulation of assisted living. *Generations, 32*(3), 67-70. Retrieved from http://asaging.org/blog/content-source/15

National Institute on Aging. (2013). *Depression*. Retrieved from http://www.nia.nih.gov/

Needham, D. M., Scales, D. C., Laupacis, A., & Pronovost, P. J. (2005). A systematic review of the Charlson Comorbidity Index using Canadian administrative databases: A perspective on risk adjustment in critical care research. *Journal of Critical Care, 20*, 12-19. doi:10.1016/j.jcrc.2004.09.007

Nichols, L. O., Martindale-Adams, J., Greene, W. A., Burns, R., Graney, M. J., & Lummus, A. (2009). Dementia caregivers' most pressing concerns. *Clinical Gerontologist, 32*, 1-14. doi: 10.1080/07317110802468546

Okura, Y., Urban, L. H., Mahoney, D. W., Jacobsen, S. J., & Rodeheffer, R. J. (2004). Agreement between self-report questionnaires and medical record data was substantial for diabetes, hypertension, myocardial infarction and stroke but not for heart failure. *Journal of Clinical Epidemiology, 57*, 1096-1103. doi:10.1016/j.jclinepi.2004.04.005

Olomu, A., B., Corser, W., D., Stommel, M., Xie, Y., & Holmes-Rovner, M. (2012). Do self-report and medical record comorbidity data predict longitudinal functional capacity and quality of life health outcomes similarly? *BMC Health Services Research, 12*, 398-398. doi:10.1186/1472-6963-12-398

Onega, L. L., & Tripp-Reimer, T. (1997). Expanding the scope of continuity theory. *Journal of Gerontological Nursing, 23*(6), 29-35. Retrieved from http://www.healio.com/journals/jgn

Opoku, A., Mauldin, T., Sweaney, A., Bachtel, D., Atiles, J., & Eaves, C. (2006). Predisposing, enabling, and need predictors of community versus institutional long-term care. *Journal of Housing for the Elderly, 20*, 133-154. doi:10.1300/J081v20n01_08

Ottenbacher, K. J., Ottenbacher, H. R., Tooth, L., & Ostir, G. V. (2004). A review of two journals found that articles using multivariable logistic regression frequently did not report commonly recommended assumptions. Journal of Clinical Epidemiology, 57, 1147-1152. doi:10.1016/j.jclinepi.2003.05.003

Park, N. S., Klemmack, D. L., Roff, L. L., Parker, M. W., Koenig, H., Sawyer, P., & Allman, R. M. (2008). Religiousness and longitudinal trajectories in elders' functional status. *Research on Aging, 30*, 279-298. doi:10.1177/0164027507313001

PR Newswire. (2014). The ABCs of CCRCs: Understanding the costs of continuing care retirement communities. *PR Newswire US*

Reed, P., & Wu, Y. (2013). Logistic regression for risk factor modelling in stuttering research. Journal of Fluency Disorders, 38(2), 88-101. doi:10.1016/j.jfludis.2012.09.003

Reisberg, , B. (1986). Dementia: A systematic approach to identifying reversible causes. *Geriatrics, 41*(4), 30-46.

Resnick, B., Galik, E., Gruber-Baldini, A., & Zimmerman, S. (2012). Falls and fall-related injuries associated with function-focused care. *Clinical Nursing Research, 21*, 43-63. doi:10.1177/1054773811420060

Resnik, L., Gozalo, P., & Hart, D. L. (2011). Weighted index explained more variance in physical function than an additively scored functional comorbidity scale. *Journal of Clinical Epidemiology, 64*, 320-330. doi:10.1016/j.jclinepi.2010.02.019

Roberts, A. R., Miller, D. B., & Hokenstad, M. C. (2012). Long term care insurance beyond the CLASS program. *Journal of Sociology & Social Welfare, 39*(3), 85-109. Retrieved from http://wmich.edu/socialwork/journal/

Rosenberg, P. B., Mielke, M. M., Samus, Q. M., Rosenblatt, A., Baker, A., Brandt, J., . . . Lykestos, C. G. (2006). Transition to nursing home from assisted living is not associated with dementia or dementia-related problem behaviors. *Journal of the American Medical Directors Association, 7*, 73-78. doi:10.1016/j.jamda.2005.06.003

Rowe, J. W., & Kahn, R. L. (1998). Successful aging. New York: Pantheon.

Samus, Q. M., Mayer, L., Onyike, C. U., Brandt, J., Baker, A., McNabney, M., . . . Rosenblatt, A. (2009). Correlates of functional dependence among recently admitted assisted living residents with and without dementia. *Journal of the American Medical Directors Association, 10*, 323-329. doi:10.1016/j.jamda.2009.01.004

Saunders, J. C., & Heliker, D. (2007). Lessons learned from 5 women as they transition into assisted living. *Geriatric Nursing, 29*, 369-375. doi: 10.1016/j.gerinurse.2007.10.018

Schneeweiss, S., & Maclure, M. (2000). Use of comorbidity scores for control of confounding in studies using administrative databases. *International Journal of Epidemiology, 29*, 891-898. doi:10.1093/ije/29.5.891

Schneeweiss, S., Seeger, J. D., Maclure, M., Wang, P. S., Avorn, J., & Glynn, R. J. (2001). Performance of comorbidity scores to control for confounding in epidemiologic studies using claims data. *American Journal of Epidemiology, 154*, 854-864. doi:10.1093/aje/154.9.854

Schneeweiss, S., Wang, P. S., Avorn, J., Maclure, M., Levin, R., & Glynn, R. J. (2004). Consistency of performance ranking of comorbidity adjustment scores in Canadian and U.S. utilization data. *Journal of General Internal Medicine, 19*, 444-450. doi:10.1111/j.1525-1497.2004.30109.x

Seeman, T., & Chen, X. (2002). Risk and protective factors for physical functioning in older adults with and without chronic conditions: MacArthur Studies of Successful Aging. *Journals of Gerontology Series B: Psychological Sciences & Social Sciences, 57B*, S135-144. doi:10.1093/geronb/57.3.S135

Sheikh JI, Yesavage JA: Geriatric Depression Scale (GDS): Recent evidence and development of a shorter version. *Clinical Gerontology: A Guide to Assessment and Intervention*.165-173, New York: The Haworth Press, 1986.

Shippee, T. P. (2009). “But I am not moving”: Residents’ perspectives on transitions within a continuing care retirement community. *The Gerontologist, 48*, 418-427. doi:10.1093/geront/gnp030

Shippee, T. P. (2012). On the edge: Balancing health, participation, and autonomy to maintain active independent living in two retirement facilities. *Journal of Aging Studies, 26*, 1-15. doi:10.1016/j.jaging.2011.05.002

Shlipak, M. G., Stehman-Breen, C., Fried, L. F., Song, X., Siscovick, D., Fried, L. P., . . . Newman, A. B. (2004). The presence of frailty in elderly persons with chronic renal

insufficiency. *American Journal of Kidney Diseases, 43*, 861-867. doi:10.1053/j.ajkd.2003.12.049

Simone, P., M., & Haas, A., L. (2013). Frailty, leisure activity and functional status in older adults: Relationship with subjective well being. *Clinical Gerontologist, 36*, 275-293. doi:10.1080/07317115.2013.788114

Slaughter, S. E., Morgan, D., & Drummond, N. (2011). Functional transitions of nursing home residents with middle-stage dementia: Perspectives of family members and nurses. *Journal of Gerontological Nursing, 37*(5), 50-59. doi:10.3928/00989134-20110106-07

Small, B. J., Dixon, R. A., McArdle, J. J., & Grimm, K. J. (2012). Do changes in lifestyle engagement moderate cognitive decline in normal aging? Evidence from the Victoria longitudinal study. *Neuropsychology, 26*, 144-155. doi:10.1037/a0026579

Soubelet, A. (2013). The role of social activity in age–cognition relations. *Educational Gerontology, 39*, 558-568. doi:10.1080/03601277.2012.701156

Spellman, S., & Brod, K. (2014). Continuing Care at Home. *Seniors Housing & Care Journal, 22*(1), 112-118. Retrieved from http://www.matherlifewaysinstituteonaging.com/research-resources/seniors-housing-care-journal/

Stav, W., B., Hallenen, T., Lane, J., & Arbesman, M. (2012). Systematic review of occupational engagement and health outcomes among community-dwelling older adults. *American Journal of Occupational Therapy, 66*, 301-310. doi:10.5014/ajot.2012.003707

Street, D. A. (2007). Sociological approaches to understanding age and aging. In J. A. Blackburn, & C. N. Dulmus (Eds.), *Handbook of gerontology: Evidence-based approaches to theory, practice, and policy.* Hoboken, NJ: John Wiley.

Sung, K. (2009). The effects of 16-week group exercise program on physical function and mental health of elderly Korean women in long-term assisted living facility. *Journal of Cardiovascular Nursing, 24*, 344-351. doi:10.1097/JCN.0b013e3181a80faf

Susser, S. R., McCusker, J., & Belzile, E. (2008). Comorbidity information in older patients at an emergency visit: Self-report vs. administrative data had poor agreement but similar predictive validity. *Journal of Clinical Epidemiology, 61*, 511-515. doi:10.1016/j.jclinepi.2007.07.009

Tam, C. W. C., & Lam, L. C. W. (2012). Cognitive function, functional performance and severity of depression in Chinese older persons with late-onset depression. *East Asian Archives of Psychiatry, 22*, 12-17. Retrieved from http://easap.asia/index.htm

Tessier, A., Finch, L., Daskalopoulou, S. S., & Mayo, N. E. (2008). Validation of the Charlson Comorbidity Index for predicting functional outcome of stroke. *Archives of Physical Medicine & Rehabilitation, 89*, 1276-1283. doi:10.1016/j.apmr.2007.11.049

Texas Department of Aging and Disability Services. (2014). Licensing standards for assisted living facilities handbook. Retrieved from http://www.dads.state.tx.us/Handbooks/ls-alf/D/index.htm

Thanakwang, K., Soonthorndhada, K., & Mongkolprasoet, J. (2012). Perspectives on healthy aging among Thai elderly: A qualitative study. *Nursing & Health Sciences, 14*, 472-479. doi:10.1111/j.1442-2018.2012.00718.x

Tops, M., & Boksem, M. A. S. (2010). Absorbed in the task: Personality measures predict engagement during task performance as tracked by error negativity and asymmetrical frontal activity. *Cognitive, Affective & Behavioral Neuroscience, 10*, 441-453. doi:10.3758/CABN.10.4.441

Treiber KA, Carlson MC, Corcoran C, Norton MC, Breitner JC, Piercy KW, . . . Tschanz, J. T. (2011). Cognitive stimulation and cognitive and functional decline in Alzheimer's disease: The Cache County Dementia Progression Study. *The Journals of Gerontology.Series B, Psychological Sciences and Social Sciences, 66*, 416-425. doi:10.1093/geronb/gbr023

United Nations, Department of Economic and Social Affairs, Population Division. (2013). World population prospects: The 2012 revision,
volume I: Comprehensive tables. (No. ST/ESA/SER.A/336.).United Nations, Department of Economic and Social Affairs, Population Division. Retrieved from http://esa.un.org/unpd/wpp/index.htm

US Census Bureau. (2011). The older population:2010. Retrieved from http://www.census.gov/prod/cen2010/briefs/c2010br-09.pdf

van Buuren, S., & Groothuis-Oudshoorn, K. (2011). Mice: Multivariate imputation by chained equations in R. Journal of Statistical Software, 45(3), 1-67. Retrieved from https://www.jstatsoft.org/index

Volpato, S., Onder, G., Cavalieri, M., Guerra, G., Sioulis, F., Maraldi, C., . . . Fellin, R. (2007). Characteristics of nondisabled older patients developing new disability associated with medical illnesses and hospitalization. *Journal of General Internal Medicine, 22*, 668-674. doi:10.1007/s11606-007-0152-1

Vreugdenhil, A., Cannell, J., Davies, A., & Razay, G. (2012). A community-based exercise programme to improve functional ability in people with Alzheimer's disease: A randomized controlled trial. *Scandinavian Journal of Caring Sciences, 26*, 12-19. doi:10.1111/j.1471-6712.2011.00895.x

Wakefield, B. J., & Holman, J. E. (2007). Functional trajectories associated with hospitalization in older adults. *Western Journal of Nursing Research, 29*(2), 161-177. doi.org/10.1177/0193945906293809

Wall, J. R., Lichtenberg, P. A., MacNeill, S. E., Walsh, P., & Deshpande, S. A. (1999). Depression detection in geriatric rehabilitation: Geriatric depression scale short form vs. long form. *Clinical Gerontologist, 20*(3), 13-21. doi:10.1300/J018v20n03_03

Wallace, M., & Shelkey, M. (2008). Monitoring functional status in hospitalized older adults. *American Journal of Nursing, 108*(4), 64-72. doi:10.1097/01.NAJ.0000314811.46029.3d

Wallmann, H., Schuerman, S., Kruskall, L., & Alpert, P. T. (2009). Administration of an exercise regimen in assisted-living facilities to improve balance and activities of daily living: A pilot study. *Home Health Care Management & Practice, 21*, 419-426. doi:10.1177/1084822309334675

Wang, T. (2004). Concept analysis of functional status*. International Journal of Nursing Studies, 41*, 457-462. Retrieved from http://www.journals.elsevier.com/international-journal-of-nursing-studies/

White, D. K., Jette, A. M., Felson, D. T., Lavalley, M. P., Lewis, C. E., Torner, J. C., . . . Keysor, J. J. (2010). Are features of the neighborhood environment associated with disability in older adults? *Disability and Rehabilitation: An International, Multidisciplinary Journal, 32*, 639-645. doi:10.3109/09638280903254547

Whitmore, R., G., Stephen, J., H., Vernick, C., Campbell, P., G., Yadla, S., Ghobrial, G., M., . . . Ratliff, J., K. (2014). ASA grade and charlson comorbidity index of spinal surgery patients: Correlation with complications and societal costs. *Spine Journal, 14*, 31-38. doi:10.1016/j.spinee.2013.03.011

Wilkins, C., H., Roe, C., M., Morris, J., C., & Galvin, J., E. (2013). Mild physical impairment predicts future diagnosis of dementia of the Alzheimer's type. *Journal of the American Geriatrics Society, 61*, 1055-1059. doi:10.1111/jgs.12255

Willette-Murphy, K., Todero, C., & Yeaworth, R. (2006). Mental health and sleep of older wife caregivers for spouses with Alzheimer's disease and related disorders*. Issues in Mental Health Nursing, 27*, 837-852. doi:10.1080/01612840600840711

Wolinsky F.D., Bentler S.E., Hockenberry J., Jones M.P., Obrizan M., Weigel P.A., . . . Wallace, R. B. (2011). Long-term declines in ADLs, IADLs, and mobility among older medicare beneficiaries. *BMC Geriatrics, 11*, 43-43. doi:10.1186/1471-2318-11-43

World Health Organization. (2013). How to use the ICF: A practical manual for using the international classification of functioning, disability and health (ICF). Exposure draft for comment. Retrieved from http://www.who.int/classifications/drafticfpracticalmanual.pdf

Young, Y., Inamdar, S., & Hannan, E. L. (2010). Comparison study on functional outcomes and perceived quality of life between all-inclusive and fee-for-service continuing care retirement communities. *Journal of the American Medical Directors Association, 11*, 257-262. doi:10.1016/j.jamda.2009.09.004

Zar, J. H. (2010). *Biostatistical analysis* (5th ed.). Upper Saddle River, NJ: Prentice-Hall.

Zhu, C. W., Leibman, C., McLaughlin, T., Scarmeas, N., Albert, M., Brandt, J., . . . Stern, Y. (2008). The effects of patient function and dependence on costs of care in Alzheimer's disease. *Journal of the American Geriatrics Society, 56*, 1497-1503. doi:10.1111/j.1532-5415.2008.01798.x

Biographical Information

Thomas Dombrowsky was born in Oregon and grew up in Arizona. He began his nursing career in 1976, graduating from the Maricopa Technical Community College LPN program. In 1985 he graduated from the University of Texas at Arlington BSN program. He worked in a variety of medical surgical nursing positions as well as in long term care. He completed a one year fellowship in evidence based practice sponsored by the Joanna Briggs Institute and by Texas Christian University. In 2011 he earned an MSN degree with a focus on nursing education from the University of Texas at Arlington. The following semester he began studies at the University of Texas at Arlington toward a PhD. His main research interests are the functional status of older adults and the factors which affect functional status.

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