The Importance of Home Modification for Occupational Participation and Safety for Low-income Older Adult Homeowners

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The Importance of Home Modification for Occupational Participation and Safety for Low-income Older Adult Homeowners

Melody Oaks

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Arts in Occupational Therapy, St. Catherine University, St. Paul, Minnesota

January, 2017

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Thesis Readers: Brent Suski, M Arch and Linda Buxell, MA, OTR/L
Acknowledgements

This thesis is a component of a larger, faculty-led and on-going research and practice partnership between the Occupational Therapy Department at St. Catherine University and Rebuilding Together Twin Cities (RTTC). Funding for my project was partially provided by a grant from the Minnesota Department of Human Services (DHS) to RTTC for outcome evaluation of their home modification services. I received additional funding from the Assistant Mentorship Program (AMP) at St. Catherine University, which supported data collection and analysis, transcription, as well as my personal and professional development.

I would like to acknowledge and thank all the staff at RTTC for their collaboration, enthusiasm, flexibility, and support throughout this research project. The work they do within our community is life-changing and invaluable for so many homeowners, but what is most impressive is the heart and spirit behind it all. Their culture of compassion and caring is profoundly felt by the homeowners they serve, and is captured poignantly in the research presented in this thesis. To all the participants in this study, a heartfelt thanks for sharing your homes and lives so freely and graciously. I would also like to particularly thank Brent Suski for his kindness, collaboration, and mentorship throughout our partnership. Many thanks to Brent, as well as Linda Buxell for their insightful feedback as my readers. This thesis would not have been possible without the friendship, dedication, and support of my stellar research partner, Anna Krech. I am sincerely grateful to my thesis advisor, Catherine Sullivan. Her impact on my development is immeasurable, and I have been so honored to learn under her enthusiastic, rigorous, and humble guidance. Finally, I want to thank my family - to my son Theo for being my never-ending light and joy, and to my husband, Cody, for always believing in me, modeling for me how to carry the load more lightly, and helping me uncover my own limitlessness.
# Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>1-2</td>
</tr>
<tr>
<td>Literature Review</td>
<td>3-25</td>
</tr>
<tr>
<td>Participation, Aging, and Disability</td>
<td>3-9</td>
</tr>
<tr>
<td>Aging in Place and Accessibility</td>
<td>9-15</td>
</tr>
<tr>
<td>Safety Risks for Older Homeowners</td>
<td>15-21</td>
</tr>
<tr>
<td>Aging in Place for Low-income Older Adult Homeowners</td>
<td>22-25</td>
</tr>
<tr>
<td>Methods</td>
<td>26-36</td>
</tr>
<tr>
<td>Research Design</td>
<td>26-27</td>
</tr>
<tr>
<td>Tools</td>
<td>27-31</td>
</tr>
<tr>
<td>Setting and Context</td>
<td>31-34</td>
</tr>
<tr>
<td>Data Analysis</td>
<td>34-36</td>
</tr>
<tr>
<td>Results</td>
<td>37-59</td>
</tr>
<tr>
<td>Research Question 1: Daily Life Routines and Activity Participation</td>
<td>38-50</td>
</tr>
<tr>
<td>Research Question 2: Awareness and Feelings of Safety</td>
<td>50-52</td>
</tr>
<tr>
<td>Research Question 3: Experience of Home Modification</td>
<td>52-59</td>
</tr>
<tr>
<td>Discussion</td>
<td>60-66</td>
</tr>
<tr>
<td>Study Limitations</td>
<td>67</td>
</tr>
<tr>
<td>Future Research</td>
<td>68</td>
</tr>
<tr>
<td>Conclusion</td>
<td>69</td>
</tr>
<tr>
<td>Appendices</td>
<td>70-78</td>
</tr>
<tr>
<td>A: Samples of Quantitative Tools</td>
<td>70-72</td>
</tr>
<tr>
<td>B: Pre and Post Interview Guides</td>
<td>73-74</td>
</tr>
<tr>
<td>C: Research Information and Consent Form</td>
<td>75-77</td>
</tr>
<tr>
<td>D: Qualitative Coding Sheet</td>
<td>78</td>
</tr>
<tr>
<td>References</td>
<td>79-88</td>
</tr>
</tbody>
</table>
Abstract

The purpose of this collaborative study between Rebuilding Together Twin Cities (RTTC) and the OT department of St. Catherine University was to evaluate the impact of home modifications on the occupational participation and safety of low-income, older adult homeowners. This study utilized a mixed methods design to answer the following three research questions: 1) How do daily life routines and activity participation change for the homeowner as a result of the modifications? 2) What is the impact on the homeowner’s awareness and feelings of safety? and 3) What is the homeowners’ experience of home modification? A total of four quantitative tools were used to answer these questions including the In-Home Occupational Performance Evaluation (I-HOPE), Life Space Assessment (LSA), Short Falls Efficacy Scale (S-FES), and Live Well at Home Rapid Screen (LWAH-RS). Semi-structured interviews were also conducted to collect qualitative data for additional interpretation. A total of 15 low-income older adult homeowners completed the study and met participation criterion. Statistical analysis showed significant improvements in occupational participation in valued daily activities for the I-HOPE, as well as clinically significant decreases in fear of falling for the S-FES and risk of long-term care placement for the LWAH-RS. Scores for the LSA did not show clear improvements when compared to baseline. The positive findings suggest that home modifications involving occupational therapists can improve occupational participation and safety for low-income older adult homeowners. Qualitative results revealed themes of increased independence and accessibility, improved community relationships and occupational activities, and increased hope to remain aging in place.
Introduction

The purpose of this mixed-methods study was to evaluate the impact of home modifications provided by RTTC on activity patterns, perceived safety, and quality of life for low-income, older adult homeowners. Through an on-going collaborative partnership, the Occupational Therapy (OT) Department at St. Catherine University completed both qualitative and quantitative outcome evaluation for home modifications that RTTC provided to low-income, community-dwelling homeowners at no cost. The mission of RTTC is to provide critical home repairs and accessibility modifications for elderly and disabled low income homeowners in the Twin Cities area, ensuring they can live independently in safe and healthy homes. The research presented in this thesis focuses specifically on how the homeowners’ daily life routines and activity participation change as a result of the modifications, and how feelings of safety and awareness are impacted.

Most home assessments checklists, including the one used by RTTC prior to this study, do not include subjective value to the homeowner or address unique activity patterns (Somerville & Stark, 2015). OT provides a unique, client-centered perspective of the person, occupation, and environment which can shape and enhance the process of home modification to enable older adults to age in place with dignity and greater participation in all domains of life. The Person, Environment, and Occupation (PEO) model provides a framework for understanding this transactional interaction between the individual and their environment, which can either hinder or support occupations (Ramafikeng, 2011). All three components of the model are interdependent and operate
in a cyclical rotation, each affecting the balance and continuation of the other (Ramafikeng, 2011). The PEO model stems from the ecological theory of aging (Lawton, 1977) which considers human behavior the result of the person interacting with and responding to the press, or demand, of the environment. Through this lens, quality of life in aging can be altered positively or negatively by the amount of demand placed on the individual by the physical environment. Home modifications can provide improvements in the physical environment to reduce the burden and press on the aging homeowner and restore order to the delicate balance between the person, environment, and occupations.

Although some research does exist on the efficacy of home modifications in fall prevention, little research focuses specifically on how the modifications impact the actual patterns and routines of homeowners (Gillespie et al., 2012) Thus, this pilot study aims at filling this gap in the literature on the outcomes of home modification for safety awareness and occupational participation. It also addresses a lack in research across disciplines on aging in place for low-income, community dwelling older adults. Due to the increasing demands of the incoming aging population, this discourse is particularly relevant to our community and society as we seek to meet the needs of older adults.
Literature Review

Participation, Aging, and Disability

Definition of problem. The U.S. is facing a scarcity of suitable housing and resources to support the number of older adults living and thriving in the community. The process of aging has changed dramatically over the past several decades, and significant changes in the makeup of the US aging population call for unique and creative approaches to housing and service delivery. The older population has grown exponentially with the aging of the baby boomer generation (Haber, 2007; O'Brien, Wu, & Baer, 2010; Shields, et al., 2013). By 2030, adults over the age of 65 will double from 37 million to 71.5 million, which will account for 19% of the entire US population (O'Brien, Wu, & Baer, 2010; Shields, et al., 2013). In addition, improvements in science, medicine, sanitation, and health behaviors, have increased life expectancy beyond any previous records (Haber, 2007). According to the Centers for Disease and Control Prevention (CDC, 2016), the current life expectancy for Americans is 78.8 years. This has created a new demographic of the “very old”, in reference to individuals over the age of 85. Since 1980, this age group has grown by 40% with each decade (Haber, 2007).

Although most older adults wish to remain living in their homes, challenges within the existing housing stock threaten this possibility. (Fausset, Kelly, Rogers, & Fisk, 2011; O’Brien et al., 2010). Most homes within the U.S. contain multiple barriers for the aging adult, with as many as 80% of homes having at least 1 identifiable environmental hazard, and roughly 40% having over 5 hazards (Steinman, Pynoos, &
Nguyen, 2009). These environmental barriers can threaten the competence and capability of the older adult to continue to age in place. Thus, with the baby boomer generation currently entering older age, the demand for housing that facilitates and supports human development into advanced age will soon result in a drastic increase in the need for home modification and accessibility programs. The lack of affordable and accessible housing will be particularly problematic for diverse and low-income homeowners with limited resources.

The older adult population is becoming more diverse in ethnicity, education levels, places of residence, socioeconomic status (SES), and health conditions (Haber, 2007; Markides & Gerst-Emerson, 2014). While the majority of the US population over the age of 65 is currently non-Hispanic white, this percentage is expected to drop from 80% to 60% of the population by the year 2050, creating a more diverse older adult population than has ever existed in the US (Markides & Gerst-Emerson, 2014). Because older adult minorities tend to experience higher rates of poverty and more barriers to resources, this shift in the aging population will likely create a greater need for more flexible and extensive resources (AoA, 2014). In addition, with the increase in life expectancy, health status is also becoming increasingly complex with age. Ensuring the quality of life, health, and wellbeing of this growing and changing population of older adults in the US will become an essential priority in the next century. A crucial component of this quality of life and successful aging is safe participation in valued daily activities.

**Occupational participation and wellness.** Health and wellbeing is strongly linked to occupational participation, which is essential for productive aging and
independence (American Occupational Therapy Association [AOTA], 2013; Niva & Skar, 2006; Vrkljan, Leuty, & Law, 2011). Occupational science examines this link between effective occupational participation and health and wellness (Bonder, 2014).

Participating in daily occupations is a fundamental act of living. The Canadian Association of Occupational Therapists (CAOT, 2016) defines occupations as “everything that people do during the course of everyday life” (para. 3). Occupational participation can be defined as “the engagement of the individual’s mind, body, and soul in goal-directed pursuits” (Christiansen & Townsend, 2010, p. 421). This definition highlights the holistic nature of wellness, as well as the transactional relationship that exists between occupational participation and the health of the individual. Participation in daily activities that are meaningful and enjoyable to older adults help to prevent disability and facilitate this balance of health and wellness (Backman, 2010; Hocking, 2014; Vrkljan et al., 2011). Health is often marked by activity and productivity. Maintaining robust habits, roles and routines provides meaning and purpose to everyday life and human identity, while supporting physical strength and mobility in aging (Hocking, 2014).

**Normal age-related changes.** The aging process produces natural declines in body structures and function, which can often affect occupational participation (Bonder, 2014). Although dementia and Alzheimer’s are not a normal part of the aging process, natural cognitive declines do occur that affect the speed and accuracy of memory recall (National Institute of Health [NIH], 2007). Changes in vision and hearing are also common, including presbyopia, or the general loss of vision acuity (Bonder, 2014; NIH, 2007). The normal wear and tear on bones, muscle tissue, and joints over time causes
damage resulting in increased weakness and frailty with age. Breakdown of the body’s organs and tissues is also a normal part of aging, resulting in thinning, sensitive skin and increased vulnerability to disease and dysfunction of body systems. (NIH, 2007). As person factors such as mobility, balance, and strength are decreased, one’s ability to meet the demands of the environment are often reduced, which can result in a disruption of occupational participation (Fausset et al., 2011).

**Disability and aging.** Although age-related changes are inevitable, aging does not affect all individuals the same (Bonder, 2014; NIH, 2007). Some individuals age better than others due to lifestyle choices, genetics, and environmental factors (Bonder, 2014). Additionally, despite commonly held negative views of aging, growing older is also accompanied by unique joys and strengths that are often inaccessible in youth. In this final stage of life, the gifts and insights gained through a lifetime of rigorous human development are realized and expressed. Haber (2007) reports that aging is associated with success in certain domains of life such as financial stability, mastery of specific expertise gained through experience, and increased proficiency in adapting to changing capacities in oneself. The human development theory of selection, optimization, and compensation explains the adaptations that the older adult makes in response to functional loss (Baltes & Baltes, 1990). In cognitive loss, for instance, the older adult will select to focus on facts and cognitive skills that are more important to them, discarding those they no longer value. They will then optimize their behaviors to learn and maintain only the skills that help them remember the more limited information they have selected as important. They might then develop compensatory habits to adjust to their more limited function, such as writing things down (Baltes & Baltes, 1990). These types of
changes in behavior can reduce the effects that age-related losses can have on function. Furthermore, Haber (2007) emphasizes that the mere presence or absence of disability and disease does not necessarily determine quality of life. Instead, older adults identify the ability to independently perform activities of daily living (ADL) as most important for successful aging, along with supportive and satisfying social relationships (Haber, 2007).

Despite the many positive aspects of maturation, the aging body is still less able to physically recover from acute injury or illness. Normal age-related changes and chronic conditions begin to affect the body, resulting in a continuum of functional changes in daily life. These declines in body systems and functions do not affect everyone the same, but can lead to deterioration and breakdown in functional participation for some older adults (Dal Bello-Haas, 2009). The World Health Organization (WHO) has developed the International Classification of Functioning, Disability, and Health (ICF) to help define health and disability. Within this system, disability is all-encompassing term for negative aspects that affect the interaction between an individual and the context of environment such as: a) body structure or function impairment, b) activity limitation, or c) participation restriction (Dal Bello-Haas, 2009; Université catholique de Louvain, 2007). The Administration on Aging [AoA] (2014) reports that almost 75% of individuals over the age of 80 report at least one disability, and roughly 35% of these individuals report needing assistance as a result of their disability (Dal Bello-Haas & Tryssenaar, 2009). The natural aging process also increases the prevalence of chronic health conditions. When compounded by normal age-related changes, chronic conditions can result in an increase in disability in advanced age
that affect functional performance. More than 80% of older adults have a chronic health problem (Abbott, 2009). Common potentially disabling chronic conditions that occur in aging include hearing loss, vision loss and conditions such as glaucoma and cataracts, Alzheimer’s and dementia, stroke, cancer, heart disease, arthritis and osteoporosis, high blood pressure, diabetes, and incontinence (APA, 2016; NIH, 2007). All of these conditions can disrupt function and cause problems in meeting the performance demands of one’s daily routines, self-cares, and responsibilities.

It is important to note that varying definitions of disability may impact research and statistics of disability prevalence. For instance, many older adults that have a chronic clinical condition may not experience any disabling restrictions in their participation in daily activities, while others may experience disability from accumulation of normal age-related changes (AoA, 2014). Furthermore, current research trends suggest that disability in aging has been overly attributed to age-related changes, but may more likely be the result of disuse and other changes in lifestyle factors (Dal Bello-Haas, 2009). Another important consideration when looking at disability statistics is that the majority of older adults do not have a disability of any sort, are independent, and are able to function on their own with limited assistance (Del Bello-Haas, 2009). In other words, aging is not synonymous with disability. Clinical diagnoses vary in their effect on participation and function, as identified in the ICF definition of disability (Université catholique de Louvain, 2007). In fact, two-thirds of non-institutionalized older adults report their health status as good, very good or excellent (American Psychological Association [APA], 2016).
**Demographic barriers in aging and participation.** Many other personal and environmental factors can affect participation. Socioeconomic status (SES) is a strong indicator of health and wellness, and affects access to quality housing, healthcare, education, and livable communities, all environmental factors that support successful aging (Markides & Gerst-Emerson, 2014). Lower SES is linked to increased chronic disease and disability (AoA, 2014; O'Brien et al., 2010). Furthermore, persons of color disproportionately make up a significantly larger percentage of older adults living in poverty, and also experience higher levels of disability that affect function and participation (Mehta, Sudharsanan, & Elo, 2014; O'Brien et al., 2010; Szanton, et al., 2011). Gender and marital status also have implications for disability and health outcomes. Women have a longer life expectancy than men, but also experience higher rates of chronic illness (AoA, 2014; O'Brien et al., 2010). Because of their longer life expectancy, women are more likely to live alone, which the AoA (2014) reports as being linked to increased hospitalizations and decreased independence. Low-income adults are much more likely to be single, unmarried, and living alone (O'Brien et al., 2010) Fauss et al. (2011) also found that single adults had significantly higher difficulties with maintaining their home than married individuals. When older adults experience multiple barriers that impede performance and participation, their quality of life and ability to safely age in place is threatened.

**Aging in Place and Accessibility**

**Meaning of home.** The aging in place movement has created a significant increase in the number of older adults living in the community (O’Brien et al., 2010). Aging in place has largely been defined as “remaining living in the community, with
some level of independence, rather than in residential care” (Wiles, Leibing, & Guberman, 2012, p. 357). Research supports that most older adults have a strong desire to remain in their home. (Fausset, et al., 2011; Gross & Caiden, 2000; Wagner, Shubar, & Michalos, 2010). According to a recent survey completed by the AARP (O’Brien et al., 2010), almost 90% of adults over the age of 50 desire to remain in their homes. Home is deeply connected to our sense of identity, safety, and comfort. Home is far more than a place to sleep, or a roof over our head. It is the place that all human activity, flourishing, and development stems from. For many older adults, their home represents their life and all they have accomplished. The home is where one’s identity, culture, and values are expressed (Chase & Christenson, 2011) and is deeply personal and valuable beyond face value. The walls hold the memories of lives built and families raised, whispering and reminding the older adult of who they are and the meaning they have brought to this world. Some more concrete benefits to older adults remaining in their homes and communities include a continued connection to social and community supports, and maintaining a connection to their past and sense of identity. These important relationships provide a sense of belonging and familiarity in a time of transition and significant shift in life roles and routines (Wiles, et al., 2012). Still, a number of barriers to aging in place must be overcome to honor the desires of older adults to continue age in their homes.

**Challenges to aging in place.** The large shift from institutionalized living to care within the community has created a new set of challenges for the medical care and social service sectors, as well as homeowners themselves (Fausset et al., 2011). Often, older adults’ homes are older and require more maintenance and upkeep (Fausset et al., 2011). Due to the decreased capabilities associated with aging, older adults often struggle to
maintain their homes, as well as access them successfully (Fausset et al., 2011; Golant 2008). Aging in place is only possible if individuals are able to fully access their homes and communities (Fausset et al., 2011, Golant, 2008; Wiles, Leibing, & Guberman, 2012). Without accessibility to one’s environment both within and outside of the home, occupational deprivation and isolation begin to occur. Occupational deprivation and marginalization can lead to poor health and decreased quality of life (Whiteford, 2010). Occupational deprivation is the result of conditions outside of one’s control, such as disabilities and physical and social environments, limiting one’s occupational opportunities on a consistent, ongoing basis. Occupational deprivation and marginalization also often result from occupational injustices such as poverty or racial inequalities (Whiteford, 2010). For instance, African American older adults have higher incidence of living in substandard and dilapidated housing in need of repair (Szanton, et al., 2011). Therefore, in order to facilitate successful aging in place and eliminate occupational deprivation that might occur as a result of the inability to access places of occupation, solutions must address accessibility for all older adults. In addition to addressing social inequalities through social policies, this means addressing the physical barriers that exist within our communities and homes.

Currently, most homes have multiple barriers and need modifications to allow older adults with decreasing function and increased disabilities to fully participate in their lives (Fausset et al., 2011; Stark, 2004). In fact, although research has shown that reducing barriers within the home slows down the rate of functional decline (Niva & Skar, 2006), less than 10% of all homes in the US have modifications for accessibility (Stark, 2004). As previously discussed, normal age-related changes can result in decline
of function and lead to increased disability. When this occurs, the natural demands of the environment begin to exceed the capacity of the individual and disrupt participation (Fausset, et al., 2011; Stark, 2004). For instance, going up and down several stairs to access an entrance to the home might become more difficult on aging knees and joints, resulting in a reduction of the individual going out into his/her community and in turn result in disuse and reduced function. In this example, a temporary ramp could be installed that would allow for easy access with adaptive equipment, like walkers. Sometimes, adding hand railings for extra upper body support and widening the stairs can also provide enough extra support to alleviate pain and excess wear and tear for individuals. Thus, implementing home modifications can prevent further disability for older homeowners and improve the prospect of aging in place (Somerville & Stark, 2015).

**Accessible communities.** Aging in place must also be facilitated by an accessible and “livable community” that promotes independence and engagement (Kirk, 2009). Maintaining social connections is one of the key benefits of aging in place. However, lack of accessibility to the community and outdoor spaces can significantly threaten an elder’s ability to maintain social connections (Fausset et al., 2011, Golant, 2008; Wiles et al., 2011) Furthermore, a hallmark of livable communities is the presence of accessible green spaces with trees and parks that invite the older adult outside to participate in the community and engage in physical activity (Abbott, 2009).Improved health has been found to be closely linked to access to nature, as well as to the built environment of one’s neighborhood (Pappas, 2009). Connecting with nature is a fundamental experience of being human. Nature is healing and restorative. Multiple studies have found that
individuals that observed scenes of nature recovered from stress symptoms more quickly than others who saw different scenes or content (Pappas, 2009). Therefore, being able to get out of one’s home and into nature, as well as living in a community that allows accessibility to nature for individuals of all abilities supports physical activity and health maintenance for older adults. However, housing and community accessibility and design is governed and dictated by a number of policies, legislation, and zoning regulations.

**Housing and accessibility legislation.** The Americans with Disabilities Act (ADA) and Fair Housing Act (FHA) have made drastic improvements to public spaces for community accessibility, as well as in commercial and multifamily unit buildings (Department of Housing and Urban Development [HUD], 2013; Salomon, 2010). Multifamily units are defined as buildings with “four or more dwelling units” (HUD, 2013). ADA and FHA legislation require accessibility features within the built environment of public spaces like sidewalks, parks, public transportation, and public buildings (HUD, 2013; Salomon, 2010). All newly constructed commercial buildings are required to have accessible entrances/exits, bathrooms, and doorways, as well as any remodels of existing structures (Abbott, 2009). Additionally, the Rehabilitation Act of 1973 mandated that all federally subsidized housing meet accessibility standards (Salomon, 2010). In addition to physical accessibility, federal legislation also governs general access to housing. The FHA requires fair practice in rental and housing processes, guaranteeing that no individual can be denied housing based on the status of race, ethnicity, religion, gender, sexual orientation, or disability (Maisel et al., 2008).

While these laws made accessibility a civil right in public spaces and buildings, these rights have not extended to private homes. Single family homes are not regulated
under the same accessibility standards, and have separate building codes and zoning laws (Lichter, 2009; Maisel, Smith & Steinfeld, 2008; Salomon, 2010). This gap in regulation leaves many Americans who are now able to easily access grocery stores and restaurants, still unable to access their own homes (Maisel et al., 2008). Thus, significant gaps still exist within our society in our effort to create communities that facilitate accessibility and engagement for all members of society. In response to these shortcomings, a number of movements and philosophies on architectural design have begun to make significant impacts in new construction.

**Universal design and visitability.** Universal design (UD) is the concept of designing products and environments that allow for access and utility by all individuals. UD emphasizes high standards in design for all people, not just individuals with disabilities, which then improves function and use for everyone (Salomon, 2010; Maisel et al., 2008). UD is a concept that has been widely influential in government policies and city planning, as well as with private contractors and building companies. UD philosophy goes beyond the basic legislative requirements and seeks to make accessible and integrated built environments that are appealing and easy for everyone to use (Maisel et al., 2008). Despite UD’s strong influence in modern design, private companies that do not have to meet ADA or FHA accessibility standards may or may not incorporate UD principles into new construction. Although UD is heavily utilized in commercial settings, it is still rarely implemented when building private homes (Salomon, 2010). Still, several trends are gaining attention and momentum which attempt to improve accessibility in private home design.
Visitability is a movement that attempts to employ UD principles specifically for accessibility to single family homes. The movement’s goal is to make all homes “visitable” for all individuals, regardless of age or ability levels. This includes 3 primary features: at least one zero step entrance, wide doorways, and a half bathroom on the main level (Lichter, 2009; Maisel et al., 2008; Salomon, 2010). Visitability standards have actually been adopted into some city and government agencies and laws for new private home construction, as well as by non-profits like Habitat for Humanity (Lichter, 2009).

Additionally, an increasing number of private home builders are becoming Certified Aging in Place Specialists (CAPS) through a certificate program provided by the National Association of Home Builders. This program specifically teaches home builders how to implement home modifications to support aging in place, and also emphasizes the principles of visitability for all home renovations and new construction (NAHB, 2016). However, progress is slow and much work remains in order to make our homes and communities more visitable, accessible, and safe.

**Safety Risks for Older Homeowners**

Older adults are more susceptible to injuries within the home when compared to their younger counterparts (New York-Presbyterian Hospital [NYP], 2010). Although falls are the most common safety risk, other common unintentional injuries for older adults include burns and scalds, medication poisoning, carbon monoxide poisoning, and wounds, bruises or laceration (Minnesota Department of Health [MDH], 2012; Shields et al., 2013). Generally, older adults experience more severe injuries from accidents and require a longer time to recover (MDH, 2012). In fact, unintentional injuries are the
leading cause of death in adults over the age of 85 (Scaffa, et al., 2010). Burn injuries in adults over the age of 65 are more likely to lead to hospitalization than for any other age group, including children under the age of 5 (Bessey et al., 2006). Deaths from fire occur twice as often in older adults, with those 85 and older experiencing four times as many deaths (Shields et al, 2013).

**Falls and injuries.** Falls are the most common source of injury within the home (Centers for Disease Control and Prevention [CDC], 2016; Chase, Mann, Wasek, & Arbesman, 2012; Gillespie et al., 2012). One out of every three (or 30%) older adults fall each year, with 20% of those falls resulting in some sort of injury (CDC, 2016; Chase et al., 2012; Steinman et al., 2009). Although most falls result in only minor injuries such as bruises, sprains and lacerations, falls are the leading cause of injury and mortality for individuals over the age of 65 (CDC, 2016; Chase et al., 2012). One out of every five falls results in a serious injury such as broken bones or head injuries (CDC, 2016). In fact, for adults over 65, falls account for 60% of all deaths (Scaffa, et al., 2010). Furthermore, the home is the primary location where most of these injuries occur (Steinman et al., 2009). For older adults living within the community, up to 75% of all falls occur within and around the home (Steinman et al., 2009). Falls are also often linked to compounding risk factors. For instance, once an adult experiences a fall, he/she will likely fall again. The CDC (2016) reports that the likelihood of falling is doubled after an initial fall. Additionally, even if falls do not result in injury, older adults often experience an increase of fear of falling in the future. This increased fear of falling is linked to decreased activity and performance of daily tasks, social isolation, anxiety and depression.
A variety of factors contribute to this high prevalence of injuries in older adults.

**Fall and injury risk factors.** Normal age-related changes in function and health puts older adults at a higher risk for fall, injury, and accidents within the home. Sensory declines can create reduced input from vision, hearing, smell and touch (Bonder, 2014; NYP, 2010). Adequate sensory input is essential for the body and mind to navigate and respond to environmental hazards (Bonder, 2014). Low vision is particularly troublesome for older adults attempting to move around and function within their homes, and is highly linked with accident and injuries (Steinman et al., 2009). Because vision intimately informs vestibular and proprioceptive sensations, reduced input from the visual system affects overall balance and stability (Steinman et al., 2009). Common vision issues associated with aging that have been linked to fall risk include reduced visual acuity, contrast awareness, depth perception, and loss in visual fields (Steinman et al., 2009). Reduced tactile sensation, which can occur as a result of peripheral neuropathy from diabetes, may not alert an older adult to painful stimuli from hot or sharp items (Bonder, 2014). Furthermore, the mind’s ability to integrate sensory input into coordinated and smooth reactions often declines and slows with age (NIH, 2007). All of these changes can result in slowed response and reaction time, increasing the risk for falls, burns, scalds and other unintentional injuries (NYP, 2010).

Reduced cognition associated with aging can also lead to injury and accidents. Cognitive processing tends to slow with age, leading to reduced reaction times and speed of problem solving (NIH, 2007). Managing medication requires a sharp memory, and strong executive functioning and planning skills, which can be affected by cognitive
declines (Bonder, 2014). Increased use of medications to control chronic conditions with age makes the use of medications more prevalent among older adults. The number and frequency of medications is positively correlated with medication poisoning (Scaffa, et al., 2010). Neurocognitive disorders such as Alzheimer’s disease are also linked to higher rates of falls and injuries due to their impact on judgment, perception, and awareness of the environment. Individuals with dementia and other similar cognitive impairments are two times more likely to fall than other older adults (Steinman et al., 2009).

Reduced motor abilities from aging are also a significant risk factor for accidents and injuries. Muscle and bone density loss are a natural part of aging, resulting in a general decrease in physical abilities, mobility, and strength (Bonder, 2009). Musculoskeletal changes are often exacerbated by sensory dysfunction, and can create further instability, poor balance, unsteady gait, and poorer response time (Steinman et al., 2009; Steward Williams et al., 2015). Decreased mobility is a significant factor contributing to fire deaths for older adults because they often require more time and assistance to move away from the danger of a fire (Shields et al., 2013). Common conditions affecting joints such as osteoporosis and arthritis create physical pain and slowness of movement, and are linked to falls and accidents (Scaffa, et al., 2010). Clinical conditions affecting motor functions also result in greater fall risk. For example, in individuals with Parkinson’s disease (PD), motor deficits such as tremors, muscle rigidity, and hypokinesia, as well as postural instability, result in increased incidence and number of falls (Dibble, Christensen, Ballard, & Foreman, 2008).

Many other individual factors contribute to falls and injury within the home for older adults. Depression and sleep disturbances are linked to increased falls, with some
studies reporting individuals with depression having 40% more fall-related injuries
(Scaffa et al., 2010; Steward Williams et al., 2015). Also, side effects from medications
such as diuretics, vasodilators, anticholinergic drugs, and sedatives create falls risks, as
does the total number and interaction of multiple medications (Scaffa et al., 2010).
Gender is also a factor since globally, women experience 30% more fall-related injuries
than men (Steward Williams et al., 2015).

Environmental factors also play a large role in safety risks for older adults. The
number of environmental barriers has been found to be positively correlated to risk of fall
and other injuries (Steward Williams et al., 2015). Poor lighting, lack of contrast, slippery
surfaces, presence of rugs, thresholds, high-pile carpet, clutter, poor layout of furniture,
hard to reach items, and poorly designed bathroom fixtures all increase risk of falling
(Pynoos, Steinman, Nguyen, & Bressette, 2012). Low lighting, failing appliances or alert
devices, and hot water temperatures can specifically contribute to scalds and burns (NYP,
2010; Shields et al., 2013). Fortunately, environmental factors within the home can be
easily remedied through effective home hazard assessments and modifications (Pynoos et
al., 2012; Shields et al., 2013).

**Evaluation and assessment measures.** A variety of home safety evaluations
tools and instruments exist for occupational therapists and other providers to evaluate the
safety of the home and inform recommendations to reduce fall and injury (Stark,
Somerville, & Russell-Thomas, 2011). The Home Falls and Accidents Screening tool
(Home FAST) is a valid and reliable screening evaluation that identifies fall risk factors
within the home environment as well as functional person factors (Vu & Mackenzie,
2012). The Home Environmental Assessment Protocol (HEAP) is a valid and reliable
evaluation designed to assess home safety and function specifically for older adults with dementia (Gitlin et al., 2002). The Safety Assessment of Function and the Environment for Rehabilitation (SAFER) is a common assessment tool that evaluates and seeks to improve overall safety within the home. The SAFER has built-in safety recommendations within the assessment process as well (Stark et al., 2011; Vu & Mackenzie, 2012). The In-Home Occupational Performance Evaluation (I-HOPE) allows assessment of the interaction of the person’s performance of valued occupations and the environmental barriers within the home (Stark et al., 2011).

Choosing the best assessment for home modifications often depends on what factors the professional is looking to evaluate. As discussed previously, the PEO model provides a strong framework for examining how the person, the environment, and the occupation all dynamically interact and affect overall individual performance. Home evaluations are most effective when they are client-centered (Pynoos et al., 2012; Stark et al., 2011). The I-HOPE fits particularly well within the PEO model as a client-centered assessment tool to measure how home modifications affect the individual perceptions of homeowners on their perceived sense of performance and satisfaction in daily activities (Stark et al., 2011).

**Research on home modifications for fall and injury prevention.** Multiple studies have been completed to evaluate the effectiveness of fall prevention programs and interventions. Much of this research has found that home modifications are effective in decreasing falls, particularly when OTs are involved and implement client-centered evaluations of occupational patterns and activities (Chase et al., 2012; Gillespie et al., 2012; Gitlin et al., 2006; Petersson et al., 2009; Pynoos et al., 2012; Stark, 2004).
Furthermore, home modifications have found to be most effective when combined with other fall prevention strategies such as physical exercise programs to increase strength and balance, coordination of care providers, medication evaluation, starting a Vitamin D regimen, and education on fall prevention strategies (Chase et al., 2012; Gillespie et al., 2012; Steinman et al., 2009; Turner et al., 2011).

The benefit of home modifications to prevent other injuries besides falls have not been as well researched. One study found that combining education and home modification was the most effective strategy in preventing scalds and burns within the home (Atiyeh, Costagliola, & Hayek, 2008). The authors also found that burn injuries are highly correlated with morbidity, even with advances in the US in acute care. Scaffa et al. (2010) reports that installation and maintenance of smoke detectors and carbon monoxide (CO2) detectors, along with prevention education significantly reduces the incidence of fire and CO2 related injuries. Another study found that installing smoke detectors in the home cuts the risk of fire-related deaths in half (Shields et al., 2013).

Despite the growing body of research on the efficacy of home modifications, little research exists on how they affect the participation and performance of everyday activities for homeowners. This is because most home modification evaluations look solely at risk and functional ability, not at the level of participation in valued activities (Petersson et al., 2009). However, Somerville and Stark (2015) developed the I-HOPE in order to evaluate the impact of home modifications on activity performance and satisfaction. To validate their tool, they completed a randomized, controlled study of 28 homes of older adults utilizing the I-HOPE to measure for changes in activity participation. They found that by removing barriers, home modifications do in fact
improve performance of activities of daily living within the home. They recommend that further research be conducted to support their findings, particularly with low-income and diverse homeowners.

Aging in Place for Low-income Older Adult Homeowners

**Prevalence of low SES in older adults.** Low-income older adults are a growing demographic, representing about 36% of the population of older adults in the US (O’Brien et al., 2010). Despite the growth of low-income older adults, poverty levels for older adults are significantly lower than for the general population due to the existence of social security income (SSI). The poverty level for older adults dropped from 25% in 1968 to 14% in 1978 during the time that SSI was created. The poverty rate has remained relatively constant since. (O’Brien et al., 2010). However, with the increasing aging population, the number of low-income older adults living below the poverty line will continue to increase. Today, nearly 3.7 million older adults live in poverty, with the poverty rate being 2-3 times higher for African American and Hispanic older adults (O’Brien et al., 2010).

A variety of other intrinsic and extrinsic factors contribute to lower SES in older adults. Ethnic and socioeconomic disparities in education levels and job opportunities result in inequalities in health, wellness, and quality of life throughout the lifespan, but are compounded in older age (AoA, 2014). For instance, low-income and African American older adults are more likely to experience chronic health problems, depression, disability, and lack of access to healthcare (O’Brien et al., 2010; Szanton et al., 2014). Living alone, being single, and female are also person factors linked to lower income.
Also, because women tend to live longer than men, the incidence of female singleness and poverty rises with age (O’Brien et al., 2010).

**Unique challenges for low-income homeowners.** Low income homeowners face many challenges to aging in place with dignity and quality of life as they attempt to maintain their homes (Gloant, 2008; Szanton et al., 2011). Older homeowners tend to live in older homes that have more barriers and need more safety modifications (Chabot, 2014; Fausset et al., 2011; Szanton et al., 2011). Because low SES is linked to increase in disability and health problems, low-income homeowners are less able to meet the demands of their environment and participate in activities required to maintain the home (O’Brien et al., 2010). Homeowners that are low-income, single, female, and African American have the most difficulty maintaining their home (Golant, 2008). In addition, the cost of hiring out home maintenance services is prohibitive to many older adults living on a fixed income (Golant, 2008). Lack of funds and more limited social supports hinder the installation of basic home safety modifications such as grab bars and anti-scald shower heads (Pynoos & Nishita, 2003; Shields et al., 2013). Finally, lack of access to fall prevention programs and healthcare in general reduces knowledge and awareness of safety prevention strategies (Calhoun et al., 2011; O’Brien et al., 2010; Shields et al., 2013).

**Funding and resources for home modifications.** There are some limited resources and funding for home modifications available to low-income older adults living in the community. Federal Medicaid funding can be accessed locally through Home and Community-Based Services (HCBS). State programs distribute individual waivers through HCBS which can then be used specifically for home modifications. However,
these resources are limited and often have long waiting lists associated with them (Pynoos & Nishita, 2003; Yamashita, Jeon, Bailar, & Mehdizadeh, 2011). In addition to waiting lists, HCBS programs have strict criteria and provide services only for individuals that meet the standard of needing “nursing home level of care” (Yamashita et al., 2011). Other options to finance home modifications in the case of limited income include second mortgages and low-interest loans available through federal and state funds such as the Minnesota Housing Finance Agency (MHFA) and the Federal Housing Administration (Pynoos & Nishita, 2003). However, for older adults living on limited and fixed incomes, a loan payment is often beyond their means, and would significantly impact their ability to meet their daily financial needs (O’Brien et al., 2010). Lastly, the U.S. Department of Veterans Affairs (VA) does have several grant programs specifically for disabled veterans to modify their homes for accessibility. To meet qualifications for assistance, however, veterans must have been significantly disabled in combat in specific ways. These resources are also extremely limited (U.S. Department of VA, 2016).

Although home safety evaluation and modification has been found to be effective in preventing costly nursing home placement and hospitalizations, occupational therapists are not typically reimbursed for those services in the US. As previously discussed, simple home modifications can result in greater safety and participation in aging and are most effective when OTs are involved (Chase et al., 2012). Because no public funding or insurance sources currently exist for reimbursement of OT services in home modification or safety evaluation, low-income homeowners that cannot pay out of pocket for these services are disproportionately affected. This contributes to increased hospitalizations and nursing home relocation at a huge cost to society (Pynoos & Nishita, 2003).
For older adults that are able to access home modification services by paying out of pocket, through HCBS, or other community resource funding, a collaboration between contractors and other qualified professionals such as OTs can be a daunting task (Pynoos & Nishita, 2003; Szanton et al., 2014). Often contractors focus only on physical features of the home, and do not consider the unique activity patterns or needs of the individual. This can result in poorly designed and ineffective modifications for the homeowner (Szanton et al., 2014). Furthermore, very few building contractors employ or consult with OTs that have specialized knowledge of person and environmental factors necessary for recommending effective home modifications (AOTA, 2014; Oakes & Leslie, 2012).

As a result of this gap in services and resources, several non-profit agencies have started to collaborate with OTs to meet the needs of low income aging and disabled homeowners, including Rebuilding Together (Oakes & Leslie, 2012). Rebuilding Together Twin Cities (RTTC) is an affiliate of the national organization that provides critical home repairs and accessibility modifications for low-income older and disabled homeowners free of cost (RTTC, 2016). RTTC has partnered with the OT department at St. Catherine’s University to develop outcome evaluations of the impact of home modification on daily activity patterns of the homeowners they work with. In addition, the evaluations provided by the OT program provide client-centered safety recommendations that enhance and validate the work that RTTC is doing.
Methods

Research Design

This outcome evaluation study utilized a mixed methods design to understand the link between home accessibility and safety modifications and the daily activity participation of older, low-income, community-dwelling adults. Because of the complex nature of the setting, community partners, and demographics of our sample, a mixed methods approach was chosen to gain a holistic and comprehensive view of the problem and results. Creswell and Clark (2007) define mixed methods research as “collecting, analyzing, and mixing both quantitative and qualitative data in a single study or series of studies. The central premise is that the use of quantitative and qualitative approaches in combination provides a better understanding of research problems than either approach alone” (p.5).

The study was guided by the following primary research question: What is the importance of home modifications for occupational participation and safety for low-income senior homeowners? To help us answer this question, we divided it into three sub-research questions. We utilized 4 quantitative tools, as well as qualitative interviews, to collect data to answer each sub-research question. Table 1 lists the 3 sub-research questions alongside the corresponding quantitative measurement tool(s).
Table 1

*Sub-Research Questions and Corresponding Quantitative Tools*

<table>
<thead>
<tr>
<th>Sub-Research Question</th>
<th>Corresponding Assessment Tool(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. How do daily life routines and activity participation change for the homeowner as a result of the modifications?</td>
<td>• In-Home Occupational Performance Measure (I-HOPE)</td>
</tr>
<tr>
<td></td>
<td>• Life Space Assessment (LSA)</td>
</tr>
<tr>
<td>2. What is the impact on the homeowner’s awareness and feelings of safety?</td>
<td>• Short Falls Efficacy Scale (S-FES)</td>
</tr>
<tr>
<td>3. What is the homeowners’ experience of home modification?</td>
<td>• Live Well at Home Rapid Screen (LWAH-RS)</td>
</tr>
</tbody>
</table>

In this simple pre-post design, homeowners received visits from graduate occupational therapy students and research assistants before the modifications to assess homeowner’s needs and collect baseline data. Post visits utilizing the same tools were completed at least one month after home and safety modifications were completed by RTTC.

**Tools**

As described in Table 1, we utilized four standardized evaluation assessments and screenings to collect quantitative data on the impact of the modifications: 1) the In-Home Occupational Performance Measure (I-HOPE), 2) the Short Falls Efficacy Scale (S-FES), 3) the Life Space Assessment (LSA), and 4) the Live Well at Home Rapid Screen (LWAH-RS). Copies of most of the scales can be seen in Appendix A.
**In-Home Occupational Performance Evaluation (I-HOPE).** The most comprehensive tool utilized was the I-HOPE, which assesses the degree to which a person’s performance and satisfaction with their level of participation in activities within the home are impacted by environmental barriers (Stark et al., 2011). The I-HOPE is informed by the PEO model of human occupation and is a person-centered approach to measuring an individual’s perceived satisfaction and performance of activities that are the most important to them. Additionally, the authors of the I-HOPE specifically developed this assessment to evaluate activities that are inherently necessary for aging in place (Stark, Somerville, & Morris, 2010). The evaluation is completed within the framework of the “person-environment fit”, observing how barriers and affordances within the environment affect the performance of the individual’s activities before and after home modifications (I-HOPE, 2011; Stark et al., 2011). The I-HOPE is a valid and reliable tool with an internal consistency subscale range of .77-.85 and an intra-class correlation coefficient (ICC) range of .99 to 1.0. This indicates strong agreement between trained raters and reliable scoring (Stark et al., 2010).

The I-HOPE is divided into three different steps and takes approximately 45 to 60 minutes to complete from start to finish. The first step is a card sort in which the homeowner places cards with pictures of 44 daily activities into one of 5 categories: “Do not do and do not want to do”, “Do now with no problem”, “Do now with difficulty”, “Do now but worried about my ability in the future”, and “Do not do but wish to do”. This categorization identifies the activities that the homeowner finds problematic or difficult. In the second step, the homeowner prioritizes the cards with activities that are most important to them, and then rates their level of Performance and Satisfaction of each
activity on a 5 point Likert scale. The third and final step requires the rater to observe the individual performing the selected activities in order to identify environmental barriers that impede or interfere with safe and independent performance (I-HOPE, 2011).

The scores provided by the I-HOPE are particularly valuable for pre and post comparison after modification completion, providing a meaningful baseline to compare gains or changes in scores and corresponding functional performance and satisfaction. The I-HOPE yields 3 scoring categories: 1) Activity Score, which measures the number of activities as well as the perceived difficulty level through a weighted calculation; 2) Performance Score (1-5) and Satisfaction Score (1-5), which are computed separately and reflect overall self-perception of how one is able to perform important activities, and the level of satisfaction with that performance; and 3) Total Barrier Severity Score which measures the number of barriers that impede performance as well as how severely the barriers affect independent performance. Each individual score can be analyzed and compared in pre and post modification evaluations.

Short Falls Efficacy Scale (S-FES). Research has established a strong link between the fear of falling and reduced activity levels (Kempen, et al., 2008). The S-FES is a simple but effective screen that evaluates an individual’s concern or fear of falling during a variety of basic, functional daily activities. The screen takes approximately 5 to 10 minutes to complete, and consists of seven questions asking participants to rate their fear of falling while doing particular activities on a 4-point Likert scale. Total scores range from 7 to 28, and the criterion-based interpretation classifies those totals as indicating Low Concern (7-8), Moderate Concern (9-13) or High Concern (14-28) about fear of falling. The short version of the FES that was utilized in this study has excellent
validity and reliability when compared with the slightly longer FES. The correlation between the long and short versions of the FES is 0.97. The internal reliability for the S-FES was a Cronbach’s alpha score of 0.92 and an inter-class coefficient (ICC) of 0.83 (Kempen, et al., 2008).

**Life Space Assessment (LSA).** The LSA is a short evaluation that measures the mobility patterns and life space use of community-dwelling older adults over the span of the previous month (Baker, Bodner, & Allman, 2003). The LSA takes approximately ten minutes to complete. It measures mobility within 5 different space levels of proximity: rooms in the home beside the bedroom (level 1), outside the home but within the yard, porch, etc. (level 2), within the neighborhood but outside of the yard or apartment building (level 3), outside of the neighborhood but within the town (level 4), or outside of the town (level 5). The tool utilizes a multiplication formula of Level (proximity category within home or community) x Frequency (number of times traveled) x Independence (equipment or personal assistance used) for a total score in each category. The LSA’s composite scores range from 0 to 120. Higher scores indicate utilization of greater space and more movement inside and outside of the home during daily routines. The LSA has been found valid and reliable, with an ICC range of 0.86 to 0.96 (Baker et al., 2003).

**Live Well at Home Rapid Screen (LWAH-RS).** The LWAH-RS is a short, quick screen developed by the State of Minnesota’s Administration on Aging to help identify community-dwelling adults that are at risk of long-term care placement. The tool is intended to help connect at-risk adults with community services to help them remain independent, age in place, and avoid long-term care placement. The LWAH-RS takes 5 minutes to complete and evaluates 7 evidence-based high risk indicators of long-term
care utilization, such as recent falls or injuries in the home and living alone. Total scores range from 1 to 7, and place the individual in one of four risk categories for institutional long term care: *No Risk* (0), *Low Risk* (1), *Moderate Risk* (2) or *High Risk* (3-7). The LWAH-RS is a new tool currently under research, and was a requirement from the funder of this project, MN Department of Human Services. An initial pilot study found significant correlations between LWAH-RS scores and utilizations of services, but psychometric properties of the tool are still under research (Gaugler, Boldischar, Vujovich, & Yahnke, 2011)

**Qualitative tools.** To gather qualitative data, we used semi-structured interviews. For the pre interview, we asked questions about the meaning of home, safety within the home, and social support systems and community resources. In the post interviews, we asked questions about changes in daily life and activities, and homeowner experience of the home modification and assessment process. Forms with both pre and post interview questions can be seen in Appendix B.

**Setting and Context**

This specific project developed out of a long-term relationship between Rebuilding Together Twin Cities (RTTC) and St. Catherine’s University MAOT Graduate Program in the Occupational Therapy Department. Through this relationship, all graduate OT students conduct home safety assessments in the context of a class assignment. RTTC has two different programs that address accessibility for low-income homeowners: Safe at Home and Access for Always (RTTC, 2016). The Safe at Home program provides minor safety and fall prevention modifications such as grab bars,
railings, and fire extinguishers. For larger, more significant structural changes, the Access for Always program provides contractor-delivered renovations like door widening and bathroom remodel. The Access for Always program has a variety of funding streams, and is often dependent on matching grant funds.

Applicants are referred to RTTC from a variety of sources, such as word of mouth, social workers, and human service and government agencies. To qualify for home repair and modifications through RTTC, applicants must meet the following criteria: a) own the home of residence and be up to date on mortgage and tax payments, and have homeowners insurance, b) must reside within the 7-county metro area of the Twin Cities, c) have a household income at or below 50% of the area median income based on household size, d) have at least one primary resident over age 55, or an individual with a disability, or an active or retired member of the armed services, or a child under the age of 18 living in the home.

The present research was initiated when RTTC and St. Kate’s obtained a grant from DHS for an outcome evaluation study which included support for the development and field testing of tools to help assess the benefit of major home modifications implemented by RTTC. The study was then extended through additional internal support from the Assistant Mentorship Program (AMP) program at St. Kate’s to include the outcome of a greater range of home safety modifications completed by RTTC following the OT students’ recommendations. All home visits and data collection were conducted in the naturalistic community setting of the homes of low-income, older adults that had previously applied to RTTC to receive home repairs and modifications at no cost.
**Population.** The sample was drawn from a population of community-dwelling, low income adults over the age of 55 applying to RTTC for home modification services. The candidates for modification were pre-selected by RTTC from their pool of qualified applicants. All clients meeting RTTC qualifications and receiving a home safety evaluation by OT students received at least some minor safety modifications through the Safe at Home program. Some homeowners qualified for major accessibility modifications, such as bathroom remodels or ramps, through the Access for Always program. RTTC’s Homeowner selection for major modifications was based on likelihood of remaining in the home, level of risk and safety, scope of work, and constraints of matching grant funding.

**Procedure.** All participants were initially contacted by RTTC and asked if they would be willing to participate in the outcome evaluation study to determine if the RTTC home modifications made a difference. They were asked for informed consent agreeing to a post-modification visit with post-visit interview and assessments, and to have aggregate results shared with a wider audience. They were told that participation was voluntary and that they would receive the pre-modification visits and obtain the recommended modifications, whether or not they agreed to have the additional post modification visits. All homeowners that qualified for modifications agreed to participate in the study. The information and consent form that each participant signed can be found in Appendix C. Appointments were scheduled by RTTC staff for pre modification visits. The S-FES, LSA, and LWAH-RS were collected either by RTTC staff over the telephone, or at the time of visit.
Graduate research assistants visited the home prior to the modification to collect baseline data either after, or at the same time as the graduate OT student’s assessment of the homeowner’s needs. Following the signed informed consent process, they completed a 2-hour long home visit to assess safety and accessibility issues, conduct a short interview and administer the I-HOPE. Based on recommendations by OT graduate students, RTTC completed major home accessibility and/or minor safety modifications within a time period ranging from 3 weeks to 3 months post assessment. The type and extent of modification provided depended in part on homeowners’ needs as well as on constraints prescribed by the funders. Post-modification home visits were then conducted by the graduate research assistants at least 1 month after modifications were completed by RTTC. The post visits consisted of the re-administration of the same tools as were used at baseline, except for changes in the qualitative interview questions. Towards the end of the study, RTTC integrated almost all the tools into their standard protocol, and conducted assessments over the phone for both pre- and post-visits scores for the S-FES, LSA, and LWAH-RS. Only the I-HOPE continued to be conducted in person.

Data Analysis

Quantitative. A total of 15 participants had homes modified for safety and had completed the post visit assessments at the time of this study. Of the 15 homeowners, 6 received major accessibility modifications such as ramps and walk-in showers, and 9 received minor safety modifications like grab bars. Pre- and post-scores from the LWAH-RS, S-FES, LSA, and I-HOPE tools were computed by graduate research assistants and then recorded in a secure, password protected excel spreadsheet. The
compiled data was then analyzed in SPSS for statistical significance and trends. We ran descriptive statistics as well as box plots to identify any potential outliers that might skew the data. No significant outliers were present. We then ran a matched pair one-tailed t-test on our pre- and post-scores in SPSS to examine the directional hypothesis of decreased risk and increased participation following modification.

**Qualitative.** The information gathered from homeowner interviews during pre- and post-visits constituted the qualitative data. For the pre-visits, the research assistants hand-recorded participants’ responses, while post-modification interviews were audio-recorded and transcribed. To analyze the qualitative interview data, we employed a Framework Analysis approach. This approach is often utilized when pre-established (or “a priori”) concepts and expectations drive the research process (Lacey & Luff, 2001). For this study, these concepts were derived from existing literature and research on the impact of home modification for participation and safety, as well as from the interests of the project funder, MDHS, and community partner, RTTC.

Lacey and Luff (2001) identify five key stages to Framework Analysis. The first stage, *Familiarization*, is the actual process of transcription and reading of the recorded data in order for the researchers to become better acquainted with the data. In the second stage, *Identifying a Thematic Framework*, a set of codes or indexes is developed from the existing *a priori* issues as well as from emerging concepts identified in the familiarization stage. The student researcher and faculty advisor independently identified emerging concepts related to safety and participation in residential homes for older adults and developed separate lists of possible codes. Those lists were then compared and refined through a collaborative process. The developed list of codes (indexes) can be found in
Appendix D. Within the third stage, *Indexing (or Coding)*, the coding sheet (thematic framework) was used by the student researcher to conduct line by line coding of the data for categorization and organization. The fourth stage, *Charting*, was the process of the student researcher organizing the coded data across participants. In the fifth and final stage, *Mapping and Interpretation*, student and faculty researchers analyzed the compiled thematic charts to identify emerging patterns concepts and relationships. Subthemes were conceptualized and organized into overarching themes according to the main research questions and in relation to the quantitative tools to allow integration of quantitative and qualitative results in the mixed-method analysis. The qualitative interview data was utilized to guide and help interpret quantitative results, as well as provide a deeper understanding of the full impact of the modifications for homeowners that might not otherwise have been captured.
Results

To reflect the mixed-methods design of this study, I will be presenting the quantitative data alongside corresponding qualitative themes that address each of the three sub-research questions, as previously presented in Table 1. This structure will allow for deeper interpretation and meaning of both data sets. Prior to that combined section, an initial summary of the quantitative data results can viewed in Table 2 and a summary of the eight qualitative themes and subthemes along with the tool they support can be found in Table 3.

The results will be divided into 3 separate sections based on the 3 sub-research questions. I will first present and summarize the findings of each quantitative tool related to each research question, and then follow with corresponding qualitative themes and supporting quotes.

Table 2
Quantitative Results

<table>
<thead>
<tr>
<th>Tool</th>
<th>N</th>
<th>Before Modification M (SD)</th>
<th>After Modification M (SD)</th>
<th>t (df) matched pairs</th>
<th>p (one tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I-HOPE: Performance</td>
<td>15</td>
<td>2.85 (.58)</td>
<td>3.03 (.44)</td>
<td>-1.31 (14)</td>
<td>.11</td>
</tr>
<tr>
<td>I-HOPE: Satisfaction</td>
<td>15</td>
<td>2.32 (.80)</td>
<td>2.84 (.65)</td>
<td>-2.41 (14)</td>
<td>.02*</td>
</tr>
<tr>
<td>LSA</td>
<td>15</td>
<td>47.73 (22.70)</td>
<td>44.73 (19.69)</td>
<td>1.03 (14)</td>
<td>.16</td>
</tr>
<tr>
<td>LWAH</td>
<td>9</td>
<td>2.67 (2.45)</td>
<td>2.00 (1.23)</td>
<td>1.11 (8)</td>
<td>.15</td>
</tr>
<tr>
<td>FES</td>
<td>15</td>
<td>15.00 (5.40)</td>
<td>13.87 (4.10)</td>
<td>1.04 (14)</td>
<td>.16</td>
</tr>
</tbody>
</table>

*Note: * = Significant p < .05
### Table 3

*Summary of Themes and Corresponding Quantitative Tools*

<table>
<thead>
<tr>
<th>1. Increased Occupational Participation and Performance (I-HOPE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Modifications create changes in occupational routines, frequency, and duration</td>
</tr>
<tr>
<td>b. Improved performance result in feelings of satisfaction</td>
</tr>
<tr>
<td>c. Recovered and improved occupations become meaningful and enjoyable</td>
</tr>
<tr>
<td>2. Ease of Accessing the Home (I-HOPE)</td>
</tr>
<tr>
<td>a. General ease of daily life within the home</td>
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<td>4. Increased Independence (LSA)</td>
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<tr>
<td>a. Reduced dependence and lightened physical and emotional burdens on caregiver</td>
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<td>b. Increased participation in mobility and self-care</td>
</tr>
<tr>
<td>c. Changes in independence improve mood and sense of self-efficacy</td>
</tr>
<tr>
<td>5. Increased Awareness and Feelings of Safety and Security (S-FES)</td>
</tr>
<tr>
<td>a. Modifications eased worry about falls and injuries</td>
</tr>
<tr>
<td>b. New sense of security and safety while performing occupations</td>
</tr>
<tr>
<td>c. Assessment and modification process resulted in awareness of safety risks</td>
</tr>
<tr>
<td>6. Normal Aging (LWAH-RS)</td>
</tr>
<tr>
<td>a. Awareness of the effects of aging process</td>
</tr>
<tr>
<td>b. Sense of loss and acceptance as part of aging</td>
</tr>
<tr>
<td>c. Age-related changes still require some ongoing support, even with modifications</td>
</tr>
<tr>
<td>7. Aging in Place (LWAH-RS)</td>
</tr>
<tr>
<td>a. Strong sense of identity and connection from home and community</td>
</tr>
<tr>
<td>b. Hope to remain in home and avoid long-term care placement</td>
</tr>
<tr>
<td>8. Overwhelming Sense of Gratitude and Thankfulness</td>
</tr>
<tr>
<td>a. Gratitude for modifications related to sense of ease, comfort and security</td>
</tr>
<tr>
<td>b. Grateful for kindness from RTTC, volunteers, and research staff</td>
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<tr>
<td>c. Even small changes make a difference and are appreciated</td>
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### Sub-Research Question 1

To answer the first research question, namely how do daily life routines and activity participation change for the homeowners as a result of the modifications, I will present the findings of the I-HOPE followed by the corresponding qualitative themes.
HOME MODIFICATION FOR OCCUPATIONAL PARTICIPATION

(Increased occupational participation and performance) and 2 (Ease of accessing the home) as presented in Table 2. I will then present the findings from the LSA, followed by the corresponding qualitative themes 3 (Greater access of community) and 4 (Increased independence) as presented Table 2.

**Quantitative tool: I-HOPE – Performance and Satisfaction.** To answer the research question of how modifications impact occupational performance, I-HOPE pre and post scores for performance and satisfaction were compared to determine if there were improvements in homeowner perception of engagement in meaningful, daily activities. In other words, when the physical barriers of the home environment were addressed through home modifications, did the homeowner experience a significant change in their functional performance or their satisfaction with their ability to perform meaningful activities? As seen in Table 2, the mean scores for Performance scores did support our directional hypothesis by increasing from an average score of 2.85 to 3.03 out of a total possible of 5, although the $p$ value of .11 did not reach significance. However, our findings for Satisfaction scores did reach a significant $p$ value of .02, with mean scores increasing from 2.32 to 2.84. Several overarching themes appeared in the qualitative research that supported the findings of the I-HOPE: 1) *Increased occupational participation and performance*, and 2) *Ease of accessing the home.*

**Qualitative theme 1: Increased occupational participation and performance.** Homeowners regularly reported that the modifications did result in an increase in overall participation, performance, and satisfaction. Subthemes from this overarching theme were a) *Modifications create changes in occupational routines, frequency, and duration,*
b) *Improved performance results in feelings of satisfaction,* and c) *Recovered and improved occupations become more meaningful and enjoyable.*

**Modifications create changes in occupational routines, frequency, and duration.** In particular, homeowners reported changes in the way they performed important activities. Several homeowners stated that the increase in ease of performance allowed them to complete activities that were once challenging and time-consuming with increased frequency. For instance, when asked if she was showering more after getting a walk-in shower, Elaine stated:

Mmmm, yeah! You know I am! [indicating she just realized this and was surprised by it.] You’re right. I didn’t even think of that. Because I was going two and three days before and now I’m doing every day because I feel so much better when I shower.

Others reported changes in efficiency, and that the decrease in demand allowed them not only to complete activities more often, but much more quickly and with very little effort.

Charlotte: And I very seldom went up the back steps because it was hard to and I had nothing to hold on to. And now I can just kind of run up the steps. [laughs]...now I can just go right up and it don’t take no time at all.

Some interviews revealed an increase in the amount of time spent doing relaxing occupations, such as showering.

Martin: I’m just able to stay in the shower longer cause I don’t have to stand up.
Interviewer: So you can have more relaxing showers. [laughs]
Martin: Yeah.

Elaine: And then as far as getting in and out of the shower I mean I can sit there and shower. Now I don't have to worry about standing up for a long time. You know I can stand up and I do standup but it's so much more comfortable sitting there taking a shower. Just taking my time and letting the water run over me.

Some homeowners also reported changes in their habits and routines around particular activities, such as leaving the home or getting groceries inside the house.
Bernice: Before, we would have to carry my wheelchair and go down the stairs. Now we just leave it on the porch…I just hop on the wheelchair and buzz down the ramp.

Jane: It helps with groceries especially. Getting them in the house. I can just put them on my walker and wheel them up the ramp.

The interview transcriptions not only supported the quantitative findings of the I-HOPE, but also highlight the nuanced, unique, and profound ways that simple modifications facilitated and enhanced occupations for these individuals. The occupational changes also introduced new, positive emotions about their lives.

**Improved performance results in feelings of satisfaction.** The gains that participants reported in their functional performance resulted in feelings of satisfaction, fulfillment, and pride.

Joyce: I feel better now because of the ramp because I can get around…I couldn’t do anything [before modifications]. Now I can do much more.

Martin: I just think it’s great that I can get in and out and up and down the front stairs without the pain. Cause believe me, going down stairs if you have bad knees is not a pretty picture [laughs].

Elaine: And I can now [use the back door]. I can go out if I need to water my yard and without having to go all the way around the house to get to the water…I can just walk out the little steps there…But yeah. That matters to me.

The quotes listed above show a simple, but profound shift of contentment with their lives, as well as the freedom and empowerment that humans feel when we accomplish something. This depth of emotion might have been reflected in the significance level of the Satisfaction scores of the I-HOPE. Deepening this theme even further, participants also described new and different activities and occupations.

**Recovered and improved occupations become meaningful and enjoyable.** Some homeowners discussed recovering lost occupations that were once important and
meaningful, but that they had given up because of barriers from the environment and losses in physical function. With the improvements in facilitation through removal of physical barriers, they were able to regain those lost occupations and find new meaning in them. For instance, Joyce stated:

Joyce: I never got the chance to use my nice backyard. But now I plant flowers. I ain’t played in the dirt since I made mud pies as a kid [referring to being able to garden].

In addition to recovering lost occupations, some homeowners reported finding new meaning and joy in existing occupations.

Joyce: I can play with my niece outside and watch her on the swing set.

Bernice: It’s a pleasure now to go out and get the paper every morning. I don’t have to worry about it at all.

Sandra: [in reference to caring for her dog] …when the light comes on, I know she’s by the door [laughs]…that extra bright light from the solar light lets me see her.

The research transcripts showed an exuberance and delight in occupations that homeowners had accepted as lost, as well as surprise at the ease and pleasure in which they are now able to enjoy the daily tasks of their lives. This satisfaction was often facilitated by the basic ability to use and get around one’s home with ease and simplicity.

**Qualitative theme 2: Ease of accessing the home.** Another strong theme supporting the I-HOPE data for occupational satisfaction was the ease of which individuals were now able to access different parts of their homes. In other words, in response to the research question, the removal of environmental barriers improved occupational participation. Subthemes that emerged were a) General ease of daily life within the home, and b) Some barriers still exist chronic pain, weather, lack of services for low-income, and resistance to change.
**General ease of daily life within the home.** Participants used the word easier frequently throughout the research interviews to describe daily activities and their life in general after modifications.

Dave: Mmmm, made life easier. It just made everything easier. And the grab bars in the bathtub are just so much easier to get in and because I’ve got a bad leg, and I don’t have the flexibility I should have. So it’s always a problem to lift your leg and you need something to grab onto.

Sandra: Going up and down the stairs is easier especially when I’m not feeling real balanced, or when my knees or hips are bothering me.

Elaine: Well when I came home with my groceries yesterday it was so much easier to get in and out of that door without having to step around the side, you know.

Zoua (son interpreting): Yes, it’s been helpful. She say that the handrail out here and then the door that go to the laundry room [referring to new handle lever]. And also the outdoor sensor light has been helpful for her.

These quotes illustrate the power of ease to facilitate participation. When it’s easier to get in and out of the home or take a shower, one’s satisfaction with life is also improved. To put it simply, life is just easier now. Still, some barriers cannot be addressed by home modifications alone.

**Some barriers still exist: chronic pain, weather, lack of services for low-income, and resistance to change.** Several participants highlighted a number of barriers that still exist for them, despite the improvements the home modifications produced. Some still had chronic pain that affected movement, mobility, and motor performance.

Victor: It’s still hard to get in and out of the bathtub. My knees hurt. I need some kind of derrick or hoister. Something of that sort.

Tonya: You know even if like I get in the tub and I’m havin’ real bad pain. I get the pains down the butt bone sometimes. Down my thigh.

It might be an important note that the individuals that spoke about pain as a remaining barrier, referenced it only when discussing getting in and out of a full bathtub. They also
had only received minor safety modifications through the RTTC Safe at Home program such as grab bars, and not any major modifications such as a walk-in shower or ramp.

Another uncontrollable force that can impede performance, particularly in northern climates like Minnesota, is the weather. For example, Victor stated:

Victor: Oh mobility is somewhat of an issue. I use a cane. With the increase snow I’m just paranoid you know about stuff out there.

Others highlighted the lack of home health or home modification services they could afford or had difficulty accessing.

Sandra: He [referring to her husband.] mentioned something about me, and one of the ladies there gave him some forms to fill out…So we were turned down by other ones [social service agencies.] because, evidently we make too much money.

Elaine: I had an estimate to do the walk-in shower. It was just so--$5,000!!

Victor: Well it shows the no bathing. Cleaning is uh. I need some light housekeeping and some bathing.

Interviewer: Okay kind of highlights that you need some help with bathing and housekeeping?

Victor: Yeah.

Although RTTC was able to complete some home modifications for all the participants, some were still in need of more major modifications and supportive services. Finally, some homeowners also simply found it difficult to incorporate new routines into their lives, thus limiting the benefit of the modifications.

Olga: I still go out the front [even though ramp was installed at back entrance.]. It’s closer and easier.

Elaine: And I can bring my groceries home. I just keep forgetting to take the key to the back door [laughs]. It’ll be a lot simpler getting my groceries in the house. Cause they’re right there by my car.

The illustrated quotes identify the multi-faceted aspects of aging and how societal, environmental, and personal factors all intertwine to either facilitate or impede
occupational performance for older adults. Cognitive declines can affect decision making and one’s basic ability remember to use new modifications. Home modifications can significantly improve daily life and address some of these barriers, but cannot meet all the needs of the individual.

**Quantitative tool: LSA – daily routines and use of space.** The LSA provided another way to address the research question of how home modifications impacted occupational performance by measuring homeowner mobility patterns and levels of home and community space use. Because the LSA is more heavily focused on community mobility than in-home mobility, significant changes and gains are expected primarily when home modifications focus external access of the home with additions like ramps, and egress hand railings. The mean scores for the LSA were 47.73 (pre) and 44.73 (post). Scores for the LSA can range from 0 to 120. Thus, the average mobility of homeowners of this study utilized 37-40% of possible home and community space levels. Surprisingly, the LSA mean scores did not increase in a positive direction to indicate an increase in the amount of space used, but actually decreased by 3 points. Additionally, the standard deviations of 22.70 (pre) and 19.69 (post) indicate a very large spread of scores. Through the qualitative interviews, it became apparent from participants’ comments, that the time of year and icy conditions of Minnesota winters might be limiting community mobility, suggesting that the season at which the testing was done may have impacted the variability of the LSA scores. The qualitative themes that emerged to inform and further interpret LSA results in response to the research question of occupational participation were: 3) Greater access of community, and 4) Increased independence.
Qualitative theme 3: Greater access of community. The LSA measures the amount of space individuals use within the home as well as throughout their community. As might be expected, only individuals that had ramps or other significant modifications to home entryways articulated gains in outdoor occupations. A particularly rich theme that emerged from the research interviews was about an increase of participation in occupations outside the home. Subthemes included: a) *Increased connection and interaction with neighbors and community*, b) *Outdoor activities and occupations improved and increased*, and c) *Community access made easier particularly in inclement weather*.

*Increased connection and interaction with neighbors and community.* A number of homeowners spoke about a heightened sense of connection to their community and neighbors because they were able to get outside and interact more frequently, or even simply hear visitors at their door.

Olga (ramp): I go out to church and coffee.

Joyce (ramp): For our block party, I got to sit on the front steps and grill hot dogs. I can be out talking with my neighbors instead of looking out the windows. Now I like being here. I used to think these people [neighbors] were stuck-up. Now I know I was wrong. I see them more and I talk to them now.

Henry (doorbell): Yes, well I like the doorbell. I like the fact that I have a doorbell. When people come to the door I can hear them [laughs].

These quotes illustrate how socialization has increased for some homeowners because they have easier access to outdoor spaces, or because community members are able to reach them. Some quotes hint at a shift from occupational isolation and deprivation to meaningful engagement and connection. Another notable subtheme was the number of references to simply being able get outside more.
Outdoor activities and occupations improve and increase. Many of the participants talked about spending more time outdoors, using their lawns and patios, and increasing engagement in outdoor occupations.

Joyce (ramp): Now I go out just to walk down my ramp and look at my yard. I’m doing more. I can use my walker with a seat and go to the corner alone now.

Bernice (ramp): I can just sit on the patio now and watch the squirrels.

Jane (ramp): I’m watering my plants more now.

Interviewer: So you’re spending more time outside then?

Martin (ramp): Yes, yes.

The above responses depict a deeper connection with nature as a result of the ability to simply be and sit outside, watching life happening around them. Others emphasized a more active engagement in nature through being able to easily access their gardens and plants. To further this theme, participants also found going out in the community easier in general.

Community access made easier particularly in inclement weather. Several homeowners discussed the increased ease of accessing their community, even in poor weather conditions.

Sandra: Oh, just to go up and down the steps, it’s easier [going in and out to the car/backyard/garage.] Especially when it was that rainy, slushy, icy. That made it easier. [referring to railing]. I wasn’t so nervous about going out.

Jean: Oh, definitely bringing up the groceries is easier. Like if it’s raining or something and the deck is slippery. [because of railing and anti-slip treads.]

Bernice: We can pull right in to the garage especially with bad weather. [because new ramp went right up to garage door.]

These statements suggest that although participants may still have limitations in how often they went out in inclement weather, the modifications made them feel safer when
they did so. This theme provided further insight into the LSA data results, in which out of home activities during the winter months went down even with modifications. In addition to increasing community access and occupations, homeowners also reported changes in levels of independence.

**Qualitative theme 4: Increased independence.** Interviewees described a variety of ways in which the modifications to their homes made them more independent in their occupations. Both the LSA and I-HOPE incorporate levels of independence/dependence within their scoring system, so this theme helps interpret both sets of scores. Subthemes that emerged under increased independence were a) *Reduced dependence and lightened physical and emotional burdens on caregiver*, b) *Increased participation in mobility and self-care*, and c) *Changes in independence improve mood and sense of self-efficacy*.

**Reduced dependence and lightened physical and emotional burdens on caregiver.** Although only several homeowners had consistent caregivers either living with them or providing care regularly, those that did reported their caregivers experienced a lightening in their responsibilities.

Joyce: Yes, my husband isn't as tired now that I can help out at home more.

Bernice: I just hop in the wheelchair and buzz down the ramp. There's no heavy lifting for Scott. [her husband.]

Tonya: It's hard to get up outta that tub. You know what I mean? At least I can be more supported. I don't have to be calling one of the kids in the bathroom. So. No the grab bars was great.

The narrative descriptions point to increased independence, which simultaneously relieved the burden on family members providing care. This relief was an important factor for the interviewees, whom often indicated surprise of this effect in their daily life.
Homeowners also discussed being able to get around and care for themselves more independently.

**Increased participation in mobility and self-care.** Participants stressed independent mobility and self-cares, such as bathing, as particularly important in being able to do without assistance.

Sandra: Well, I guess I can do more things and more mobile. On my bad days especially. I’m more mobile on my bad days. Because they’re there. [referring to grab bars and hand rails.] Taking a shower, you know. There are times when I wouldn’t take a shower because I was feeling real tippy, and now I do it no problem.

Tonya: Yeah, I take a bath alone now, how ‘bout that? [laughs.]

Dave: Well movin’ around and like I say, getting’ in and out of the tub makes it a lot easier. Yeah.

Being able to complete simple tasks like getting from one room to another and getting in and out of the tub by oneself created greater independence overall. This improved independence seemed to affect self-esteem and sense of identity.

**Changes in independence improve mood and sense of self-efficacy.** Increases in independence had a direct effect on participant mood levels and feelings of self-efficacy, creating a sense of pride and joy in their improved occupational performance.

Joyce: It helped. Seeing what I couldn't do that I can do now -- Not as depressed as I was. I feel better because I did better.

Tonya: Yeah, I take a bath alone now. How ‘bout that? [laughs.]

Jean: It [referring to assessments] just kind of tells me that I feel like I’m doing a good enough job.

These statements were often collected in the participant’s response to their experience of the assessment process. The process of self-evaluation and description of their activity
patterns elicited smiles and laughter as they described how they did things better or more independently.

**Sub-Research Question 2**

To answer the second research question, namely what is the impact on the homeowner’s awareness and feelings of safety, I will present the findings of the S-FES followed by the corresponding qualitative theme 5 (Increased awareness and feelings of safety and security) as presented in Table 2.

**Quantitative: S-FES – safety and security.** The S-FES measures an individual’s fear of falling while completing common tasks of mobility and self-care. We utilized the tool to help answer the research question of how home modifications impact homeowner safety and awareness. Mean scores on the S-FES decreased from 15.00 to 13.87 out of a possible score range of 7 to 28. This change showed a decrease in concern of falling, but did not reach statistical significance. Although the post mean score stayed in the *High Concern* (14-28) range after rounding up from 13.87 to 14, it did come very close to decreasing to the *Moderate Concern* range (9-13). The primary qualitative theme that corresponded to the FES was: 5) *Increased awareness and feelings of safety and security.*

**Qualitative theme 5: Increased awareness and feelings of safety and security.**

Homeowners consistently reported feeling less worried and more secure when performing daily activities, as well as heightened awareness of safety in general.

Subthemes found for this theme are: a) *Modifications ease worry about falls and injuries,* b) *New sense of security and safety while performing occupations,* and c) *Assessment and modification process result in awareness of safety risks.*
Modifications ease worry about falls and injuries. Many participants made statements about being afraid to do certain activities within their home prior to the modifications, or avoiding them altogether due to fear of falling or injury. Their comments show a decrease in worry following the changes.

Charlotte: Well it just helped me get up and down the stairs better. Before I was kind of scared to go up and down the stairs but those helped a lot. Because you got something to hold onto. So it worked out real well.

Dave: So I'm surprised I haven't fallen on the floor before I got those grab bars.

The presence of safety modifications provided the supports necessary to overcome the fear they felt while performing occupations previously. As a result, they experienced new and positive emotions of wellbeing.

New sense of security and safety while performing occupations. Another common theme among homeowners was an increased sense of protection and security they felt from the new modifications. These feelings of safety often came from very minor changes such as grab bars and anti-slip treads on stairs.

Jean: Well it just made ya feel more secure for one thing. Which is very important. Like if it's raining or something and the deck is slippery I like kind of freak out. That I'll fall. Oh yeah and the tape along the edge too. Makes you feel a little more secure.

Greg: Yeah, yeah. The steps are not as slippery.


Feelings of safety and security while performing occupations seemed to also result in more overall satisfaction with daily activities. When individuals are less worried about falling, they are able to more fully engage in the task at hand. Furthermore, participating in the assessment and modification process in and of itself seemed to raise awareness of safety in and around the home.
Assessment and modification process result in awareness of safety risks. When asked about the assessment and modification process, many homeowners identified that the process of self-reflection made them more attuned to their own safety risks and the activities they struggled with.

Charlotte: I guess I would've never thought about some of the things that you asked. But now I think it makes you more aware. And you'll be more conscious of when you do it.

Martin: Umm there were just some things I hadn’t thought of as being unsafe.

These quotes highlight the benefits of the self-evaluation methods utilized in this study, and often found in other assessments used by occupational therapists. As echoed above, self-report has the potential to create unique insight and awareness that can lead to behavior change, furthering the safety effects of the home modifications. Alongside themes of safety, homeowners also discussed their overall experience of the home modification process.

Sub-Research Question 3

To answer the third research question, namely what is the homeowners’ experience of home modification, I will present the findings of the LWAH-RS followed by the corresponding qualitative themes 6 (Normal aging) and 7 (Aging in place) as seen in Table 2. I will then separately present qualitative theme 8 (Overwhelming sense of gratitude and thankfulness) from Table 2, which does not correspond to the LWAH-RS, but does address research question 3.

Quantitative tool: LWAH-RS – Aging in place and long term care risks. The LWAH-RS includes questions about falls in the home, social support, cognitive declines,
and level of assistance needed – all risk factors for institutionalization. The total score provides a risk indicator for likelihood of having to move from one’s home to a long-term care setting. In addressing the question of the homeowners’ experience of home modification, the LWAH-RS provides a quantifiable measurement of how home modifications reduce risk factors for homeowners. Due to changes in procedure in the course of the study, only 9 complete pre and post scores were collected for analysis, resulting in a particularly small sample for this specific tool. Despite the small sample size, the directional hypothesis was supported by a decrease in means scores from 2.67 (high risk) to 2.00 (moderate risk). This change shows a clinically significant decrease in risk for long-term care placement even though the statistical difference did not reach significance (p = .15). Two predominant themes came out of the qualitative results related to the research question: 6) Normal aging, and 7) Aging in place.

**Qualitative theme 6: Normal aging.** The LWAH-RS helps to measure the impact that home modifications have on aging adults as they attempt to age in place and possibly avoid long-term care. The qualitative data expanded this measurement by focusing on the lived experience of the home modification process. The interview data revealed a common theme of an attentiveness to the typical losses that come with age. Subthemes for this overall theme are: a) *Awareness of the effects of aging process*, b) *Sense of loss and acceptance as normal part of aging*, and c) *Age-related changes still require some ongoing support, even with modifications*.

**Awareness of the effects of aging process.** Participants expressed an awareness of the effects of age-related changes on their own physical function and health.

Zoua (son interpreting): She say that in the future she will need a lot of help because of her age.
Charlotte: Well I guess it just that you know it makes you think about what you can and what you can’t do. And um you know as you get older and you can’t do what you used to do.

These quotes illustrate that the older adult participants in our study were aware of the physical changes they were experiencing in their daily lives, which will likely progress with age. Along with this general awareness of the changes that come with age, interviewees articulated feelings of loss over age-related changes in function.

**Sense of loss and acceptance as normal part of aging.** Homeowners discussed the losses they felt in daily physical performance and abilities. These losses sometimes resulted in changes in meaningful occupations and were often accompanied by a sense of grief but also acceptance.

Martin: And of course I was able to get out of the tub only because of upper body strength. And I do miss the tub. 
Interviewer: Being able to soak in it?
Martin: Yes. I do miss that.

Elaine: I know it’s gotten more difficult to do certain things and I wish I could do more. And that kind of upsets me but I have to accept it. It’s part of life. I don’t like it. I’d like to be able walk a mile around Lake Harriet like I used to. I’d like to get out to church more and I don’t. I’d like to be with my family more and I’m not. I’d like to be able to paint my house and I can’t. [laughs] I painted these rooms myself. More than once.

Tonya: Okay if I take this off-- [demonstrating: points to her hair net.] When I can’t do my hair this is what I wear, these. I mean so it’s like okay grooming’s not that important to me anymore so this is more important to me. [figuratively speaking of another activity.]

The listed quotes are touched with deep emotions around the sorrow and even anger over the loss of identity and former abilities, but also imbue a resolute acceptance: as if to say, “This is aging – this is life.” Some homeowners discuss their adaptations to these losses, as illustrated in Tonya’s quote. She decided that doing her hair and grooming was not as
important to her as some other activities, so she chose to start wearing a bandana instead to conserve energy. However, some participants still needed further support as a result of their physical declines.

*Age-related changes still require some ongoing support, even with modifications.* Some interviewees highlighted the need for ongoing support due to age-related declines in health, despite modifications. For example, Victor states:

Victor: Oh it's okay. Mobility is you know going to be an issue. Housekeeping. I need something. Even like having that guy. [didn't finish this sentence.] I found these 42 gallon bags. [gestures towards the garbage bags still in the room he had tried to clean up some of the clutter with.]

Victor is attempting to illustrate that even the small task of picking up his living room has become difficult for him, an activity that could not be altered by modifications. In his case, he identified that his function had declined so much that he needed significant caregiver support to maintain his basic activities of daily living. Despite his substantial need for homecare, Victor as well as other participants, identified a strong desire to continue living in their homes.

**Qualitative theme 7: Aging in place.** For every homeowner that participated in our study, remaining in their home was of paramount importance. Many had spent decades in their home, raising their children and families. Some had nursed spouses and parents to their final hours in their homes, and wished the same end for themselves.

Several subthemes resulted from the data: a) *Strong sense of identity and connection from home and community,* b) *Hope to remain in home and avoid long-term care placement.*

*Strong sense of identity and connection from home and community.* Participants expressed strong ties to their neighborhoods and communities and a desire to remain living in and connected to them.
Elaine: I can stay here. And I feel it's a safe neighborhood. And I love my neighbors and my neighborhood. Very, very good memories. There's a lot of nice places around here too. The Great Harvest Bakery. My kids went there. My grandkids went there [laughter] and my grand-babies go there. They love that park.

Interviewer: How important is it for you to live in this home?
Tonya: Really important. Everybody should be able to live where they're comfortable, and I'm comfortable here. I can't imagine living anywhere else.

These quotes embody the sense of identity and meaning that participants drew from their homes and neighborhoods. They seemed to be grafted into each other, and the familiar faces, places, habits, and routines provided a comforting continuity and sense of security. Elaine’s quote illustrates the power of her home for multiple generations, keeping her connected to faraway family. To this end, all the participants stated they wanted to continue living in their homes.

*Hope to remain in home and avoid long-term care placement.* A common reply to the question of how important it was for participants to remain in their homes was that they want to live out the rest of their days in their home – they never wanted to leave. Their hope echoed a universal human longing to die peacefully surrounded by the people, places, and things they treasured most. Accompanying this desire to stay in their homes, was a fear or apprehension of having to move to a long-term care setting.

Jean: And uh at my age I really needed it. Because uh trying to protect myself from having to go to the hospital or having to go into an um uh old folk’s home you know.

Henry: I don't want to go anywhere.

These quotes show both the desire to remain in their homes, as well as the hope that they will be able to avoid institutionalization. In order to age in place successfully, one must be and feel safe within the home. Many homeowners reported feeling more safe in their
HOME MODIFICATION FOR OCCUPATIONAL PARTICIPATION  

home as a result of the modifications, suggesting that RTTC helped them realize their desire to continue aging and developing in their home and community. A final theme found under the research question of the experience of home modifications, was a deep sense of appreciation from homeowners.

Qualitative theme 8: Overwhelming sense of gratitude and thankfulness. The final qualitative theme related to the experience of the homeowner was not connected to any of our quantitative tools, but was a resounding expression from all homeowners interviewed. Subthemes within the larger theme of thankfulness were: a) Gratitude for modifications related to sense of ease, comfort and security, b) Even small changes make a difference and are appreciated and, c) Grateful for kindness from RTTC, volunteers, and research staff.

Gratitude for modifications related to sense of ease, comfort and security. A common sentiment of gratitude was for the modifications in and of themselves.

Jean: Oh I particularly love the hand rail going up right there. The little short one. It does help me.

Tonya: I love them. Like I told before if ya'll just put in the grab bar I'd of been happy but you put in the stair the rod - the rail. That was great.

Homeowners frequently told the interviewers how much they appreciated how the modifications helped them in their daily lives. As Tonya’s quote indicates, many articulated how grateful they were for all that RTTC did in their homes – a sense that they went above and beyond what the homeowners were expecting. Because RTTC provides the modifications at no cost to the homeowner, the participants seemed to value the home modifications as an enormous gift they were reminded of every day. This was true even for very minor changes within the homes.
Even small changes make a difference and are appreciated. Several homeowners commented on the difference that modifications as simple as doorbells, made in their daily life.

Victor: No yeah I'm appreciative any help I can get. Sometime the change is just incremental. Small but subtle changes. Doorbell is nice. I like that.

Henry: Yes. Well I like the fact that I have a doorbell. When people come to the door I can hear them. [laughing] And uh have the smoke detectors uh for two years. I don't have to bother with them. And that's real nice. [laughing]...And I'm very happy.

As these quotes show, small changes can result in peace of mind for aging homeowners. Additionally, interviewees voiced a genuine and moving appreciation for the kindness they experienced from all of the volunteers and staff involved in the home modification and evaluation process.

Grateful for kindness from RTTC, volunteers, and research staff. Every interview included an expression of gratitude to RTTC for the kindness they received from everyone involved.

Elaine: Everybody was so kind to me. And uh they just went way above what I could have ever asked or expected.

Sandra: I think everybody's been so sweet. I just wish more people had the opportunity and knew about you [RTTC].

Dave: I think you guys are wonderful.

Jane: It was a great experience. Everyone was very nice.

The work completed by RTTC is often done by trained volunteers, and many of the homeowners commented on how wonderful the volunteers were. This philanthropic exchange seemed to leave a lasting impression on the homeowners.
In summary, homeowners reported a number of benefits and positive changes to their daily lives and activity patterns after receiving home modifications.
Discussion

The purpose of this study was to evaluate the importance of home modifications provided by RTTC for occupational participation and safety for low-income, older adult homeowners. More specifically, this study looked at how low-income homeowner’s daily life routines, activity participation, and feelings of safety changed as a result of modifications. We also looked at the overall experience of the evaluation and assessment process of the homeowner and how this impacted awareness of safety in daily routines. We utilized a mixed methods approach to deepen our findings and gain a more comprehensive understanding of the impact of home modifications on homeowners (Creswell & Clark, 2007). The blend of qualitative and quantitative data reinforced and expanded the results found in both sets of data, and added richness to the interpretation of the quantitative results. The results found in this study suggest that home modifications provided in collaboration with occupational therapists can positively impact occupational performance and satisfaction, and increase feelings of safety and security for low-income senior homeowners. Similar to the presentation of the results, the quantitative and qualitative results will be discussed together following each research question.

Impact on Occupational Participation

To answer the first research question about the impact on occupational participation we used results of In-Home Occupational Performance Evaluation (I-HOPE) scores to measure self-rated Performance and Satisfaction for basic daily...
activities. Additionally, the Life Space Assessment (LSA) was utilized to measure how modifications impacted changes in occupational routines through home and community mobility patterns. We also used the qualitative data captured in interview questions related to changes in daily life and activity patterns and routines. Together, the results suggest that client-centered home modifications did have a positive impact on homeowner participation in meaningful and valued activities. Of particular note was the improvement in Satisfaction scores on the I-HOPE, which showed a significant increase in mean score from pre to post evaluation. Although the Performance scores on the I-HOPE did increase, they did not reach significance. However, the qualitative data suggests that the satisfaction reported by homeowners was tied to their improved performance. These findings also support and enhance similar results for significant changes in performance and satisfaction in other studies utilizing the I-HOPE by providing qualitative data that helps interpret the reasons for changes in I-HOPE scores (Somerville & Stark, 2015; Stark, 2004). Thus, it is also likely that with a larger sample size, a significant change might be found for performance scores as well.

Our findings are also consistent with another longitudinal study that found home modifications to be effective in decreasing difficulty in performance of ADLs (Petersson, Kottorp, Bergstrom, & Lilja, 2009). The present study extends those results by addressing a gap in the literature in focusing on low income homeowners. Our diverse and inclusive sample also adds to the previous studies by providing evidence that home modifications positively impact occupational performance and satisfaction for older adults from a variety of cultural backgrounds, including individuals that speak primary languages other than English. Additionally, we did not exclude individuals with cognitive deficits, as
many other studies have, suggesting that findings could be generalized to low-income adults with cognitive and memory impairments as well. In a systematic review of home modification studies for individuals with Alzheimer’s disease, Struckmeyer and Pickens (2016) identify a gap in the literature for the lack of standardized assessment tools to determine outcomes. Our findings from this pilot study provide a baseline for future research to utilize the I-HOPE (or the caregiver version of this tool) for individuals with memory and cognitive impairments.

Another strong theme emerged from the qualitative data that highlighted changes and improvements to meaningful activities outdoors as a result of increased accessibility. Consistently, the low-income homeowners in the current study discussed a re-connection with nature, neighbors, and their communities. The interview data from these themes are filled with strong emotions and vibrant language, hinting at the meaning these changes brought to the lives of older adults. These findings are consistent with existing research that indicates a strong link between connection with nature and overall health and wellbeing (Pappas, 2009). This small, pilot study did not have the numbers to allow for further evaluation of the impact that different types of modifications had on mobility and accessibility within the community versus just within the home. For instance, the qualitative data we collected suggested that participants that received ramps and other accessibility features to home entrances spent more time outside, but these findings were not supported by LSA quantitative results. Thus, with an increase in sample size, the LSA data from in-home modifications could be analyzed separately from those following home entrance accessibility modifications such as ramps and railings, possibly resulting in more significant findings. In addition, a separate version of the LSA tool, the Home-
Based Life Space Assessment (Hb-LSA), could be used to assess in-home mobility following in-home modifications. A 2014 study recently validated the use of the Hb-LSA as a measure for in-home mobility alongside the traditional LSA with promising results (Onuma, Hashidate, RyuTakashi, & Abe, 2014).

Furthermore, low-income older adults often have fewer access to resources and are more likely to experience occupational deprivation (Whiteford, 2010). These findings add to existing research by providing evidence that home modifications might be able to reduce isolation and occupational deprivation for low-income elders. This would be an area for future research to explore.

**Impact on Feelings of Safety**

To address the research question on how home modifications impact feelings of safety, we utilized the Short Falls Efficacy Scale (S-FES) to measure concern for falling while completing everyday tasks. Additionally, we collected qualitative data from interview questions on safety and security, as well as awareness of safety within the home. This study found decline in fear of falling approaching clinical significance although the difference in means was not statistically significant. The qualitative themes of increased safety and security supported the improvements in S-FES scores as evidenced by homeowners reporting increased confidence and self-efficacy thanks to the added security of accessibility and safety modifications. Even simple changes like anti-slip treads on stairs were identified as providing a sense of security, particularly when going out in inclement weather. These findings are consistent with other studies that have found that home modifications reduce fall risks and fear of falling (Chase et al., 2012;
Gillespie et al., 2012). Unique to this study was the mixed-methods approach which provided nuanced meaning and understanding to the ways in which fear of falling was reduced by modifications.

In addition, a sub-research question of this study was to evaluate if the home modification and assessment process raised awareness of safety issues. The qualitative interview responses suggest that the use of occupational therapy assessment tools during the modification process do raise awareness of safety concerns during occupational performance routines. Homeowners identified that the process of self-reflection and evaluation required them to think about their own safety habits and possible risks that they had not thought about before. These findings provide further support to existing research that has found home modifications to be most effective when OTs are involved (Chase et al., 2012; Gillespie et al., 2012; Gitlin, 2006). OT interventions can be particularly beneficial in addressing the whole person and improving overall safety for the homeowner during home modifications. As Gillespie et al. (2012) reports, fall and injury prevention programs are most effective when multi-factorial, addressing the person, the environment and the occupations of the individuals. OTs can provide unique client-centered safety interventions that address the whole person such as fall prevention strategies and education, strengthening and endurance training and exercises, psychosocial strategies, medication management and disease process education, and activity modifications all within the context of home evaluations (Chase et al., 2012). Thus, they are able to provide client-centered recommendations for home modifications, while helping the individual improve in occupational performance and safety awareness, ultimately improving the efficacy of the home modifications (Chase, et al, 2012).
Experience of Home Modification

The final sub-research question of this study sought to understand the experience of the homeowner during home evaluation and modification in order to further elucidate the meaning of aging in place for participants. Homeowners’ ability to age in place is often determined ultimately by their safety in completing daily activities with independence. Research has long supported that the majority of older adults wish to remain living in their homes (AoA, 2014). Our qualitative data further supports those findings. Homeowners were absolute in expressing the importance of their home and their strong desire to remain in their community and avoid long-term institutionalization. The results of the Live Well at Home Rapid Screen (LWAH-RS) provided a quantitative measure of the risk for long-term care placement. The clinically significant decrease from high to medium risk category, even if not statistically significant, suggests that home modifications can reduce the risk of low-income homeowners being institutionalized.

Considering the limited research on aging in place for low-income homeowners, these findings are particularly important in supporting our diverse aging population. Providing home modifications is a far more cost effective intervention than the cost of nursing-home care, and also supports the desires and wishes of low-income older adults living in the community (Fausset et al., 2011; Gaugler et al., 2011). Because RTTC is able to provide support to low income homeowners who may not qualify for other community based resources, they are able to help fill the gap in human services that support aging in place. This research study shows how home modifications can help fulfill the deep desire of low-income older adults to remain living in their homes with
success and dignity, and serves as a unique model for future research on providing client-centered home modifications and outcome evaluation.

In summary, the results of this study show the importance of evaluating the impact of home modifications on occupational participation and feelings of safety for low-income homeowners. In particular, the I-HOPE, S-FES, and LWAH-RS can be useful tools when measuring these types of outcomes. Our results also show the unique role of occupational therapy in home safety evaluation and recommendations, in partnership with community organizations such as Rebuilding Together. Finally, the research provides support for possible significant financial savings for state and government programs by investing in relatively small home modifications to allow low-income older adults to remain in their homes.
Study Limitations

The sample size of our pilot study was small, variable, and not randomly-controlled, limiting its generalizability to the general population. Another limitation of our research was the exclusive reliance on self-report measures and data. Additionally, conducting research in real-life community settings with low-income homeowners in collaboration with a community partner with a number of financial constraints limits the opportunity for systematic experimental control. As a result, our sample was missing data for several homeowners for the LWAH-RS, and several homeowners did not receive all the modifications recommended due to funding restrictions, ultimately reducing the strength of our findings. Another limitation of our study was the timing of our pre and post visits affecting the outcomes of our assessment of their life space, or degree to which they accessed their communities following modification to their homes. Qualitative interviews revealed that use of space was limited by homeowners in winter months due to inclement weather and icy conditions. Also, because the LSA focuses more heavily on space levels outside of the home, it may not be sensitive enough to measure changes in mobility within the home. Despite these setbacks, this type of applied research provides unique insights and opportunities for meaningful and relevant findings, as well as real life benefits to low-income homeowners wishing to age in place.
Future Research

The evidence found within our study added to the available research literature by focusing on low-income homeowners, and calls for further research on the impact of home modifications for this group of older adults. Although our sample was ethnically diverse, further research is needed to build on our findings and explore the cultural relevance of occupational therapy home safety assessments for individuals with varying cultures and languages. In addition, future studies could use the standard LSA to measure community mobility for individuals receiving exterior accessibility modifications, and utilize the new Hb-LSA to measure in-home mobility for internal modifications. Another possible focus for future research would be to analyze the effects of minor modifications separately from more major modifications. The qualitative findings on the renewed number and connection to meaningful occupations following greater access to outdoor occupations warrants further investigation into the impact of home modifications on preventing occupational deprivation and isolation for aging and low-income homeowners. Finally, this research highlights the benefit of the occupational science perspective and the unique contribution of OT in outcome studies regarding home safety evaluations, modifications, and interventions.
Conclusion

Home modifications improved functional performance of daily activities, engagement in meaningful occupations, and feelings of safety and security during occupational routines and activities. This study provides mixed-methods support and evidence that home modifications provided in collaboration with occupational therapists, can significantly improve the daily life of low-income older adult homeowners. Client-centered assessment and outcome evaluations provide unique insight into the challenges faced by aging homeowners, and can help document the profound impact that relatively small modifications can have on their daily function. Finally, the fact that RTTC has now incorporated the short screen assessments used in this study into their general intake and follow up procedures supports the value of these measurements and insures sustainability of the outcome evaluation process initiated in the context of this project.
Appendix A

Live Well At Home Rapid Screen

Name: ____________________________  Screen Date: __________

1. Do you need help to do the following?
   a) Walking  b) Getting out of bed/chair  c) Going to the bathroom
   d) Eating   e) Dressing   f) Eating
   If 2 or more circled → SCORE = 2

2. During the last 6 months, have you had a fall that caused injuries? Yes  No
   NOTE: "Injuries" means fracture or joint dislocation, head injuries resulting in loss of
   consciousness and hospitalization, joint injuries that led to decreased activity,
   internal injuries that led to hospitalization OR 3 or more of any falls.
   If YES circled → SCORE = 2

3. Do you have a family member/friend give you help when you need it? Yes  No
   If NO circled → SCORE = 2

4. Does your caregiver feel overwhelmed or stressed because of the care they provide you? Yes  No
   If YES circled → SCORE = 2

5. Have you thought about moving to other housing? Yes  No
   If YES, ask: where have you considered moving to?
   If answered NURSING HOME or ASSISTED LIVING (i.e., Housing With Services) → SCORE = 2

6. Do you live alone? Yes  No
   If YES circled → SCORE = 1

7. Do you or your family have concerns about your memory, thinking, or ability to make decisions?
   If YES, are you: Very concerned  Somewhat concerned  Not concerned?
   If VERY CONCERNED circled → SCORE = 2
   If SOMEWHAT CONCERNED circled → SCORE = 1

TOTAL SCORE (Sum of Scores For Items 1 Through 7) =

Score and Risk Category

0 = No Risk  1 = Low Risk  2 = Moderate Risk  3 and up = High Risk

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Revised 01.07.10
Below are some questions about how concerned you are about the possibility of falling. Please reply thinking about how you usually do the activity. If you currently don’t do the activity (for example, if someone does your shopping for you), please answer to show whether you think you would be concerned about falling if you did the activity. For each of the following activities, please check the box which is closest to your own opinion to show how concerned you are that you might fall if you did this activity.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Not at all concerned</th>
<th>Somewhat concerned</th>
<th>Fairly concerned</th>
<th>Very concerned</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Getting dressed or undressed</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>2. Taking a bath or shower</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>3. Getting in or out of a chair</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>4. Going up or down stairs</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>5. Reaching for something above your head or on the ground</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>6. Walking up or down a slope</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>7. Going out to a social event (for example, religious service, family gathering or club meeting)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

**TOTAL SCORE=**

**SCORING:** Low Concern: 7-8; Moderate Concern: 9-13; High Concern: 14-28
UAB Study of Aging Life-Space Assessment™

These questions refer to your activities just within the past month.

<table>
<thead>
<tr>
<th>LIFE-SPACE LEVEL</th>
<th>FREQUENCY</th>
<th>INDEPENDENCE</th>
<th>SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td>During the past four weeks, have you been to . . .</td>
<td>How often did you get there?</td>
<td>Did you use aids or equipment? Did you need help from another person?</td>
<td>Level X Frequency X Independence</td>
</tr>
<tr>
<td>Life-Space Level 1 . . . Other rooms of your home besides the room where you sleep?</td>
<td>Yes</td>
<td>No</td>
<td>Less than 1 /week</td>
</tr>
<tr>
<td>Score</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Life-Space Level 2 . . . An area outside your home such as your porch, deck or patio, hallway (of an apartment building) or garage, in your own yard or driveway?</td>
<td>Yes</td>
<td>No</td>
<td>Less than 1 /week</td>
</tr>
<tr>
<td>Score</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Life-Space Level 3 . . . Places in your neighborhood, other than your own yard or apartment building?</td>
<td>Yes</td>
<td>No</td>
<td>Less than 1 /week</td>
</tr>
<tr>
<td>Score</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Life-Space Level 4 . . . Places outside your neighborhood, but within your town?</td>
<td>Yes</td>
<td>No</td>
<td>Less than 1 /week</td>
</tr>
<tr>
<td>Score</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Life-Space Level 5 . . . Places outside your town?</td>
<td>Yes</td>
<td>No</td>
<td>Less than 1 /week</td>
</tr>
<tr>
<td>Score</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

**TOTAL SCORE (ADD)**

**Sum of Levels**
Appendix B

Rebuilding Together Twin Cities (RTTC)
Outcome Evaluation for Home Modification
Pre Interview Questions

1. How long have you lived in your home?
2. How important is it for you to live in this home?
3. Informal support:
   a. Do you have family and friends around?
   b. What kind of help have you been getting from them?
4. What community resources besides friend and family have you been using? If any?
   i.e. community center, visiting nurse, meals on wheels.
5. Did you ever have any accidents in your home (fire, scald, fall)?
   a. If so, could you tell where it happened?
   b. What were the circumstances?
6. Resources for home safety:
   a. In addition to contacting Rebuilding Together, what have you been doing to help keep your home safe and accessible for you?
   b. Do you know of other community resources besides RTTC to help with home modifications?
7. Vision issues are linked to safety in the home.
   a. Do you use bifocals?
   b. Do you walk with them?
   c. Do you have any other problems with your eyes or with vision?
      What have you been doing so far to reduce risks in your home due to vision issues?
8. Taking several medications can increase the risk of falls.
   a. Would you mind sharing how many separate medications you take?
   b. When was the last time you reviewed your medications with a health professional?
   c. What do you know about the link between medications and falls?
Rebuilding Together Twin Cities (RTTC)
Outcome Evaluation for Home Modification
Post Interview Questions

1. Did the modifications produce the changes you expected? How so?
2. In what ways did your daily life change as a result of the modifications?
   a. Any positive surprises?
   b. Any disappointments?
3. Did the modifications change your participation in activities that are important to you in your home?
4. Did the modifications change your participation in activities in your community?
5. Any other comments about the impact of the modifications?
6. Assessments
   a. What was your experience of the Short Falls assessment? What did you think of it? What did it make you think about?
   b. What was your experience of the Life Space assessment? What did you think of it? What did it make you think about?
   c. What was your experience of the I-HOPE assessment? What did you think of it? What did it make you think about?
7. Did the assessments feel tiring or difficult to complete?
8. How did the home assessment and modification process raise your awareness of safety in your home?
9. Anything else you wish to add about your experience with us or with Rebuilding Together?
Appendix C

Rebuilding Together Twin Cities (RTTC)
Outcome Evaluation for Home Modifications SAFE AT HOME
INFORMATION AND CONSENT FORM

Introduction:
We invite you to participate in a study aimed at improving the assessment process for RTTC's home modification program. This should allow RTTC to find out more clearly how their program benefits the homeowners’ experience of safety and mobility. RTTC is working with St. Catherine University to conduct this study. Graduate students are conducting the assessments under the direction of Catherine Sullivan, a faculty member in the Department of Occupational Therapy. You were selected for participation because you applied or RTTC services and have needs which could qualify you for home modifications.

Background Information:
We are developing a new procedure for evaluating your home, which we feel will give us a better idea of the homeowners’ needs. We feel that it would be helpful for other organizations to find out about the usefulness of those assessments and procedures, so we are asking for your consent to allow us to share the assessment results and come back to your home for a follow-up visit after the modifications have been made by RTTC. Please read the consent form and ask any questions you may have prior to signing it.
Approximately thirty people are expected to participate in this project.

Procedures
RTTC staff scheduled your home to be assessed by our occupational therapy students because you applied with RTTC for repairs and/or safety modifications. Groups of 2 or 3 students will be using the regular RTTC protocol and assessments to evaluate the safety of your home. In addition, one graduate student assistant will use one more assessment that is called I-HOPE involving photos of activities people typically do during the day to help determine your specific needs.

If you agree to participate, RTTC will schedule a second visit by two graduate student assistants about a month after the home modifications have been made by RTTC. At that point, the two graduate student assistants will interview you again and give you the same assessments they gave prior to the visit to see if the home modifications made a difference.
What we are seeking your permission for, is 1) agree to the follow up visit by the two graduate student assistants after the modifications have been made and 2) for RTTC and Dr. Sullivan to share the results from the interview and assessment with the broader public. We assure you that if it is shared, neither your name nor any recognizable information about you will be included in the results.

**Risks and Benefits for being in the study:**

The study has no risk or benefits over and above the normal home evaluation procedures conducted by RTTC. You will not receive any compensation for participating.

**Confidentiality:**

RTTC will keep the completed assessments in their secured files along with the other information you provided as part of the homeowner application process. The graduate student assistants will enter your answers from the assessments and interviews on a spreadsheet that shared only with RTTC, and Dr. Sullivan so your privacy will be protected. Since only group data will be analyzed, you will not be recognizable in any public presentation of the results.

**Voluntary nature of the study:**

Your decision whether or not to let us come back for a follow-up visit and present the data to the public will not affect your future relations with RTTC or St. Catherine University. If you decide to participate, you are free to change you mind at any time without affecting these relationships.

**Contacts and questions:**

If you have any questions, please ask them now or feel free to contact the faculty supervisor Dr. Catherine Sullivan at (651) 690-8602. If you have other questions or concerns regarding the study and would like to talk to someone other than the researcher(s), you may also contact Dr. John Schmitt, Chair of the St. Catherine University Institutional Review Board, at (651) 690-7739 or jsschmitt@stkate.edu.

You may keep a copy of this form for your records.
Statement of Consent:

You are making a decision whether or not to participate. Your signature indicates that you have read this information and your questions have been answered. Even after signing this form, please know that you may withdraw from the study.

I, _____________________________________________ consent to participate in the study under the conditions outlined above. I understand that when the interview and assessment data is shared, there will not be any identification linking my identity to the data.

______________________________________________________________
Signature of Participant                                      Date

______________________________________________________________
Signature of Researcher                                        Date
Appendix D

Qualitative Codes and Labels

<table>
<thead>
<tr>
<th>Code</th>
<th>Label</th>
</tr>
</thead>
<tbody>
<tr>
<td>Independence</td>
<td>inde</td>
</tr>
<tr>
<td>Caregiver burden</td>
<td>care</td>
</tr>
<tr>
<td>Connection with Community</td>
<td>comm</td>
</tr>
<tr>
<td>Ease</td>
<td>ease</td>
</tr>
<tr>
<td>Safety</td>
<td>safe</td>
</tr>
<tr>
<td>Accessibility</td>
<td>acc</td>
</tr>
<tr>
<td>Awareness</td>
<td>awar</td>
</tr>
<tr>
<td>Satisfaction</td>
<td>sat</td>
</tr>
<tr>
<td>Other</td>
<td>oth</td>
</tr>
<tr>
<td>Study</td>
<td>stud</td>
</tr>
</tbody>
</table>
References


https://www.caot.ca/default.asp?pageid=3824


HUD. (2013). *Accessibility (design and construction) requirements for covered multifamily dwellings under the fair housing act.* Washington D. C.: Office of


Scarfo, *Re-Creating neighborhoods for successful aging* (pp. 53-84). Baltimore: Health Professions Press, Inc.


doi:http://dx.doi.org/10.1016/j.gerinurse.2012.06.010


