

**The psychosocial aspects of older adults' decision making  
process in the adoption of home modifications:  
Development of a research proposal for grant funding**

**by**

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## **Abstract**

This project presents a research grant proposal based on the Canadian Institutes of Health Research (CIHR) Project Scheme: 2016 1st Live Pilot guidelines. The proposed study aims to have a comprehensive understanding of the objective and subjective factors impacting older adults' decision making process to implement home modifications (HMs). The study will utilize a mixed methods research approach. Community-dwelling older adults from urban and rural British Columbia will take part in surveys and home environment assessments using the Housing Enabler (North American version) tool. A sub-set of participants will receive HM recommendations and take part in semi-structured interviews about their decision to adopt and implement HMs. The study findings will provide conceptual and substantive insights into the various factors that influence the decision making process. Additionally, the findings will inform professionals in occupational therapy and housing policy on the influencing factors and multidimensional characteristics of older adults' decision making process.

**Keywords:** Home Modifications (HMs); Older Adults; Seniors' Housing; Aging in Place; Person-Environment Fit

*I dedicate this capstone project to my grandparents and great-grandmothers: Karen Cowie (Granny), Peter Cowie (Papa), Phyllis Scarrow (Nana), Richmond Scarrow (Gramp), Alice Scarrow (Little Gram), and Phyllis Livingstone (Nana Nana). Thank you for all the wonderful memories, I wouldn't be who I am today without all of you.*

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## List of Acronyms

ADLs	Activities of Daily Living
BC	British Columbia
CAOT	Canadian Association of Occupational Therapists
CMHC	Canadian Mortgage and Housing Corporation
CMOP	Canadian Model of Occupational Performance
CMOP- E	Canadian Model of Occupational Performance and Engagement
COPM	Canadian Occupational Performance Measure
HAFI	Home Adaptation for Independence Program
HASI	Home Adaptations for Seniors Independence Program
HMs	Home Modifications
HCQ	Housing-Related Control Beliefs Questionnaire
IADLs	Instrumental Activities of Daily Living
RRAP	Residential Rehabilitation Assistance Program
RRAP- D	Residential Rehabilitation Assistance Program – Persons with Disability
SPMSQ	Short Portable Mental Status Questionnaire
UIMH	Usability in My Home

# Chapter 1.

## Introduction

Canada's population is aging and it is projected that by 2063 approximately twenty-five percent of Canadians will be over the age of sixty-five (Statistics Canada, 2014). It is widely noted in the literature that most of these individuals will want to age in place, i.e., remain in their own home or community for as long as possible (Ahn & Hedge, 2011; Canadian Mortgage and Housing Corporation [CMHC], 2008; Gitlin, 2003; Hartje, Tremblay, & Birdsong, 2006; Iwarsson, Wahl, Nygren, Oswald, Sixsmith, Sixsmith, Szeman, & Tomsone, 2007; Stark, 2004; Tanner, Tilse, & De Jonge, 2008; Wagnild, 2001). In fact, 85% of older adults over the age of 55 hope to remain in their current homes (CMHC, 2008). Additionally, as people age, they tend to spend more time in their homes (Fange & Iwarsson, 2003; Northridge & Levick, 2002; Oswald & Wahl, 2005; Oswald, 2003). However, the aging process is often accompanied by age-related declines which can result in functional limitations, mobility problems, an inability to independently complete activities of daily living (ADLs), and other health concerns (CMHC, 2008; Hartje et al., 2006; Verbrugge & Jette, 1994). These declines pose a challenge to aging in place, as the physical infrastructure of many older adults' homes are also aging and/or not suited to their changing functional abilities (Northridge & Levick, 2002; Pynoos, 1992; Stark, 2004). In fact, barriers/hazards in the home are quite common (Gitlin, 2003; Iwarsson et al., 2006); the homes of older adults contain, on average, 4.7 to 13.4 safety hazards and/or barriers (Gitlin, Mann, Tomit, & Marcus, 2001b; Stark, 2004). Examples of these common barriers/hazards include, but are not limited to, toilets that are too low or too high, loose carpeting or throw rugs, and/or a lack of handrails on the stairs (Gitlin et al., 2001b).

Research shows that individuals' level of physical and/or cognitive functioning and the surrounding built environment are intertwined, therefore environments that are not suited to older adults' level of physical and/or cognitive functioning, can result in

challenges, such as reduced ability to complete ADLs, increased risk of falls, and subsequently an inability to age in place safely (Gitlin, Hauck, Dennis, Winter, Hodgson, & Schinfeld, 2009; Gitlin et al., 2001b; Greenfield, 2012; Hazen & McCree, 2001; Iwarsson et al., 2007; Johansson, Josephsson, & Lilja, 2009b; Lawton & Nahemow, 1973; Northridge & Levick, 2002; Oswald & Wahl, 2005; Oswald, Wahl, Schilling, Nygren, Fange, Sixsmith, Sixsmith, Szeman, Tomsne, & Iwarsson, 2007; Stark, Landsbaum, Palmer, Somerville, & Morris, 2009; Stark, 2004; Slangen-de Kort, Midden, & van Wagenberg, 1998; Verbrugge & Jette, 1994; Wahl, Fange, Oswald, Gitlin, & Iwarsson, 2009). Home Modifications (HMs) serve as a method to modify the built environment to better suit the needs of older adults with frailty and/or functional limitations. HMs can increase older adults' level of safety and independence, ease their ability to do ADLs, decrease their risk of falls, and therefore allow them to age in place (Aplin, de Jonge & Gustafsson, 2013; CMHC, 2008; Clemson, Cusick, & Fozzard, 1999; Cumming, Thomas, Szonyi, Salkeld, O'Neill, Westbury, & Frampton, 1999; Hartje et al., 2006; Hazen & McCree, 2001; Hwang, Cummings, Sixsmith, & Sixsmith, 2011; Johansson et al., 2009b; Liu & Lapane, 2009; Nishita & Pynoos, 2005; Pynoos, 1992; Stark et al., 2009; Stark, 2004; Struthers, 2005).

There are mixed findings on the extent to which older adults adopt HMs and the nature of the associated decision making process. A few studies indicate that older adults want to implement HMs, at least to a certain extent (e.g. Aplin et al., 2013; Kruse, Moore, Tofle, LeMaster, Aud, Hicks, Minor, Canfield, & Mehr, 2010). For instance, it has been found that some individuals are interested in HMs as long as they promote safety, autonomy, independence and self-care, and/or allow individuals to prepare for future declines (Aplin et al., 2013). However, additional research indicates that not all older adults will adopt or utilize HMs (e.g. Clemson et al., 1999; Kruse et al., 2010; Naik & Gill, 2005). Their reasons behind this diversity may be subjective in nature. For instance, some individuals may never have considered HMs, some may believe that HMs are not for them/their needs, and some may simply not be interested in HMs (Bunn, Dickinson, Barnett-Page, McInnes, & Horton, 2008; Clemson et al., 1999; Hazen & McCree, 2001; Kruse et al., 2010; Naik & Gill, 2005; Wagnild, 2001). Other older individuals may not adopt HMs for objective reasons such as being unable to afford HMs and/or not having access to HMs or HM services (Aplin et al., 2013; Mathieson, Kronenfeld, & Keith, 2002).

In order for HMs to have a positive effect, older adults must implement them first (Cumming, Thomas, Szonyi, Frampton, Salkeld, & Clemson, 2001). Therefore, there is a critical need to examine the various objective and perceived/subjective reasons that influence older individuals' decision to implement HMs.

## **1.1. Study Significance**

As older adults' health begins to decline, most do not want to move into an institutional setting (Wagner, Shubair, & Michalos, 2010). The majority of older adults would rather remain in their own homes and age in place (Tanner et al., 2008). Findings show that a wide array of diverse older adults share the desire to age in place. According to Wangild (2001), the want to age in place is equal for both men (69%) and women (68%). Similarly, the want to age in place is relatively equal for both older adults who live alone (79%) and those who live with a spouse (72%); and older adults in both low (82%) and high income brackets (70%) (Wangild, 2001). Older adults in good, very good, or excellent health (66%) also expressed a want to age in place and the want to remain in one's current home was especially high for older adults in fair to poor health (81%) (Wangild, 2001). Additionally, 94% of older adults who report being satisfied to very satisfied with life wish to remain in their home (Wagnild, 2001). The desire to age in place is also strong amongst individuals with dementia and their caregivers, who aim to keep older adults in their homes as long as possible (Gitlin & Corcoran, 1996; Gitlin & Corcoran, 2000; Olsen, Ehrenkrantz, & Hutchings, 1996). Older adults' memories of family and past events, their psychological investment over time, and their ability to personally express themselves all contribute to a strong emotional bond with their homes, which in turn, makes home part of their self-identity (Gitlin, 2003; Northridge & Levick, 2002; Oswald & Wahl, 2005; Peace, Holland, & Kellaher, 2011; Rowles & Chaudhury, 2005; Rubinstein & Parmelee, 1992; Tanner et al., 2008; Wiles, Leibing, Guberman, Reeve, & Allen, 2011). For older adults, aging in place is a way to maintain independence and control, feel safe and secure, be near their family and friends, and be in familiar surroundings (Wangild, 2001). Home is a comforting space for many older adults (Wiles, Allen, Palmer, Hayman, Keeling, & Kerse, 2009), and many will avoid moving even when their home is no longer a safe option (Fange & Iwarsson, 2003). Additionally, research shows that aging in place can have a positive

financial impact for the government of British Columbia, as an investment in appropriate home care for older adults has the potential to be more cost effective for the provincial government than long-term care options (Hollander & Chappell, 2007). It is therefore important to identify strategies to create housing that will allow older adults to age in place safely and comfortably in the place they call 'home' for as long as possible.

There are several challenges to successfully aging in place. Aging can often be accompanied by functional declines, mobility problems, struggles with ADLs, and other health concerns (CMHC, 2008; Hartje et al., 2006; Verbrugge & Jette, 1994). Aging is also associated with an increased chance of dementia (Gitlin & Corcoran, 1996). As with functional declines, dementia can lead to decreased health, as well as difficulty with ADLs and instrumental activities of daily living (IADLs) (Davis, 1991; Gitlin & Corcoran, 2000; Pynoos, Steinman, Nguyen & Bressette, 2012). Therefore, many older adults with dementia become increasingly reliant on formal and informal caregivers if they wish to remain in their homes (Davis, 1991).

Many of the homes that older adults live in are also aging (Charness & Holley, 2001; Marquardt, Johnston, Black, Morrison, Rosenblatt, Lyketsos & Samus, 2011; Northridge & Levick, 2002; Pynoos, 1992; Stark, 2004), for instance many Canadian homes were built prior to 1961 (29% of urban homes and 34% of non-urban homes) (CMHC, 2008). Additionally, many homes do not support the changing needs and abilities of older occupants (Charness & Holley, 2001; Marquardt et al., 2011; Northridge & Levick, 2002; Pynoos, 1992; Stark, 2004). This is due to the fact that private dwellings are not required to be accessible (Mace, 1998), and homes are generally designed and built with young and active individuals in mind (Barlow & Venables, 2004; Hartje et al., 2006; Pynoos, 1992). Aging and/or poorly designed homes are an issue, because as individuals' age and their needs and abilities change, the homes that suited them as young adults, may no longer support them in the later stages of life (Hartje et al., 2006). Additionally, many homes are not designed to properly aid formal or informal caregivers whom may be assisting older individuals to remain in their homes (Charness & Holley, 2001; Gitlin & Corcoran, 1996; Olsen et al., 1996). Safe and age friendly housing is particularly lacking in rural areas (Struthers, 2005).

Housing that does not meet the unique needs of older adults can limit individuals' ability to safely and comfortably function (Barlow & Venables, 2004; Hartje et al., 2006). An unsupportive home can hinder older adults' independence and autonomy (Evans, Kantrowitz, & Eshelman, 2002; Slangen-de Kort et al., 1998). Spontaneous action and activities become limited (Johansson et al., 2009b), and ADLs and IADLs become difficult to impossible to complete (Gitlin et al., 2001b; Pynoos, 1992). Some older adults will even take part in potentially harmful/risky situations (e.g. using an unstable footstool to reach high items) in order to complete ADLs and IADLs as independently as possible, while other older individuals have to rely on formal/informal supports to simply get through the day (Johansson et al., 2009b; Rogers, Rogers, Takeshima, & Islam, 2004). Unsafe homes can also lead to falls and increased frailty amongst older individuals (Northridge & Levick, 2002). Poor housing can also negatively impact individuals' mental health (Evans et al., 2002). Some older adults are even forced to move from their beloved home when the issues facing them overwhelm their capacity to adapt (Barlow & Venables, 2004). As Canada's population ages, there is going to be a larger demand for housing and housing related services that can and will support the needs of older adults' (Barlow & Venables, 2004; CMHC, 2008; Evans et al., 2002).

The current homes in Canada need "to be modified to promote safety, ADLs, [and] mobility" (CMHC, 2008, p. 14). New builds can be costly and time-consuming, but retrofitting homes can provide older adults with the support they need to age in place (Nishita & Pynoos, 2005). HMs are one method in creating safe environments that fit the needs of older adults. HMs can range from minor changes (e.g. installing grab bars or removing a throw rug) to major alterations (e.g. installing a stair lift). As previously mentioned, HMs can increase safety, independence, autonomy, and spontaneity; decrease ADL difficulty and falls risk; and consequently allow older individuals to age in place (Aplin et al., 2013; CMHC, 2008; Clemson et al., 1999; Cumming et al., 1999; Hartje et al., 2006; Hazen & McCree, 2001; Hwang et al., 2011; Johansson et al., 2009b; Liu & Lapane, 2009; Nishita & Pynoos, 2005; Pynoos, 1992; Stark et al., 2009; Stark, 2004; Struthers, 2005). However, not all older adults engage in HMs (Bunn et al., 2008; Clemson et al., 1999; Hazen & McCree, 2001; Kruse et al., 2010; Naik & Gill, 2005; Wagnild, 2001). For example, many older individuals would rather make behavioral changes and find ways to avoid the hazards than implement HMs (Kruse et al., 2010). It is therefore important to

find ways to inform older adults and their caregivers about HMs, in order for them to be able to identify risks in the home and see HMs as an acceptable solution (Hazen & McCree, 2001; Marquardt et al., 2011; Renaut, Ogg, Petite, & Chamahian, 2015).

The decision making process behind the implementation of HMs is complex and involves multiple factors (Yuen & Carter, 2006). It is also a highly individualized process (Aplin et al., 2013; Fange & Iwarsson, 2003; Gitlin et al., 2009; Johansson, Borell, & Lilja, 2009a; Yuen & Carter, 2006), in which both subjective and objective factors have the potential to impact the final decision. The literature points to a variety of subjective and objective factors that can impact older adults' opinion of HMs and his/her decision to implement them or not (e.g. Ahn & Hedge, 2011; Aplin et al., 2013; Bunn et al., 2008; Clemson et al., 1999; Cumming et al., 2001; Danziger & Chaudhury, 2009; Gignac, Cott, & Badley, 2002; Hwang et al., 2011; Johansson et al., 2009a; Johansson et al., 2009b; Kruse et al., 2010; Leland, Porell, & Murphy, 2010; Mace, 1998; Mathieson et al., 2002; McNulty, Johnson, Poole, & Winkle, 2003; Naik & Gill, 2005; Nishita & Pynoos, 2005; Pynoos, 1992; Rubinstein & Parmelee, 1992; Slangen-de Kort et al., 1998; Stark et al., 2009; Tanner et al., 2008; Wiles et al., 2011; Yuen & Carter, 2006). For example, subjective factors impacting the process can include older adults' aesthetic preferences and their wish to maintain control over their environments (Aplin et al., 2013). Whereas objective considerations can include the cost of the HM or the physical environment of the home, as not all homes are designed to accommodate certain HMs, such as a roll in shower (Aplin et al., 2013; Gitlin & Corcoran, 1996). Since both objective and subjective factors have the potential encourage and/or discourage the implementation of HMs, it is very important to look at both aspects (Baltes & Baltes, 1990) of older adults' decision making process and see how these factors interact with one another. A holistic approach will provide greater insight into the HM adoption experience. Objective and subjective factor's impact on the decision to implement HMs is not always clear. For example, one study found the simple task of removing a throw rug to be the most utilized HM (Cumming et al., 2001), while other studies have found that the décor of the home often takes precedent over HMs, therefore individuals refuse to remove throw rugs (Kruse et al., 2010; McNulty et al., 2003). Another thought-provoking study found that individuals with lesser functional impairment were more likely to implement HMs than those with higher levels of need (Mathieson et al., 2002). The research therefore highlights the importance of

examining multiple psychosocial factors and how they might interact with each other across different individuals.

There is currently little empirical research about how these objective and subjective factors directly or indirectly influence the decision making process of HM implementation (Yuen & Carter, 2006). The current empirical literature on HMs often focuses only on one aspect of the decision making or implementation process (e.g. falls prevention, finances, proactive measures, health status, readiness, housing satisfaction, intention, process, adherence and/or treatment programs that also involve behavioural modifications) (e.g. Ahn & Hedge, 2011; Bunn et al., 2008; Clemson et al., 1999; Cumming et al., 2001; Johansson et al., 2009a; Kruse et al., 2010; Mathieson et al., 2002; McNaulty et al., 2003; Slagen-de Kort et al., 1998; Yuen & Carter, 2006). Focusing on particular factors or aspects does not allow for an in-depth understanding of the complexity and nuances of the decision making process. The current empirical literature is also lacking when it comes to subjective experiences, as little is known about the HM decision making process from the unique point of view of older adults (Clemson et al., 1999). For instance, a few studies include older adults as part of a larger sample, but do not highlight what is most relevant to the older individuals as a distinct group (e.g. Aplin et al., 2013). It has also been found that several of the current studies contain small and/or homogeneous samples (e.g. Clemson et al., 1999; McNaulty et al., 2003; Yeun & Carter, 2006). Additionally, other existing studies do not gain a comprehensive view of the decision making process because they only include participants who have either implemented HMs (e.g. Aplin et al., 2013) or those who have not (e.g. Clemson et al., 1999), therefore, they are unable to compare the diverse perspective of the opposing groups.

This study aims to gather a more comprehensive view of the numerous psychosocial factors impacting HM adoption. This project will examine how subjective and objective factors interact to influence older adults' decision making process, thus expanding the currently limited literature on the psychosocial processes in which older adults decide to implement HMs. Findings from this study will be used to inform professionals in the occupational therapy and housing disciplines and professions on the multidimensional nature of their clients' decision making process, as well as help in identifying future research directions.

## **1.2. Purpose and Research Questions**

The purpose of this proposed study is to expand the currently limited literature on the psychosocial processes in which older adults' make the decision to implement HMs. The findings of this study will shed conceptual and substantive insights into the various factors that influence the decision making process. Additionally, the findings will inform professionals in the occupational therapy and housing disciplines and professions on the multidimensional nature of their client's decision making process, as well as inform future research directions. There are two research questions guiding this study. First, in order to understand the decision making process in a holistic way, it is important to assess the person-environment fit of the older participants' homes. Person-environment fit is crucial in creating spaces that allow older adults to age in place safely and comfortably (Lawton, 1982; Lawton & Nahemow, 1973), therefore the first research question will gain perspective on how the person-environment fit of older participants impacts their decision making processes. Second, the primary research question, will provide greater insight into the specific objective and subjective factors impacting older adults' decision to implement HMs. The guiding research questions are:

1. What is the person-environment fit for community-dwelling older adults in their home environments?
2. What are the primary factors affecting the psychosocial aspects of decision making process to implement home modifications among community-dwelling older adults'?

## Chapter 2.

### Theoretical Perspectives

This section covers three theoretical perspectives relevant to the psychosocial aspects underlying older adults' decision making process in implementing HMs. The section begins by highlighting key aspects of each conceptual framework, followed by a comparative analysis.

#### 2.1. Competence-Press Model

The Competence-Press Model, or Ecological Theory of Aging, demonstrates how the built environment can both positively and negatively impact older adults' ability to safely and comfortably function in a physical setting (Lawton & Nahemow, 1973). The two key terms in this model are 'individual competence' and 'environmental-press.' Individuals' competence, as explained in this model, is the capacity to which persons "function in the areas of biological health, sensation-perception, motoric behaviour, and cognition" (Lawton, 1982, p. 38). This indicates that individuals have different levels of competence or functional capacity based on a variety of factors in their lives (e.g. health and/or cognition) (Lawton & Nahemow, 1973). The term environmental press, as represented in this model, refers to the level of demand an environment places on individuals, whether it be positive, negative, or neutral (Lawton, 1982). Therefore, environmental press represents the level of hazards, barriers, and/or aids that a given physical environment presents individuals (Lawton, 1982; Lawton & Nahemow, 1973).

According to this model, individuals' behaviour can be expressed in the ecological equation,  $B = f(P, E, P \times E)$ , in which behaviour (B) is shown to be the function (f) of the person (P), the environment (E), and the interaction between the two (P x E) (Lawton, 1982). This suggests that individuals' ability to safely remain in the home is the product of their individualized level of competence and the unique level of environmental-press that the home exerts (Chaudhury & Cooke, 2014; Lawton, 1982; Lawton & Nahemow, 1973). Several studies provide evidence for this interaction (e.g. Benzinger, Iwarsson,

Krong, Reische, Lindemann, Klenk, & Becker, 2014; Iwarsson, Horstmann, Carlsson, Oswald, & Wahl, 2009; Iwarsson, Nygren, Oswald, Wahl, & Tomsone, 2006; Nygren, Oswald, Iwarsson, Fange, Sixsmith, Schiling, ..., Wahl, 2007; Werngren-Elgstrom, Carlsson, & Iwarsson, 2008). For instance, Werngren-Elgstrom et al. (2008) found that declines in ADL independence are the result of the interaction between functional decline and environmental obstacles, rather than one or the other. Similarly, Iwarsson et al. (2009) found that falls amongst older adults are better predicted when looking at person-environment fit, rather than the number of barriers in the home alone. These studies therefore indicate that person-environment fit is an important factor to consider when designing or modifying homes for older adults' to age in place (Iwarsson et al., 2009).

This conceptual model clearly demonstrates how environmental demands that exceed older adults' physical and/or cognitive functioning can negatively impact individuals' ability to live to their fullest potential (Lawton & Nahemow, 1973). If older adults' competence level is not well suited to the environmental press of their homes, it can result in maladaptive performance and behaviour (Lawton & Nahemow, 1973). Environments that contains hazards/barriers (e.g. stairs, knob controlled faucets, out of reach cupboards, etc.), and therefore do not support older adults' health status or functional abilities (e.g. arthritis, low vision, balance problems, etc.) have the potential to result in challenges such as reduced ability to complete ADLs, increased risk of falls, and a subsequent inability to age in place safely (Danziger & Chaudhury, 2009; Gitlin et al., 2009; Gitlin et al., 2001b; Greenfield, 2012; Hazen & McCree, 2001; Iwarsson et al., 2007; Johansson et al., 2009b; Lawton, 1982; Lawton & Nahemow, 1973; Northridge & Levick, 2002; Oswald & Wahl, 2005; Oswald et al., 2007; Stark et al., 2009; Stark, 2004; Slangen-de Kort et al., 1998; Verbrugge & Jette, 1994; Wahl et al., 2009). Therefore, this model can also be used to demonstrate how HMs can create environments that are safer for older adults to age in. HMs can act as a way help to lower the level of environmental press in older individuals' homes, consequently making sure that the homes of older adults better suit their individual level of competence (Lawton and Nahemow, 1973). In this way, older adults are able to live in what Lawton and Nahemow (1973) call the zone of maximum performance potential, allowing them to age in place safely. This model also highlights the importance of taking the person-environment fit into consideration when seeing why older adults do or do not adopt HMs.

## 2.2. Selective Optimization with Compensation (SOC)

It is also important to consider theoretical perspectives that can help explain the psychological process in which older adults choose to adopt HMs or not. According to Baltes and Baltes' (1990) Selective Optimization with Compensation (SOC) model, the aging process is accompanied by several gains and losses; for instance, as individuals age, it becomes increasingly difficult to perform certain tasks that may have come more naturally in the past. Therefore, the SOC model helps explain the various ways in which individuals can adapt to these changes through three specific behaviors or approaches: *selection*, *optimization*, and *compensation* (Baltes & Baltes, 1990).

The first adaptive behavior that older adults may employ when faced with age-related functional declines is selection, which refers to the active choice of older adults to focus only on the activities that they consider important and disregard the others (Baltes & Baltes, 1990; Gigance et al., 2002). By doing this, older adults are able to exert control over the mastery of meaningful activities to achieve a sense of satisfaction (Baltes & Baltes, 1990). Optimization is when older individuals choose to find a way in which to reach the highest level of competence possible in a chosen activity through practice and/or education (Baltes & Baltes, 1990; Gigance et al., 2002). Finally, compensation involves older individuals finding alternative ways to complete an activity (Baltes & Baltes, 1990; Gigance et al., 2002; Renaut et al., 2015). For instance, some may make behavioural changes, while others utilize external support, such as HMs, in order to continue an activity in a different way than before (Baltes & Baltes, 1990; Gigance et al., 2002; Kiata, Kerse, Hughes, Hayman, Robertson, La Grow, & Campbell, 2008; Renaut et al., 2015).

Older adults are a diverse group of individuals with different goals, aspirations, and resources available to them (Baltes & Baltes, 1990; Slangen-de Kort, et al., 1998). The SOC model clarifies that the path older adults choose when faced with decline differs from person to person (Baltes & Baltes, 1990). The choice between selection, optimization, or compensation depends on what activities individuals consider important, available resources, and ultimately what best fits their needs (Baltes & Baltes, 1990; Slangen-de Kort, et al., 1998). Understanding the subjective aspects of the decision making process, as highlighted by the SOC model, is useful when studying HM adoption, as older adults'

decisions on how to address functional decline (i.e. selection, optimization, or compensation) is impacted by their' unique opinion of what successful aging means to them (Baltes & Baltes, 1990). This model highlights the individualized nature of the decision making process when it comes to addressing functional declines, while HMs (i.e. compensation) will suit some individuals, avoiding particular tasks (i.e. selection) will work better for other older adults.

### **2.3. The Disablement Process Model**

Finally, the Disablement Process Model (DPM) explains how both acute and chronic illnesses can impact individuals' ability to complete tasks and take part in daily activities (Verbrugge & Jette, 1994). In addition, it recognizes that environments (both social and physical) have the ability to further impact the disablement process (Verbrugge & Jette, 1994). When older individuals experience age-related disablement, it is often gradual — they remember what life was like before and are often interested in finding ways to slow the disablement process and restore lost skills and abilities (Verbrugge & Jette, 1994). Therefore, the DPM presents four ways in which individuals can reduce the effect that the environment has on quickening the process of disablement: activity accommodation, changing the environment, psychosocial coping, and environmental support (Verbrugge & Jette, 1994).

First, activity accommodation refers to when older adults change an activity, which they now find difficult, in a way that better suits their current abilities (Verbrugge & Jette, 1994). To do this, individuals will find ways to lessen the demand (physical or mental) that a task normally requires (Verbrugge & Jette, 1994). For instance, individuals will adjust the steps and actions involved in an activity, or change how often and for how long they take part in an activity (Verbrugge & Jette, 1994). Second, individuals may account for disablement by making changes to the physical and/or social environment (Verbrugge & Jette, 1994). Examples of this include the introduction of anti-discrimination legislation (social change) and the introduction of HMs (physical change) (Verbrugge & Jette, 1994). Third, psychosocial coping, involves the acceptance of physical and cognitive challenges as a part of their life (Verbrugge & Jette, 1994). In this way some individuals will find ways to cope with challenges through activities such as prayer or peer support (Verbrugge &

Jette, 1994). Finally, individuals could choose to deal with disablement by utilizing external supports such as assistive devices (e.g. a cane) or meals on wheels (Verbrugge & Jette, 1994).

The DPM is a useful framework for examining older adults' decision making processes. Like the SOC model, the DPM shows that there are numerous ways in which individuals deal with age related challenges. For instance, while some older adults may deal with disability-related outcomes through changing the environment with HMs, others may feel more comfortable relying on behavioural changes to deal with their limitations (Kruse et al., 2010; Verbrugge & Jette, 1994; Wahl et al., 2009). Additionally, like the Competence-Press model (Lawton, 1982; Lawton & Nahemow, 1973), the DPM also highlights the importance of the environment on the disablement process (Verbrugge & Jette, 1994). The DPM's holistic perspective is therefore important to consider when examining HMs and older adults' decision making process.

## **2.4. Comparison of the Theoretical Perspectives**

All three theoretical perspectives presented in this section - the Competence-Press model (Lawton, 1982; Lawton & Nahemow, 1973), the SOC model (Baltes & Baltes, 1990), and DPM (Verbrugge & Jette, 1994) - are useful in understanding older adults' decision making processes with respect to HM adoption. All three perspectives offer unique viewpoints, as well as connect and work together in a way that benefits the study of HM adoption. As demonstrated above, all three theories discussed here describe how older adults may face functional and/or cognitive declines as they age. First, the Competence-Press model (Lawton, 1982; Lawton & Nahemow, 1973) explains how several factors (e.g. health, cognition) can negatively impact individuals' competence level. Second, the SOC model (Baltes & Baltes, 1990) explains how both gains and losses associated with the aging process can make daily tasks increasingly difficult to accomplish. Lastly, the DPM (Verbrugge & Jette, 1994) explains how acute and chronic illnesses can lead to increased disablement among individuals. Additionally, both the Competence-Press model and the DPM explain how the environment can negatively (or positively) impact older adults' functional abilities (Lawton, 1982; Lawton & Nahemow, 1973; Verbrugge & Jette, 1994). As previously discussed, the homes occupied by older individuals are not ordinarily

designed to support age related declines (Charness & Holley, 2001; Stark, 2004; Marquardt et al., 2011; Northridge & Levick, 2002; Pynoos, 1992). Therefore, these three key theoretical perspectives acknowledge the impact of age related decline on older adults, and are critical to the examination of HM adoption.

The three theories also highlight the diversity and individuality of older adults, showing that older individuals are not a homogenous group. First, the Competence-Press model explains how both functional competence and environmental press experienced by older individuals' differs (Lawton, 1982; Lawton & Nahemow, 1973). Therefore, individuals will fall into different categories of impairment based on the person-environment interaction (Lawton, 1982; Lawton & Nahemow, 1973). Next, the SOC model explains how individuals uniquely decide what successful aging means to them and then act or behave based on those beliefs (Baltes & Baltes, 1990). Therefore, the activities older individuals consider important when it comes to successful aging differ from person to person (Baltes & Baltes, 1990). Finally, the DPM highlights how individuals' disablement process can be impacted by a number of risk factors (e.g., environmental risks, demographics, biology), extra-individual factors (e.g., counseling, recreational therapy, assistive devices, HMs), and intra-individual factors (e.g., lifestyle changes, peer support groups, activity accommodation) that further showcase how older adults face different and unique challenges (Verbrugge & Jette, 1994).

Additionally, all three theories highlight the importance of finding environmental and/or individual solutions that suit the unique wants, needs, and available resources of older individuals. Thus, these three theories highlight the complexity and variations in the decision making process. Specifically, the Competence-Press model explains how the physical environment can be changed or altered in order to lower (or raise) the environmental press to better suit the competence of older adults, which in turn, results in adaptive behaviour (Lawton, 1982; Lawton & Nahemow, 1973). In line with the Competence-Press Model it has been found that an appropriate balance of person-environment fit makes for the most effective HMs (e.g. Campbell, Robertson, Grow, Kerse, Sanderson, Jacobs,..., & Hale, 2005; Charness & Holley, 2001; Gitlin & Corcoran, 1996; Gitlin & Corcoran, 2000; Liu & Lapane, 2009; Northridge & Levick, 2002; Olsen et al., 1996; Pynoos, Steinman, Nguyen, & Bressette, 2012; Rose, 2002; Unwin, Andrews,

Andrews, & Hanson, 2009; Wahl et al., 2009). On the other hand, the SOC model focuses on the internal factors that impact older adults' decision making processes (Baltes & Baltes, 1990). In this model, older adults' behavioural approach with respect to selection, optimization, or compensation differs based on the activities these individuals find the most important and the resources they have available to them (Baltes & Baltes, 1990; Gigance et al., 2002; Slangen-de Kort, et al., 1998). Therefore, the HMs individuals chose to implement (or not) will also depend on these same factors. Finally, the DPM looks at individuals' internal/personal wants and needs, as well as environmental factors (both physical and social) together and how they impact the decision making process (Verbrugge & Jette, 1994). The combination of influencing internal and environmental factors will differ from person to person, therefore older adults' decision making processes will also have distinct and/or nuanced characteristics. Some older individuals will choose HMs (i.e. changes to the physical environment), while others may decide to simply accept environmental challenges and live with them as is (i.e. psychosocial coping) (Verbrugge & Jette, 1994). Overall, these three theories show how a wide variety of factors can impact the HM implementation process, and therefore highlight the importance of a holistic and in-depth perspective in this area of study.

Collectively, these theoretical perspectives are important frameworks when it comes to studying older adults' decision making processes. They provide unique perspectives, while also complementing one another. Overall, they also highlight the need for a holistic study on HM adoption, one that addresses the various objective and subjective/perceived factors affecting older adults' decision making processes.

## **Chapter 3.**

### **Literature Review**

The focus of this literature review is to discuss currently known factors that impact older adults' decision to implement HMs. This review will address common barriers and hazards in the homes of older adults; the definition of HMs and the various findings with respect to their effectiveness; the subjective and objective factors impacting the decision making process; as well as the HM services and programs available to older adults in British Columbia.

To gain a comprehensive review of the relevant literature, numerous databases were utilized and searched including Ageline, PsycINFO, CINAHL, Medline and Google Scholar. The reference sections of relevant articles were also manually searched for articles related to the research questions. Additionally, articles were gathered based on recommendations from experts in the field. Search keywords included: home modification(s), environmental modification(s), adaptable design, universal design, older adult(s), caregiver(s), dementia, aging in place, meaning of home, attachment to place, safety, security, perception, barriers, falls, activities of daily living, and instrumental activities of daily living, in both the urban and rural contexts. All articles utilized had to be in English and had to be published after 1990, with the exception of seminal articles of great importance and relevance to the topic at hand. Following the initial search process, a large number of articles were identified and collected, after which respective abstracts were read and reviewed for relevance to the capstone topic and research questions. From this search process, 105 total key pieces were identified. This included 66 empirical studies and 39 non-empirical and conceptual pieces (including systematic reviews and book chapters).

### **3.1. Common Barriers and Hazards in the Homes of Older Adults**

As previously discussed, the magnitude of environmental press in relation to individuals' competence, not the number of barriers and/or hazards in the home, impact individuals' ability to safely age in place (Benzinger et al., 2014; Nygren et al., 2007; Oswald et al., 2007). However, the homes of older adults are not necessarily designed to help individuals age in place safely and comfortably (Charness & Holley, 2001; Marquardt et al., 2011; Northridge & Levick, 2002; Pynoos, 1992; Stark, 2004). In fact, research suggests that barriers/hazards in the homes of older adults are quite common (Gitlin, 2003; Iwarsson et al., 2006; Marquardt et al., 2011; Pynoos, 1992). Therefore, although not every older adult will be negatively affected by barriers and/or hazards, they are important to consider when evaluating the homes of older individuals for potential HMs.

Numerous studies have attempted to identify the average number of barriers and/or hazards in the homes of older adults; however, the exact number differs greatly from study to study. For example, Wyman et al. (2007) found that the homes of older adults can contain anywhere from four to 17 hazards, with the average of 10.7 hazards per home. In fact, over half (54.6%) of the homes in Wyman et al.'s (2007) study contained at least 11 hazards. However, not all studies in this area have found similar results. For instance, Stark (2004) identified a much lower average of 4.7 barriers per home; while Gitlin et al. (2001b) found a much higher average of 13.4 environmental barriers per home. Additionally, Iwarsson et al. (2006) found that some of the most prevalent environmental barriers/hazards are present in 77-98% of older adults' homes. Research has also found that some areas of the homes tend to contain more barriers/hazards than others. For instance, Gitlin et al. (2001b) observed 16 areas in older adults' homes and found that, on average, 7.4 areas per older home contained a barrier and/or hazard. Specifically, Gitlin et al. (2001b) found that 88% of participants faced challenges in the bathroom (e.g. a lack of grab bars), 76% faced difficulties in the kitchen (e.g., the space itself was too small), 61% had troubles in their bedroom (e.g., bed is difficult to get in and out of), 58% had barriers in their entryways (e.g., presence of steps/lack of ramp), and 55% had difficulty in their living/family rooms (e.g., clutter) (Gitlin et al., 2001b). In this specific study, only one percent of participants (n = 4) lived in homes with no problem areas, while only a single

participant lived in a home where there was an issue in all 16 spaces (Gitlin et al., 2001b). Overall, the research provides evidence that a large number of older adults face barriers and hazards throughout their homes.

The literature often references older adults' bathrooms as having a high number of barriers and/or hazards. Activity of daily living (ADL) independence in the bathroom is crucial when it comes to aging in place, yet due to surrounding barriers, many individuals face difficulties navigating this space (Naik & Gill, 2005). For instance, many older adults report difficulty and/or dependence on others when it comes to bathing and making transfers in and out of the tub (Naik & Gill, 2005). According to Wyman et al. (2007), bathrooms, on average, contain 3.7 barriers, which is the most of any of the rooms this team examined. Similarly, when recommending HMs, Currin, Comans, Heathcote, and Haines (2012) made the most recommendations in older adults' bathrooms. Barriers in the washroom include, but are not limited to; a lack of grab bars in the shower/tub and next to the toilet, toilets that are difficult to get on and off of (i.e. too high or too low), non-lever faucets that are difficult to grasp/manipulate, and not having a walk/roll-in-shower or handheld shower head (Aplin et al., 2013; Danzinger & Chaudhury, 2009; Gitlin & Corcoran, 1996; Gitlin et al., 2001b; McNulty et al., 2003; Wyman et al., 2007). Additionally, washrooms that are simply too small for informal and formal caregivers to offer proper assistance and washrooms that do not accommodate walkers or wheelchairs can also be barriers to use (Gitlin et al., 2001b; Wagner et al., 2010). A survey in Northern British Columbia found that 11.6% of older participants were unable to safely turnaround in their bathroom while utilizing a power chair or walker (Wagner et al., 2010), which is a critical issue if individuals with mobility aids (e.g. wheelchairs, walkers, scooters) wish to remain in the home.

Older adults' ability to access and navigate areas of the home, other than the bathroom, can also be a challenge for many individuals who do and do not use mobility aids. For example, some participants in Wagner et al.'s (2010) study were unable to properly utilize their kitchen when using a power chair or walker (8.4%); in fact 5.4% of participants could not even fit their walker or power chair in the kitchen. Wagner et al. (2010) also found that 26.8% of older participants had homes where the hallways were too narrow to accommodate wheelchairs at all. Additionally, a study by Marquardt et al.

(2011), examined the homes of older adults with cognitive impairments and found that only half of their participant's homes had enough room for the individuals to navigate the space in a safe manner.

Access in and out of individuals' homes is another problem many older adults' face when aging in place. For instance, a survey by Struthers et al. (2005), found that only 28% of older adults in rural Illinois had wheelchair accessible homes. Similarly, Wagner et al. (2010) found that 5.2% of surveyed participants could not fit their scooters or power chairs through their home's front door, while 1.4% of apartment dwellers were unable to fit their scooter in the building's elevator. Similarly, Wagner et al. (2010) also found that 13.8% of study participants reported finding the steps to their front door too difficult to maneuver, thus decreasing the accessibility of their homes. In addition to steps leading into a home, having steps inside a home can also serve as a barrier/hazard to aging in place via a tripping hazard (Gitlin et al., 2001b; Wagner et al., 2010; Wyman et al., 2007). Numerous older adults therefore attempt to find ways in which to avoid stairs altogether (CMHC, 2008). Whether older adults use a mobility aid or not, the above findings show that access into and movement within one's home can become a challenge for many older adults.

The literature shows that homes also contain many tripping hazards, other than stairs, which may increase fall risk and make aging in place increasingly difficult. For instance, throw rugs are a very common and very dangerous hazard in the homes of many older individuals (Horowitz, Nochajski, & Schweitzer, 2013; Kiata et al., 2008; McNulty et al., 2003; Wyman et al., 2007). In fact, McNulty et al. (2003) reported that throw rugs are one of the most common hazards in the homes of older adults. Specifically, Wyman et al. (2007) found that 72.4% of older participants had a throw rug in the bathroom and 51.7% had one in the kitchen. Moreover, other common tripping hazards include basic clutter and electrical cords (Horowitz et al., 2013; Kiata et al., 2008). Although small, these items can all greatly impact older adults' ability to safely age in place and therefore serve as major hazards in the home.

There are also a number of other common hazards that can make ADLs and aging in place difficult and uncomfortable for older adults. For instance, many barriers in the

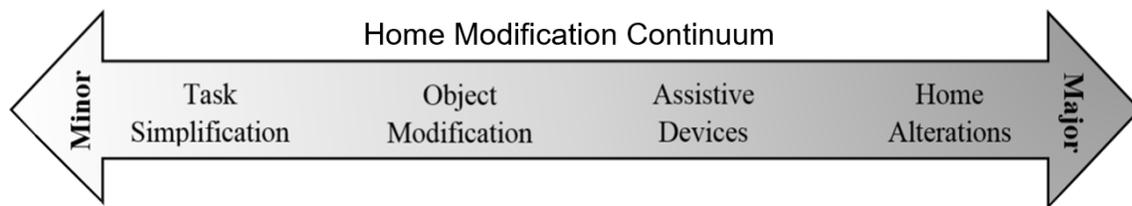
home are related to use of the upper extremities (Iwarsson et al., 2006); such as, cupboards that are out of reach/hard to access (i.e., too high or too low), countertops that are too high to comfortably use and/or access from a seated position, and appliances, outlets, temperature controls, and/or light switches that are out of reach (Danzinger & Chaudhury, 2009; Gitlin et al., 2001b). Additionally, appliances that are hard to open (e.g., ovens) and faucets that do not have a lever handle can all be a challenge for some older adults (Danzinger & Chaudhury, 2009; Gitlin et al., 2001b). Even older adults' choice of furniture (e.g., beds and chairs that are hard to get in and out of) can serve as a barrier to comfortably aging in place (Gitlin et al., 2001b). Furthermore, a lack of adequate lighting can also make the process of aging in place increasingly difficult (Danzinger & Chaudhury, 2009; Gitlin et al., 2001b; Horowitz et al., 2013; Wyman et al., 2007). These examples once again demonstrate that small things can make a huge impact on older adults' ability to safely and comfortably age in place. Although just a brief overview, this section has shown that there are a number of potential environmental hazards and/or barriers in the homes of older adults that could be addressed in order to make them safer places to live.

## **3.2. Home Modifications**

### **3.2.1. What are Home Modifications?**

In order to make older adults' homes safer places to live, both empirical and conceptual literature on aging in place suggest that individuals make environmental changes or HMs (Aplin et al., 2013; CMHC, 2008; Clemson et al., 1999; Cumming et al., 1999; Hartje et al., 2006; Hazen & McCree, 2001; Hwang et al., 2011; Johansson et al., 2009a; Johansson et al., 2009b; Liu & Lapane, 2009; Nishita & Pynoos, 2005; Pynoos, 1992; Stark et al., 2009; Stark, 2004; Verbrugge & Jette, 1994). The aim of HMs is to reduce the demand that environments place on older adults, thus increasing their independence, allowing them to maintain their normal routines, giving them the freedom to be spontaneous, and making their homes user friendly, safe, and secure places to live (Hartje et al., 2006; Hwang et al., 2011; Johansson et al., 2009b; Tanner et al., 2008). This section will provide a brief overview of what HMs are.

The term 'home modifications' encompasses a wide array of environmental changes, both large and small. In their work on HMs, Gitlin and Corcoran (1996) presented a comprehensive categorization of available HMs, which incorporated everything from minor changes (e.g., the removal of clutter) to major alterations (e.g., widening doorframes). This classification system was initially designed to categorize HMs specifically for individuals with dementia. However, a review of the categories shows that they are also applicable to individuals with functional declines as well. The four categories presented by Gitlin and Corcoran (1996) include task simplification, object modification, assistive devices, and home alterations. This classification helps provide those who are not familiar with the extensive range of HM items and changes with a well-rounded and comprehensive frame of reference. Figure 3.1 demonstrates how these four categories can be arranged to display the range of available HMs from minor to major renovations.



**Figure 3-1 Home Modification Continuum - based on Gitlin and Corcoran (1996)**

First, the goal of task simplification is to reorganize or change the environment in a way that will lessen its demand on individuals and make IADLs and ADLs easier to perform (Gitlin & Corcoran, 1996). For individuals with dementia, this could include providing visual or tactile prompts as a way to assist with the independent completion of tasks (e.g., brushing one's own teeth) (Gitlin & Corcoran, 1996). For individuals with functional declines, this could involve rearranging the home so regularly utilized items are within reach; this way older adults do not have to use something like an unstable footstool to reach these items (Rogers et al., 2004).

Second, object modification refers to making small adjustments and/or changes to existing items in a home (Gitlin & Corcoran, 1996). For example, this could include making homes safer for individuals with dementia by disabling the stove (Gitlin & Corcoran, 1996). For older adults, with and without dementia, this classification could also include making

homes safer through the removal of clutter and/or extra objects that serve as a tripping hazard (e.g., throw rugs) (Gitlin & Corcoran, 1996).

Third, according to Gitlin and Corcoran (1996), assistive devices refer to items that are added to a home in order to make it a safer place for older adults to age in place. These devices, which are suitable for both individuals with and without dementia, can include items to increase safety and independence in the bathroom such as grab bars, raised toilet seats, and shower chairs (Gitlin & Corcoran, 1996; Olsen et al., 1996). Additionally, assistive devices can also include items specifically for the homes of individuals with dementia, such as locks on cupboards that contain potentially harmful items (e.g., knives or poisonous cleaners) (Gitlin & Corcoran, 1996; Olsen et al., 1996).

Finally, home alterations refer to large scale home renovations (Gitlin & Corcoran, 1996). These large scale changes can include modifications such as the addition of ramps to a home's entrance, the installation of walk-in showers, and/or the addition of backyard fencing to stop individuals with dementia from wandering beyond the property lines alone (Davis, 1991; Gitlin & Corcoran, 1996)

### **3.2.2. What is the Effectiveness of Home Modifications?**

As previously mentioned, HMs are often suggested as a way to improve the homes of older adults and make the dwellings safe and comfortable places to age. However, it is important to ensure the effectiveness of HMs before recommending them to all older adults wishing to age in place. In order to gain a comprehensive perspective on HM effectiveness, the following section will review the current literature within five categories: safety and independence, falls reduction, perceived safety, support for individuals with dementia, and support for caregivers.

#### ***Safe and Independent Physical Functioning***

Safe and independent functioning is critical to aging in place. Yet, when it comes to promoting safety and independence in the home, the evidence of HMs' efficacy is mixed. This sub-section will highlight findings related to the impact of HMs on physical functioning, ADL and IADL performance, and mobility.

For physical functioning, positive increases in functional performance and decreases in functional decline have been reported following the implementation of HMs, with the benefits lasting for at least two years following the intervention (Stark, 2004; Stark et al., 2009; Unwin et al., 2009). Older adults have also subjectively reported an increased level of satisfaction with functional performance following HMs (Stark, 2004; Stark et al., 2009). It has also been found that older adults who implement HMs experience less functional decline than those who do not integrate HMs into their residences (Liu & Lapane, 2009; Mann, Offenbacher, Fraas, Tomita, & Granger, 1999). Additionally, according to one study, HMs were found to result in increased occupational performance for all older adults receiving them (Stark, 2004). HMs may also improve gait, balance, and reach (Lin, Wolf, Hwang, Gong, & Chen, 2007). However, with respect to physical independence, occupational performance, and gait, the results are inconclusive as not all studies have been able to find evidence to support the use of HMs (Lin et al., 2007; Mann et al., 1999; Turner, Arthur, Lyons, Weightman, Mann, Jones, & Lannon, 2011; Van Haastregt, 2000).

Similarly, the findings related to ADL and IADL performance following the introduction of HMs are mixed. For instance, it has been found that older adults have fewer problems performing some ADLs once HMs are installed (Lin et al., 2007). Also, in comparison to older adults who do not implement HMs, it has been shown that those with HMs demonstrate less overall ADL/IADL struggle and decline (Gitlin, Winter, Dennis, Corcoran, Schinfeld, & Hauck, 2006; Van Haastregt, 2000). Specifically, the study by Gitlin et al. (2006) found that HMs can lead to increased self-care, especially when it comes to bathing and toileting. Additionally, the implementation of HMs can even lead to more self-efficacy and self-assurance when it comes to ADL performance (Gitlin et al., 2006). However, many of these positive outcomes following HMs, are not considered to be long lasting, which may not strongly support their overall effectiveness (Gitlin et al., 2006; Van Haastregt, 2000).

There have also been studies that examine HMs targeting mobility related issues some older adults face while trying to age in place. A number of these studies found no evidence to support that those with HMs have increased mobility, mobility control, and/or mobility range when compared to older adults without HMs (Gitlin et al., 2006; Van

Haastregt, 2000). Using descriptive statistics, Mann et al. (1999) found, that individuals who got HMs showed more mobility declines than those without HMs, however when the scores were standardized it was found that those with HMs showed slightly less decline in mobility than those without HMs.

Although the research on the efficacy of HMs for safe and independent functioning is mixed, it is important to note that findings do suggest that HMs are particularly effective when they target the specific needs and abilities of older individuals (Liu & Lapane, 2009; Unwin et al., 2009). This means that proper person-environment fit is key in finding HMs that promote safety and independence in the home. This is a positive finding when reviewing the usefulness of HMs, because it shows that properly fitting HMs can make a difference when it comes to safe and independent functioning.

### ***Falls Reduction***

It has been found that the majority of the falls older individuals experience occur in their own home (Tideiksaar, 1986 as cited by Northridge & Levick, 2002). Therefore, falls reduction is a critical area to examine when discussing ways to increase older individuals' ability to age in place safely. However, when it comes to reducing the number of falls older adults suffer in the home, the effectiveness of HMs as a standalone solution are mixed (Rose, 2002; Tse, 2005).

When compared to both themselves before HMs and other individuals without HMs, it has been found that older adults experience fewer falls following HM implementation (Campbell et al., 2005; Cumming et al., 1999; Day, Fildes, Gordon, Fitzharris, Flamer, & Lord, 2002; Gitlin et al., 2006; Nikolaus & Bach, 2003; Peel, Steinberg, & Williams, 2000; Pighills, Torgerson, Sheldon, Drummond, & Bland, 2011; Rogers et al., 2004; Rose, 2002). However, in some cases, it was discovered that HMs were more effective for the population of older adults who had a history of falls in the home (Campbell et al, 2005; Costello & Edelstein, 2008; Cumming et al., 1999; Lord, Menz, & Sherrington, 2006; Nikolaus & Bach, 2003; Tse, 2005). Although, it should be noted that some research that has not been able to find a connection between falls history and HM efficacy (e.g. Lin et al., 2007; Stevens, Holman, Bennett, & de Klerk, 2001; Van Haastregt, 2000). In fact, many studies have found that HMs make little to no impact on falls reduction at all (e.g.

Lord et al., 2006; Peel et al., 2000; Stevens et al., 2001; Tse, 2005; Van Haastregt, 2000). According to a literature review by Lord et al. (2006), only one out of the five randomized control trials (RCTs) reviewed showed a reduction in falls following the implementation of HMs. Similarly, Turner et al.'s (2011) found that 11 of 19 RCTs showed HMs to be ineffective in reducing falls. In addition, other research has found that HMs, even if they do reduce the number of falls older adults' experience, do not significantly reduce the level of injury caused by a fall (Campbell et al., 2005; Peel et al, 2000; Stevens et al., 2001).

Falls are caused by a variety of factors in older adults' lives (Northridge & Levick, 2002; Pynoos et al., 2012; Rose, 2002); therefore, there is an assortment of intervention techniques aimed at reducing the risk for falls. When HM interventions were compared to other intervention methods (e.g., education or exercise) it was found that HMs do not result in fewer falls (Lin et al., 2007). Therefore, many researchers have posited that since falls are the result of numerous factors, then the only way to effectively reduce them is to combine several methods into one large multifactorial intervention (Day et al., 2002; Lord et al., 2006; Northridge & Levick, 2002; Pynoos et al., 2012; Rose, 2002; Tse, 2005). Day et al. (2002) provided proof for this notion by finding that the effectiveness of HM interventions for falls improved once combined with exercise and/or vision correction.

Other suggestions for ensuring the effectiveness of HMs for falls prevention include realizing that individuals' needs change as they age, therefore, HMs need to adjust to meet individuals' current needs and abilities (Pynoos et al., 2012). Specifically targeting HMs to individuals' needs and abilities will help increase efficacy (Campbell et al., 2005; Costello & Edelstein, 2008; Lord et al., 2006; Northridge & Levick, 2002; Pynoos et al., 2012; Rose, 2002). Also, having professionals do proper assessments of the home plays a big part in ensuring that HMs are successful reducing the risk of falls (Costello & Edelstein, 2008; Northridge & Levick, 2002; Pighills et al., 2011; Pynoos et al., 2012; Rogers et al., 2004; Rose, 2002; Tse, 2005).

### ***Perceived Safety***

Current research has not thoroughly examined older adults' perception of safety following the implementation of HMs. A study by Tanner et al. (2008) found that HMs can increase older individuals' feelings of safety, security, and comfort. However, Petersson,

Lilja, and Borell (2012) found that HMs alone do not increase older adults' perceived level of safety. Rather, the latter study found that older adults must first meet the following three prerequisites: feeling healthy, having someone to rely on, and feeling at home in order to feel safer following the implementation of HMs (Pettersson et al., 2012). Again, this highlights the importance of taking the individuals into consideration when measuring the impact of HMs on peoples' ability to age in place.

Although the amount of research on older adults' perceived level of safety following HMs is limited, several publications have examined the impact of HM installation on individuals' fear of falling. Similar to the findings on falls reduction, the studies looking as HM's impact on fear of falling were mixed. For instance, Lin et al. (2007) found that older adults experience a reduction in their level of fear related to falling following HM implementation. Cumming et al. (2001) found that 73% of participants thought that making the home safer could help prevent falls. Additionally, Gitlin et al. (2006) found that those with HMs exhibit less fear of falling than those without HMs. However, not all studies showed such support for the use of HMs to reduce individuals' perceived level of fear. For example, Van Haastregt et al. (2000) found that any significant difference in fear between individuals with and without HMs does not last as time goes on. In fact, some research states that there is no association at all between HMs and the lowering of individuals' level of fear when it comes to falling (Pighills et al., 2011). One study in particular found no difference in the level of fear displayed by older adults with or without HMs (Peel, 2000). The differing results showing again that the impact of HMs may have more to do with the individuals utilizing them than the HMs themselves.

### ***Support for People with Dementia***

As previously discussed, HMs can also be utilized specifically to help individuals with dementia to age in place. Research suggests the use of HMs as a way to delay the institutionalization of individuals with dementia (Gitlin & Corcoran, 1996). Unfortunately, much of the literature on HMs for individuals with dementia is conceptual, in fact only two articles identified for this section of the review were empirical studies (i.e. Calkins & Namazi, 1991; Gitlin, Corcoran, Winter, Boyce, & Hauck, 2001a).

Many of the same issues that individuals face with functional declines also face those with dementia; such as declines in functional ability, reduced ADL and IADL independence, limited mobility, and falls risk. When it comes to individuals with dementia and overall functional decline, the theoretical literature suggests that HMs can serve as a way to slow this decline (Gitlin & Corcoran, 1996). Similarly, it is suggested that HMs can serve as a way to reduce falls for those with dementia (Gitlin & Corcoran, 1996; Rogers et al., 2004). When it comes to the impact of HMs on ADL and IADL independence, amongst individuals with dementia, the empirical literature supports the fact that HMs can slow IADL decline, however HM's were not found to impact ADL decline (Gitlin et al., 2001a). The empirical evidence also shows that caregivers of older adults with dementia believe that the HMs they utilize have aided individuals with dementia in some way (Calkins & Namazi, 1991). In particular, they reported that HMs assisted with increasing individuals with dementia's level of independence and safety in the bathroom, kitchen, and living/dining room (Calkins & Namazi, 1991).

Individuals with dementia also face unique challenges to aging in place which can be made easier through the use of HMs. For example, HMs have been found to assist with the management of wandering behaviours (Calkins & Namazi, 1991). Additionally, the conceptual work suggests HMs can reduce the problem behaviours associated with dementia (Gitlin & Corcoran, 1996), however the empirical work has not shown HMs to be effective at significantly reducing said behaviours (Gitlin et al., 2001a). When it comes to ensuring or enhancing the effectiveness of HMs it has been suggested that they be targeted at the specific behaviour they want to promote or detour (Gitlin & Corcoran, 1996). Examples of this include installing locks on the doors of individuals who tend to wander or providing a walk-in shower for individuals who display resistance to bathing (Gitlin & Corcoran, 1996).

Since individuals with dementia faces their own unique and individualized challenges it makes testing HM's effectiveness difficult (Gitlin & Corcoran, 1996). Therefore, in order to increase effectiveness, HMs need to be designed to suit individuals' specific needs (Charness & Holley, 2001; Gitlin & Corcoran, 1996; Gitlin & Corcoran, 2000; Olsen et al., 1996; Pynoos et al., 2012; Unwin et al., 2009). In addition, since dementia is a progressive disorder HMs should match the stage of dementia individuals

are at and should continue to change as the dementia progresses, because what is most effective in the early stages may not aid individuals with later stage dementia (Davis, 1991; Gitlin & Corcoran, 1996; Olsen et al., 1996). For example, individuals in the earlier stages need HMs that will increase their independence, such as a grab bars in the bathtub, while those with later stages of dementia will require more HMs aimed at assisting caregivers (e.g. a large bathroom and roll in shower) (Olsen et al., 1996). Two additional suggestions on improving the efficacy of HMs for individuals with dementia include being sure the HMs promote safety and independence without being too restrictive (Olsen et al., 1996; Unwin et al., 2009). As well as introducing HMs into individuals lives at a gradual pace, allowing them time to adapt to the changes in their environment (Gitlin & Corcoran, 1996; Gitlin & Corcoran, 2000). The research in this area again highlights the importance of individualized HMs.

### ***Support for Caregivers***

HMs are also suggested as a way to aid formal and informal caregivers, particularly the caregivers of individuals with dementia (Barlow & Venables, 2004). Therefore, another way to measure the effectiveness of HMs is to examine the impact that HMs have on caregivers. Many of the studies discussed in this section address HMs as a way to aid caregivers of people with dementia, consequently some of the findings from the previous section on support for people with dementia will be echoed again here.

According to the empirical literature, the majority of caregivers (85%) find the implementation of HMs to be beneficial (Calkin & Namazi, 1991). In particular, they find 77% of HMs to be effective (Calkins & Namazi, 1991). The HMs aid caregivers in providing ADL assistance, lead to reduced physical demands, and help caregivers to watch over individuals with dementia (Gitlin & Corcoran, 1996; Olsen et al., 1996). It has also been found that HMs, which increase individuals with dementia's ADL and IADL independence, lessen caregiver stress, upset, and emotional burden (Calkins & Namazi, 1991; Olsen et al., 1996; Unwin et al., 2009). Caregivers also report that HMs help create calmer homes because they lead to a reduction in havoc and confusion (Calkins & Namazi, 1991). However, despite these positive results, one study by Gitlin et al. (2001a) did find that HMs are not effective when it comes to increasing caregiver self-efficacy and reducing caregiver upset related to handling ADLs, IADLs, and/or behaviour problems. Gitlin et al.

(2001a) speculated that the lack of statistically significant results was due to the following; the impact of the intervention was found to be inconsistent across subgroups thus weakening the final results, the study was cross-sectional and may not have allowed enough time between the intervention and the follow-up, the intervention was not strong enough, there was a ceiling effect, and/or the fact that not all of the recommended interventions were implemented by the caregivers.

It is important to note that, similar to previous findings, to be effective HMs must suit the needs of the caregivers (Charness & Holley, 2001; Gitlin & Corcoran, 1996; Gitlin & Corcoran, 2000). For example, in the study Gitlin et al. (2001a), HMs were not found to lead to significant changes in self-efficacy and upset amongst the study's caregivers as a whole. However, positive benefits were found in a few caregiver subgroups. For example, minority caregivers showed more improvements in self-efficacy related to ADLs and IADLs than Caucasian caregivers (Gitlin et al., 2001a). Male caregivers demonstrated fewer improvements in ADL assistance and dealing with problem behaviours than female caregivers (Gitlin et al., 2001a). Also, when it came to reducing upset related to dealing with problem behaviours, caregivers who were the spouses of individuals with dementia found HMs more beneficial than non-spousal caregivers (Gitlin et al., 2001a). Finally, it is also important to remember that as the needs of individuals with dementia progress, the HMs that will best support caregivers will change (Davis, 1991; Gitlin & Corcoran, 1996; Olsen et al., 1996), further highlighting the importance of finding HMs that suit the unique needs of individuals for the most effective results.

### ***Summary of Effectiveness***

The results from the previous research discussed here, when taken as a whole, show the effectiveness of HMs to be mixed. The importance of Person-Environment Fit (i.e. the Competence-Press Model; Lawton, 1982; Lawton & Nahemow, 1973) is evident as it has been shown time and time again that for HMs to be the most effective, they must suit the individuals utilizing them (e.g. Campbell et al., 2005; Charness & Holley, 2001; Gitlin & Corcoran, 1996; Gitlin & Corcoran, 2000; Liu & Lpane, 2009; Northridge & Levick, 2002; Olsen et al., 1996; Pynoos et al., 2012; Rose, 2002; Unwin et al., 2009; Wahl et al., 2009). Overall showing that HMs, when properly implemented, can be an effective solution for older individuals who wish to age in place.

### **3.3. Adoption of Home Modifications and the Decision Making Process**

Studies have shown that there are older adults interested in implementing HMs (e.g. Aplin et al., 2013; Kruse et al., 2010; Wagner et al., 2010). However, other research has found that there are also a number of reasons why some older adults are not interested or able to incorporate HMs into their homes (e.g. Clemson et al., 1999; Kruse et al., 2010; Naik & Gill, 2005). As discussed, this is a major source of concern, because in order for HMs to have a positive effect, older adults must implement them first (Cumming et al., 2001).

The decision making process behind the adoption of HMs is complex (Yuen & Carter, 2006). It is a highly individualized process, in which both subjective and objective influences have the potential to impact the final decision (Aplin et al., 2013; Fange & Iwarsson, 2003; Gitlin et al., 2009; Johansson et al., 2009a; McNulty et al., 2003; Yuen & Carter, 2006). In fact, the literature points to a wide array of subjective and objective factors that can influence older adults' opinion of HMs and their decision to implement them (e.g. Ahn & Hedge, 2011; Aplin et al., 2013; Bunn et al., 2008; Clemson et al., 1999; Cumming et al., 2001; Currin et al., 2012; Danziger & Chaudhury, 2009; Gignac et al., 2002; Hwang et al., 2011; Johansson et al., 2009a; Johansson et al., 2009b; Kruse et al., 2010; Leland et al., 2010; Mace, 1998; Mathieson et al., 2002; McNulty et al., 2003; Nishita & Pynoos, 2005; Naik & Gill, 2005; Pynoos, 1992; Rubinsein & Parmelee, 1992; Slangen-de Kort et al., 1998; Stark et al., 2009; Tanner et al., 2008; Wiles et al., 2011; Yuen & Carter, 2006). The following section will expand on how a number of these objective and subjective factors impact older individuals' choice to implement HMs. It will also touch on how these objective and subjective factors can interact with one another to result in a final decision.

#### **3.3.1. Objective Factors**

An objective factor is one "based on facts rather than feelings or opinions" (Objective, n.d., para. 1). Both the conceptual and empirical literature on the decision making process point to a host of objective factors that can affect individuals' decision to

implement HMs or not. Objective factors addressed in the following section include: cost, homes' physical structure, access to resources, service providers and regulations, resale value, homeownership, individual factors (e.g. health status), and knowledge of HMs.

### **Cost**

The cost associated with the implementation of HMs is one of the most commonly cited objective factors in the literature (e.g. Aplin et al., 2013; Barlow & Venables, 2004; CMHC, 2008; Gitlin & Corcoran, 1996; Mathieson et al., 2002; McNulty et al., 2003; Pynoss, 1992; Wagner et al., 2010). Cost has been found to play a major part in many individuals' decision to implement HMs (Aplin et al., 2013; Barlow & Venables, 2004; CMHC, 2008; Gitlin & Corcoran, 1996; Mathieson et al., 2002; McNulty et al., 2003; Pynoss, 1992; Wagner et al., 2010). In their research on access to home and community based services in rural areas, Li (2006a) found that cost was one of the primary barriers related to HM adoption. Specifically, cost was found to be a barrier to HM implementation 33.3% of the time (Li, 2006a). Therefore, cost is an important factor to consider, especially when it comes to large scale renovations, such as the installation of roll-in-showers or stair-lifts (Pynoss, 1992). For many individuals the cost of daily living (i.e. food, clothing, and shelter) takes priority, thus leaving them with nothing left over for HMs (Mathieson et al., 2002). In a survey on housing, Wagner et al. (2010) found that 49.5% of participants could not afford needed HMs. Therefore, finding ways to remove or reduce the costs related to HMs is believed to help increase overall HM implementation amongst older adults (Aplin et al., 2013; Wyman et al., 2007).

### ***The Physical Structure and Age of the Home***

A home itself can also objectively impact older adults' decision to make HMs or not. A home's existing structure must be able to accommodate any needed HMs, for instance not all bathrooms are designed to fit a roll-in-shower for wheelchair users (Aplin et al., 2013; Gitlin & Corcoran, 1996). Therefore, not all older adults can follow through with necessary HMs, as the physical structure of their home does not allow them to do so. The age of the home can also impact if older adults find HMs necessary or not. One study found that homes built between 1951 and 1970 are more likely to have been modified than those built outside of this timeframe (Ahn & Hedge, 2011). Perhaps this is due to the difference in the quality or style of housing built during certain timeframes. Overall these

reported findings show that homes themselves can objectively play a role in the adoption of HMs.

### ***Regulations and Services Providers***

The implementation of HMs often involves having to deal with a large number of service providers and organizations, such as contractors and city officials, a fact which can deter many individuals from pursuing HMs (Aplin et al., 2013; Johansson et al., 2009a; McNulty et al., 2003). These older persons find the whole HM process to be too much effort, too complicated and/or too restrictive, therefore they choose not to implement needed HMs (Aplin et al., 2013; Johansson et al., 2009a; McNulty et al., 2003). For instance, Aplin et al. (2013) found that some individuals indicate that having to meet mandatory housing regulations while implementing HMs can be a struggle, this negatively impacting their decision making process, and consequently, rather than implementing the HMs to code they forego the project entirely.

The research also shows that it is rare for older individuals to access outside agencies to complete HMs for them; older adults only use these services about 27% of the time (Currin et al., 2012). However, when they do, the chances that the HMs will be completed rise dramatically from 41% to 71% (Currin et al., 2012). Therefore, having programs run through senior's organizations, where volunteers can help with the installation of small HMs (e.g. tacking down carpets/ rugs) could be extremely helpful (CMHC, 2008).

### ***Home's Resale Value***

Individuals have also indicated that the decision making process can be impacted by how HMs affect homes' resale value (Aplin et al., 2013). Some homeowners are concerned that the appearance of HM's will result in decreased resale value (Aplin et al., 2013). This idea that HMs may negatively impact the resale value of the home may therefore explain why larger scale project and/or more visible projects have a lower rate of adherence (Cumming et al., 2001). If HMs were more acceptable throughout society, then perhaps HMs would lead to increased resale value.

### ***Home Ownership versus Renting***

Whether older individuals own or rent can also objectively impact the implementation of HMs (Hwang et al., 2011; Struthers, 2005). Renters are dependent on landlords to make any needed HMs or repairs; consequently, renters have a lack of individual power in the HM decision making process (Struthers, 2005). Homeowners, on the other hand, retain the power to make their own HM choices (Hwang et al., 2011). Especially, when they are the only family occupying the house, as it has been found that homeowners of single-family dwellings are the most likely group to make HMs (Hwang et al., 2011).

### ***Rural versus Urban***

The location in which individuals live, whether it be rural or urban in nature, can also play a part in the decision making process. For instance, Struthers (2005) suggests that numerous rural areas face issues when it comes to providing older adults with appropriate housing and housing related services. Issues such as this can therefore impact how older adults living in rural versus urban areas come to the decision to implement HMs. Li (2006a) looked at barriers to home and community service in rural areas and found that when it came to HMs and HM services there is a lack of availability for 5.1% of the older rural participants. Additionally, a lack of awareness about HMs and HM services (38.5%) and the costs related to HMs and HM services (33.3%) were found to be the most common barriers impacting rural older adults in the study (Li, 2006a).

Li (2006b) also conducted research to see if the caregivers of older adults in both rural and urban areas, who had accessed home and community services, felt that their needs were being met. When looking at all the home and community services (e.g. meals on wheels, assistive devices, respite care, etc.) 38.4% of the sample indicated that their needs were not being met, of which 74.9% were urban dwelling older adults and their caregivers (Li, 2006b). Specifically, 24.3% of urban dwelling older adults and 14.3% of rural dwelling older adults, who had access to HMs, felt their needs were not being met (Li, 2006b). Analysis of this data found the difference between urban and rural older adults on HMs to be insignificant (Li, 2006b). However, it is interesting to note that more urban, rather than rural, dwelling older adults felt their needs were not being met, which goes

against what the author had expected (Li, 2006b). Li (2006b) suggested that the urban dwelling older adults may have higher expectations when it comes to services, such as HMs, therefore, they feel that their needs are not being met, despite having greater access to service than those in the rural community. However, Li (2006b) notes that only future qualitative analysis would be able to properly address this postulation.

### ***Individual Objective Factors***

Objective factors related to the individuals themselves can also play a part in the decision making process. For instance, it has been found that individuals' objective history of falls can impact their choice to implement HMs or not (Clemson et al., 1999; Leland et al., 2010). Specifically, Leland et al. (2010) found that the more falls older adults experience, particularly falls resulting in injury, the more likely they are to implement HMs. It has also been found that the level of dependency individuals face when it comes to ADLs can impact their decision making process. Naik and Gill (2005) found that those who are dependent on the assistance of someone to complete bathroom related ADLs (e.g. transferring, showering) are more likely to implement HMs than those who only have difficulty doing said tasks. Similarly, Cumming et al. (2001) found that those who receive more informal care often follow through with more HMs. Finally, the health of older individuals can also directly impact the decision to implement HMs or not. Currin et al. (2012) found that those with a higher prevalence of comorbidities showed a greater level of HM adherence. However, Mathieson et al. (2002) found that those with the highest level of impairment are less likely to turn to HMs than those with more mild impairments. Showing that the impact of objective health factors on the decision to implement HMs is not as linear as one may assume.

### ***Knowledge of Home Modifications***

Individuals' objective level of knowledge related to HMs and environmental risks can also impact the decision making process (Aplin et al., 2013; Clemson et al., 1999; Slagen-de Kort et al., 1998; Wyman et al., 2007). Individuals who are more educated on the benefits of HMs have been shown to be more likely to implement them (Slagen de Kort et al., 1998). In one study, participants were split into two groups, one group received falls education, which included information on HMs, and the other group received general health information (Wyman et al., 2007). Following these interventions, 69.1% of those in

the falls education group planned to implement HMs, while only 8% of those in the basic health education group displayed interest in HMs (Wyman et al., 2007). It has also been found that if individuals have implemented HMs for falls in the past they are more likely to know the benefits and therefore they are more likely to implement them again (Yuen & Carter, 2006). The previous finding therefore shows that if individuals recognize HMs as helpful with present and/or future declines then they are more likely to implement them (Aplin et al., 2013).

### **3.3.2. Subjective Factors**

On the other side of the spectrum, a subjective factor is one “based on feelings or opinions rather than facts” (Subjective, n.d., para. 1). Another way to look at it is that subjectivity is how individuals “experienc[e] things in [their] own mind” (Subjective, n.d., para. 1). The literature often focuses on objective factors, but there is a definite need to take individuals and their subjective wants and needs into consideration (Oswald, Wahl, Martin, & Mollenkopf, 2003). How individuals subjectively views their home may be completely out of line with its objective condition. When Struthers (2005) asked older adults to rate their homes out of ten, 83% gave their home a score of between eight and ten, no matter the objective condition of the structure. Older individuals’ decision to adopt HMs can also be impacted by how they view the aging process and what it means to them to be ‘old’ (Renaut et al, 2015). Consequently, it is extremely important to take the subjective wants, needs, and opinions of older individuals into consideration when studying the factors impacting the decision making process. This section will review subjective factors that have been found to impact the HM adoption process such as avoidance and denial, the opinion of others, stigmatization, preference for non-environmental solutions, belief in HMs, aesthetics, and ultimately control.

#### ***Avoidance and Denial***

When it comes to the implementation of HMs, some individuals are not interested, some deny needing them, and some have simply never considered HMs before (Bunn et al., 2008; Clemson et al., 1999; Hazen & McCree, 2001; Kruse et al., 2010; Naik & Gill, 2005; Wagnild, 2001), showing that for many individuals there is a certain level of avoidance and even denial when it comes to the need for HMs (Kruse et al., 2010). When

interviewing older adults about aging-in-place, Wagnild (2001) found that although most individuals wanted to grow old in their current homes, many had not considered ways in which to do so. When asked about barriers to aging-in-place, most participants left the question blank; Wagnild et al. (2001) conjecture that this could be because the participants had already fixed the barriers in their homes, had never considered what barriers were present previously, or were unable to admit that they may face barriers to aging-in-place. In a study by Kruse et al. (2010), they looked at older adults' attitudes towards HMs for fall prevention and found that many of the participants expressed no interest in making even the smallest modifications. In fact, most would rather have avoided the topic of falls risk all together (Kruse et al., 2010). This could be because some older adults cannot believe and/or cannot admit that they are aging and therefore are in need of increased help and HMs to safely and comfortably remain in their homes (Kruse et al., 2010; Wyman et al., 2007). The factors of denial and avoidance are therefore critical to understand when studying the decision making process behind HMs.

### ***Comparison to Others***

It has been found that there is a tendency for older individuals, even those in objectively bad health, to compare themselves to those in similar circumstances (Baltes & Baltes, 1990). A systematic review conducted by Bunn et al. (2008), found that even though individuals acknowledge how helpful both environmental and behavioural strategies can be at preventing falls for others, they still insist that they themselves do not need to utilize said strategies. This finding is in line with another study that found that the barriers which older adults identify as a problem for others are often different than the ones they identify as being potential problems for themselves (Wagnild, 2001). The research shows that while some older adults may be facing difficulties to aging in place, they believe that they are doing better than other people in their age and/or health bracket and therefore they decide that they do not personally need HMs.

### ***Suggestion of Others***

Individuals will often look to other people for validation before committing to a HM (Clemson et al., 1999). There are a number of people whom can have a positive or negative impact on the final decision to implement HMs or not (e.g. occupational therapists, doctors, family members, caregivers, landlords, and friends) (Davis, 1991;

Johansson et al., 2009b). For example, the literature has found that many individuals with dementia are reliant on their caregivers to aid in the process of aging in place (e.g. ADL assistance) (Davis, 1991), therefore the caregivers hold the power when it comes to HMs. The research therefore, demonstrates the influence of others can greatly impact the decision making process (Aplin et al., 2013; Clemson et al., 1999).

### ***Stigmatization***

In the same vein, individuals may also be impacted by what they believe others (e.g. strangers, friends, and family) will think of them if they adopt HMs. Bunn et al. (2008) discuss how the stigma attached to both falls and HMs, such as grab bars, can actually stop many older individuals from considering HMs. The perceived opinion and/or judgement of others greatly impacts the decision making process. Making stigmatization a very impactful subjective factor to keep in mind.

### ***Behavioural and Non-Environmental Changes***

For a number of reasons (e.g., stigma, not believing that HMs are effective, not having access to HMs) many older adults, when faced with functional decline, will choose to find solutions other than HMs. Some will find ways in which to change their behaviour (Fogel, 1992; Kruse et al., 2010). In Kruse et al.'s (2010) study on falls prevention, many of the participants reported that they would rather make behavioural changes than implement HMs. This was especially true if the individuals blamed their own actions as being the cause of the fall, rather than the environment playing a role (Kruse et al., 2010). Some people will even find ways to avoid identified safety hazards in their own homes rather than make the necessary environmental changes (Fogel, 1992; Kruse et al., 2010). Some individuals will also turn to other non-environmental solutions such as exercise programs, eyesight checks, footwear checks, and/or medication reviews before they even consider HMs (Bunn et al., 2008). Perhaps, in line with the selective optimization and disablement process models, these individuals perceive these options as better and/or more effective options to meet their wants and needs.

## ***Personal Belief in Home Modifications***

When discussing objective factors, it was mentioned that many individuals need clear proof that there is a hazard in the home as well as proof that a HM can effectively solve the issue before they will adopt a HM. However, there is also a subjective piece to the puzzle, as individuals not only need objective proof, they also subjectively need to believe that there is a problem and that a HM will work. For instance, it has been found that individuals will implement more HMs for the hazards that they recognize and accept as being a problem (McNulty et al., 2003). Therefore, if older adults truly believe that HMs will increase their safety (e.g. prevent more falls), they are more likely to implement them (Cumming et al., 2001; Kruse et al., 2010; Yuen & Carter, 2006). In fact, the only difference that Cumming et al. (2001) found when comparing those who did and did not implement HMs was if individuals' believed that the HM would work or not. Specifically, it was found that believing HMs will work resulted in individuals being twice as likely to implement HMs (Cumming et al., 2001). Showing the importance ones subjective belief can have in the decision making process.

## ***Aesthetics***

The subjective opinion of individuals in relation to their home's design, aesthetics, ambiance, and appearance is another major factor that can impact their choice to implement HMs or not (Aplin et al., 2013; Kiata et al., 2008; Kruse et al., 2010). For many older adults, the personalization, décor, and the overall look of their home takes priority over making the home safer (Kruse et al., 2010). Many individuals fear that HMs will make their home appear institutional (Kruse et al., 2010). In addition, many individuals feel that they will no longer be satisfied with their home if they have to make aesthetic changes to it (Ahn & Hedge, 2011; Clemson et al., 1999). People's identity is often closely connected to their home (Aplin et al., 2013; Clemson et al., 1999). The meaning individuals attach to their home and the possessions in that home can be very important. In fact, meaning of home and attachment to place can be so important in the study of environmental gerontology, that these two terms in relation to HMs will be discussed in more detail in a subsequent section (Section 3.3.5).

## **Control**

Overall, many of the subjective factors discussed in this section have one thing in common: control. Individuals want to retain a sense of control over their own lives (Aplin et al., 2013; Bunn et al., 2008; Clemson et al., 1999; Johansson et al, 2009a; Kruse et al., 2010; Slagen- de Kort, et al, 1998; Tanner et al., 2008; Yuen & Carter, 2006). People want to be independent, and in the eyes of some older adults, HMs take away their sense of independence in the home (Bunn et al., 2008). Individuals want control over the place they call home, therefore when someone else suggests that they modify their household this can come off as a loss of independence, when the general purpose of HMs is to assist in maintaining independence (Kruse et al., 2010). If HMs are to be accepted, older adults need to be in control of the HM decision and implementation process (Clemson et al., 1999; Johansson et al., 2009a). It has been found that the individuals who are happiest with their HMs and HM provider are those who are able to share their input and opinions throughout the process (Tanner et al., 2008). Even the simple perception of control in the HM process has been found to make all the difference (Slagen-de Kort et al., 1998). The research therefore highlights the importance of allowing older adults to retain independence and control over their lives and subsequently HM decisions.

### **3.3.3. An Example of Objective versus Subjective (The Rug)**

As the previous sections have shown both objective and subjective factors can dominate individuals' decision to adopt HMs or not. This following section will offer an example of how the factors governing individuals' decision to adopt HMs or not can differ from person to person, by looking at the decision to remove a rug through both an objective and a subjective lens.

As mentioned earlier, rugs can serve as a major tripping hazard in the homes of older adults; therefore, the removal of a rug is an example of a simple/minor HM (object modification) that can be done to create safer environments for older adults. However, both objective and subjective factors can impact older adults' decision to remove throw rugs from their homes. From an objective perspective, the choice to secure and/or remove rugs is common, because it is an objectively low cost solution, which involves little effort to complete (McNulty et al., 2003). However, for some older adults, the removal of a rug

may not be as simple. In fact, much of the literature shows that the décor of a home often takes precedent over HMs, meaning it is unlikely that a beloved rug would be so easily removed (Kiata et al., 2008; Kruse et al., 2010; McNulty et al., 2003). For example, Kruse et al. (2010) found that many participants would readily tuck away cords which were a tripping hazard, but were far less agreeable when it came time to remove décor related items such as rugs, which were also deemed a fall risk.

Kiata et al. (2008) did an entire study looking at the reasons why older individuals are not interested in removing throw rugs from their homes. During which aesthetic factors were key in many participants choice to keep the rug. Also, many subjectively felt that the rug served a useful purpose (e.g. keeping the carpet beneath it clean) and therefore saw no reason to remove it. Some stated that because they knew where the rug was it was not a problem, they could rely on behavioural modifications such as avoiding the rug or being extra careful around it instead. Overall, it was found that the reasons 43% of the participants (n=13) kept the rugs involved maintaining a sense of control in some way (Kiata et al., 2008). Clearly demonstrating that subjective factors, like objective factors, can dominate the decision process. However, it is important to note that the final decision is not simply a matter of either an objective or a subjective factor. Rather, in many cases it is an interplay between both objective and subjective factors that guides older adults' decision making process, as the next sub-section will detail.

### **3.3.4. Interplay between Objective and Subjective Factors**

As demonstrated by the theories discussed in Chapter Three (i.e. Competence-Press Model, SOC, DPM), no two older adults are the same, and as a result the choice to implement HMs or not is a highly individualized process (Aplin et al., 2013; Fänge & Iwarsson, 2003; Gitlin et al., 2009; Johansson et al., 2009a; Yuen & Carter, 2006). It has similarly been found that the type of HM suggested can also change how individuals view the decision and what objective and subjective factors are in play in the decision making process (Currin et al., 2012). Therefore, individuals may be more or less likely to implement one type of HM over another (Currin et al., 2012). As shown above, even the simple suggestion to remove a rug can be impacted by both subjective and objective factors. Therefore, it is important to look at both types of factors when attempting to

understand older adults' decision making process in a holistic way (Baltes & Baltes, 1990; Currin et al, 2012; Nygren al., 2007; Renaut et al., 2015). It is also important to see how the various contributing factors interrelate and influence one another (Baltes & Baltes, 1990; Currin et al, 2012; Nygren al., 2007; Renaut et al., 2015). Therefore, providing researchers with the most comprehensive look at HM adoption possible.

A study by Aplin et al. (2013) looked directly at the decision making process behind the implementation of HMs. This study included a wide range of ages, including everyone from parents of children with disabilities to older adults dealing with age related declines. From their findings they went on to categorize the diverse range of subjective and objective factors into six overlapping dimensions: personal, societal, physical, temporal, occupational, and social (Aplin et al., 2013). The personal dimension included factors such as the home's appearance, and individuals' perceived safety, privacy, freedom, and choice. Societal included factors like the cost of the HM, the service provider restrictions, and the housing standards that had to be met. The physical dimension included available material, the existing structure, and ambiance. Next, factors such as individuals' future change in function and the resale value of the home comprised the temporal dimension. Next, the occupational dimension included factors such as individuals' ability to conduct self-care and/or meaningful activities. Finally, the social dimension was when individuals took the consideration of others as part of the decision making process (Aplin et al., 2013).

With such a large variety of influencing factors, it is clear how individuals could come to a different decisions. In a recent study by Renaut et al. (2015) they went on to identify four behaviour types when it comes to HM adherence. These types were based on their finding that there are two types of individual: those who proactively make HMs, and those who wait until HMs are needed. These types were also based on Renaut et al.'s (2015) other finding that individuals can be split into two fiscal situations; one where they have the resources and financial freedom needed to make HMs, and another where they do not have access to the needed finances and resources. From these to findings, the four behaviour types were identified. The first type is called "act when the time is right" (p. 1289). These individuals have the resources needed to make HMs, but choose to wait until the HMs were needed before implementing them. Next is "anticipation and prevention" (p. 1291), these individuals also have access to the needed resources,

however, unlike the last group, they chose to proactively implement HMs. These individuals often have been or currently are caregivers, thus they know firsthand what kind of difference a HM can make. However, although these individuals are interested in proactively making HMs, Renault et al. (2015) found that they still try to avoid HMs that they consider stigmatizing. Next, there are the individuals Renault et al. (2015) call “situational compromise or resignation” (p. 1293). These are the individuals who do not have the resources available to them to make HMs, therefore they wait until the HMs are absolutely needed before they even think about implementing them. In many circumstances, financial strain means that these older adults cannot even think about HMs as their finances are better used elsewhere. Finally, there are the “recourse to the domestic economy and co-habitation” individuals (p. 1295). This is when older adults’ live with their children and therefore are able to pool their resources together in order to afford proactive HMs. These four behaviours do a great job in showing how the complex interaction of personal and environmental factors, such as life course and SES, can impact the adherence process (Renaut et al., 2015). Thus, highlighting the importance of a holistic perspective to the HM decision making process.

Overall, the complex interaction between objective and subjective factors outlined here shows the importance of a holistic perspective when studying HM adoption. Although there are studies on HM adoption out there, the empirical research in this area is still lacking (Yuen & Carter, 2006), meaning there is a need for more studies on HM adoption from a holistic perspective. Both researchers and those directly involved in the HM profession, such as occupational therapists, will benefit from utilizing a well-rounded and all-inclusive perspective in studying and increasing adherence (Aplin et al., 2013; Clemson et al., 1999; Currin et al., 2012; Nygren et al., 2007).

### **3.3.5. Role of Subjective “Meaning of Home” and Attachment to Place**

Meaning of home and attachment to place are two important and interrelated concepts in the study of environmental gerontology. Therefore, when studying the decision making process behind HM adoption, aging in place and meaning of home are

two key concepts to understand. This section will discuss aging in place and meaning of homes' impact on older adults.

Individuals are considered attached to their residence when they go from seeing their house as simply an objective physical structure to a home of more subjective significance (Cristoforetti, Gennai, & Rodeschini, 2011; Rubinstein & Parmelee, 1992; Willes et al., 2009). These positive feelings and sense of attachment increase over time (De Donder, De Witte, Buffel, Dury, & Verte, 2012; Gilleard, Hyde, & Higgs, 2007; Oswald, Jopp, Rott, & Wahl, 2010; Rowles, 1993; Rubinstein & Parmelee, 1992; Shenk, Kuwahara, & Zablotzky, 2004; Wiles et al., 2009). For some, the way they feel about their home is similar to the way they feel about a loved one (Fogel, 1992). One study found that 77% of older individuals feel a sense of pride, a sense of belonging, and/or a feeling of familiarity when they think of their home (Wiles et al., 2009). Even when older individuals' lives are not going as planned, their home can still serve as a place of positivity (Wiles et al., 2009).

For many older adults their home is an important and often central point in their lives (Gillsjo & Schwartz-Barcott, 2011; Gitlin, 2003; Oswald et al., 2003). It is a space where they are able to maintain a sense of autonomy and independence (e.g. ADL independence) (Oswald et al., 2007; Tanner et al., 2008; Wagnild, 2001; Wiles et al., 2009; Wiles et al., 2011). It is a comforting space, a refuge from the outside world (Gillsjo & Schwartz-Barcott, 2011; Tanner et al., 2008; Wiles et al., 2009; Wiles et al., 2011). It is a space in which they feel safe and secure (DeDonder et al., 2012; Gillsjo & Schwartz-Barcott, 2011; Tanner et al., 2008; Wagnild, 2001; Wiles et al., 2011). By aging in place, individuals are able to remain in familiar surroundings (Perkins Taylor, 2001; Rowles, 1993; Wagnild, 2001; Wiles et al., 2011). Therefore, allowing them to easily maintain social contact with nearby friends, family, and the community at large (DeDonder et al., 2012; Perkins Taylor, 2001; Rowles, 1993; Tanner et al., 2008; Wagnild, 2001; Wiles et al., 2011). Additionally, over the years, the home becomes a major source of familiarity and memories (DeDonder et al., 2012; Evans et al., 2002; Gilleard et al., 2007; Gitlin, 2003; Northridge & Levick, 2002; Oswald & Wahl, 2005; Peace et al., 2011; Perkins Taylor, 2001; Petersson et al., 2012; Rowles, 1993; Rowles & Chaudhury, 2005; Rubinstein & Parmelee, 1992; Shenk et al., 2004; Tanner et al., 2008; Wiles et al., 2011;

Wiles et al., 2009). The home is a place where individuals can connect to the past and perhaps a more happy and/or significant time in their lives (Rubinstein & Parmelee, 1992). It is also a place where meaningful relationships, such as that between a parent and their child are formed (Tanner et al., 2008). Attachment to one's home has even been found to help individuals cope with the loss of a loved one (Cristoforetti et al., 2011). Overall the research demonstrates the great importance that aging in place and meaning of home can have for older adults.

In one's home, individuals are able to maintain a sense of control over their environment and their lives (Oswald et al., 2007; Tanner et al., 2008; Wagnild, 2001; Wiles et al., 2009; Wiles et al., 2011). A person's home is an extension of who they are, it is a space where they are able to express themselves through personalization and decoration (DeDonder et al., 2012; Evans et al., 2002; Gilleard et al., 2007; Gitlin, 2003; Northridge & Levick, 2002; Oswald & Wahl, 2005; Peace et al., 2011; Perkins Taylor, 2001; Petersson et al., 2012; Rowles, 1993; Rowles & Chaudhury, 2005; Rubinstein & Parmelee, 1992; Shenk et al., 2004; Tanner et al., 2008; Wiles et al., 2011; Wiles et al., 2009). Individuals often have strong attachments to the objects they keep and display in their home (Shenk et al., 2004). Thus their home allows them the freedom and control to display these items. Individuals' level control in the home also goes beyond décor. In the home individuals are able to make their own rules, which only strengthens their attachment to place (Oswald et al., 2007; Tanner et al., 2008). Not to mention, the home is a private space where they can be themselves and they have the power to hide things, such as their declining function, from the outside world if they want (Peace et al., 2011; Rubinstein & Parmelee, 1992). Overall showing how the home allows individuals to maintain some control over their lives.

Even though medical professionals often underestimate the health and security benefits that meaning of home and attachment to place can offer (Fogel, 1992), both of these concepts have been found to have a number of positive benefits for older adults. For instance aging in place and meaning of home have been linked to decreased rates of depression (Oswald et al., 2007), as well as greater positive affect, life satisfaction, and well-being (Gilleard et al., 2007; Oswald et al., 2010; Oswald et al., 2007; Wiles et al., 2009). One study in particular found that while both attachment to place and the objective quality of the home lead to improved positive affect, the impact that attachment to place

has is much stronger (Evans et al., 2002). Showing that objective factors are not all that matters when appraising the benefits of an older adults' home, rather subjective factors can be much more powerful. In the same vain, it has been found that objective factors such as accessibility do not impact the meaning people associate with their home (Nygren et al., 2007).

However, it is also important to realize that meaning of home and attachment to place can also have negative outcomes. According to one study, even though place attachment can have a positive effect on an older adults' mental health, it can also have a negative impact as well (Evans et al., 2002). For instance, if individuals see the home as a burden or an unsafe place to be, they may feel a sense of anxiety when they think of their home rather than one of positive attachment (Oswald & Wahl, 2005). Also, some older individuals are able to recognize that a strong attachment to their home could be negative, because when the time comes it may be harder to accept/admit that their home is no longer able to support them due to age related declines (Wiles et al., 2009). It is important to note that for some the meaning they attach to their home can be impacted by numerous social (e.g. social networks), physical (e.g. the community), and personal (e.g. emotional well-being) factors (Oswald & Wahl, 2005; Rubinstein & Parmelee, 1992; Tanner et al., 2008; Wiles et al., 2009). Therefore, it is important to note while these factors may lead some individuals to attach great meaning to their home, these same factors may do the opposite for others, as not all individuals are attached to the place they call home (Rowles, 1993). Different factors such as gender, personality, SES, marital status, and health status have all been found to impact the importance and meaning individuals associate with their home (Fogel, 1992). Highlighting the importance of taking a holistic point of view when studying anything related to attachment to place and meaning of home, such as the decision to adopt HMs.

One study in particular, by Heywood (2005), looked directly at how HMs can impact older adults' subjective meaning of home. In this study Heywood (2005) interviewed 104 individuals in three age ranges; children, adults under sixty years old, and adults over the age of sixty on HMs impact on meaning of home. According to Heywood (2005) there are nine aspects of meaning of home which can potentially be impacted by HMs: primal security, privacy, control over decisions, freedom to act, reflection of self/achievement, a

place to foster relationships, a place of nurture, play and growth (for children), a point from which to go out and return, and rootedness. This study highlighted many of the factors discussed in the sections above and how HMs truly can impact individuals' subjective meaning of home, both positively and negatively (Heywood, 2005).

First Heywood (2005) found that if individuals deem their home as being unsafe, their meaning of home was negatively affected. Therefore, a HM could help restore their meaning of home by restoring their sense of security, while a HM that did not adequately make the home a safer place further weakened an individuals' meaning of home (Heywood, 2005). Similarly, it was found that if the HM allowed individuals to privately care for themselves in the home, it helped them to maintain a positive meaning of home. However, if the individuals had to continue relying on others (e.g. formal or informal caregivers) for assistance, they lost their sense of privacy and subsequently their positive associations with their home (Heywood, 2005). It was also found that the relationships that take place in the home need to be positive or the meaning of home could be negatively affected, therefore, if the HMs ruined older adults' relationship with others, it could negatively impact their meaning of home (Heywood, 2005). Additionally, when it came to the implementation of HMs it was found that individuals must have a say in the process or the meaning of home could be negatively affected (Heywood, 2005). Meaning of home was also found to be re-established when HMs allowed for increased independence and autonomy (Heywood et al., 2005). Since the home is a reflection of the individual, it was further found that successful HMs can make people feel good about themselves and poorly executed HMs can make people feel bad about themselves and thus ruining their meaning of home (Heywood, 2005). Homes also need to be a place that individuals can leave and return to, therefore it was found that HMs which make the home more accessible increase meaning of home (Heywood, 2005). Finally, it was found that proper HMs can allow individuals to stay in their home, which increases their connection to home and strengthens their positive associations with home (Heywood, 2005). All together this study shows that proper and effective HMs can have a direct impact on individuals' subjective meaning of home, thus highlighting the importance of examining subjective concepts, such as aging in place and meaning of home while studying HM adoption

### **3.4. Home Modification Service and Programs in British Columbia**

There is a major need for both policies and programs that support the implementation of HMs for older adults (Pynoos, 1992). Ninety percent of individuals believe that their government should be responsible for meeting the needs of older individuals when it comes to housing (Wagner et al., 2010). Additionally, since every person's level of knowledge on the types of available programs differs (Johansson et al., 2009a), there is a need for this information to be easily accessible for all older individuals (Wagnild, 2001). The following section highlights the programs currently available to older individuals living in British Columbia.

#### **3.4.1. Home Renovation Tax for Seniors and Persons with Disabilities**

The British Columbia Senior's Home Renovation Tax Credit is a refundable tax credit that has been offered by the government of British Columbia since April 2012 (British Columbia, n.d.). According to the rules/regulations of this tax credit, it can only be applied to renovation and/or supply costs associated with HMs intended to make dwellings more accessible and/or functional. Therefore, the credit cannot be used for HMs made purely for cosmetic reasons and/or for increasing a home's resale value. Acceptable HMs include: improving accessibility (e.g. wheelchair ramps), assisting with mobility (e.g. handrails in hallways) or functional declines (e.g. lever door handles), and minimizing risk of injury (e.g. non-slip flooring). Individuals can claim this credit on their yearly personal income tax return with proof of receipts and they can claim up to 10% of the HM's costs, up to a yearly maximum of \$1,000 (i.e. up to \$10,000 a year in expense claims). To be eligible for this tax credit, individuals must also be age 65 or older, or be living with a family member who is over the age of 65, however in 2016, the credit was also expanded to include individuals with disabilities who may qualify for the 'disability tax credit' as well. Applicants also need to be a resident of British Columbia and the home must be individuals' permanent residence (British Columbia, n.d.).

### **3.4.2. The Home Adaptations for Independence (HAFI) Program**

The Home Adaptations for Independence Program (HAFI) is designed to provide both older adults and individuals with disabilities with the financial assistance needed to make necessary HMs (British Columbia (BC) Housing, 2014; 2016). The goal of HAFI is to ensure that the homes of these individuals are safe and comfortable places to live (BC Housing, 2014; 2016). Now run by BC Housing, this program was originally administered by the Canadian Mortgage and Housing Corporation (CMHC) as the Home Adaptations for Seniors Independence (HASI) program (United Way, 2013/2014). Applications for the HAFI program are open to both homeowners and landlords (British Columbia (BC) Housing, n.d.). To be eligible as a homeowner, the individuals or persons living with them must have “a permanent disability or diminished ability” which negatively impacts their ability to carry out ADLs (BC Housing, n.d., p. 1). The individuals must also be Canadian citizens, who live in British Columbia, are considered low-income and whose home is their permanent residence (BC Housing, n.d.; 2014). For landlords to be eligible, their self-contained unit needs to be housing a low-income Canadian citizen who resides in British Columbia and have “a permanent disability or diminished ability” (BC Housing, n.d., p.1).

Assistance is received as a non-taxable grant or forgivable loan up to the amount of \$20,000 and the \$20,000 can be used to offset the costs of both materials and labour (BC Housing, n.d; 2014). HMs must be permanent/fixed items, with some exceptions granted (e.g. tub lift), and should specifically aid individuals with completing tasks related to their disability/reduced function (BC Housing, 2014). A further benefit of this program is that information is readily available to individuals who speak not only English, but those who speak Chinese or Panjabi as well (BC Housing, 2015; United Way, 2013/2014).

### **3.4.3. Home Adaptations for Seniors Independence Program (HASI) – On-Reserve**

Older First Nations members are eligible for CMHC’s Home Adaptations for Seniors Independence Program (HASI) (Canadian Mortgage and Housing Corporation [CMHC], 2016a). Individuals must be 65 years of age or older, First Nation members, have age related functional declines, be low income, and the HMs must be for their permanent residence (CMHC, 2016a). The goal of this program is to help older First

Nations individuals to independently age in place (CMHC, 2016a). This program supplies recipients with a \$3,500 forgivable loan to complete minor HMs (e.g. implementing lever door handles) (CMHC, 2016a).

#### **3.4.4. On-Reserve Residential Rehabilitation Assistance (RRAP)**

CMHC (2016b) also offers a program called the On-Reserve Residential Rehabilitation Assistance Program (RRAP). This program includes five funding streams; RRAP On-Reserve, RRAP Rental, RRAP Conversion, RRAP Secondary/Garden Suit, and RRAP Persons with Disability (RRAP-D) (CMHC, 2016b). Older adults can access two of these streams in order to make HMs. The first is RRAP On-Reserve, which is a program by which First Nation members with a low income can receive a loan (Southern Canada \$16,000; Northern Canada \$19,000) to bring their home up to minimum safety standards (CMHC, 2016c). The home must be at least five years old and the modifications can include structural upgrades, as well as electrical, plumbing, heating, and fire safety upgrades (CMHC, 2016c). The second program, specifically for HMs, is RRAP-D (CMHC, 2016d). This program was designed to help low-income First Nations members with permanent disabilities to make the needed changes to their homes so they can live safely and independently (CMHC, 2016d). The loan itself covers the full cost of the HMs, up to the regional limit, which is \$16,000 for Southern Canada and \$19,000 for Northern Canada (CMHC, 2016d).

**Table 3-1 Home Modification Services and Programs in British Columbia Comparison**

	Tax Credit	HAFI	HASI	RRAP	RRAP-D
<b>Administer</b>	British Columbia Government	BC Housing	CMHC	CMHC	CMHC
<b>Eligibility</b>	Age: 65+ <i>or</i> living with family member 65+  British Columbia resident	<i>Homeowner:</i> Must have a disability/declined ability <i>or</i> be living with someone with a disability/declined ability  Canadian citizen – living in British Columbia  Low-income  Home is their permanent residency  <i>Landlord:</i> Individual living in the self-contained unit must fulfill the above criteria	First Nations members  Age: 65+  Have age related functional declines  Low-income  Home is their permanent residency	First Nations members  Low-income  Home must be at least 5 years old	First Nations members  Permanent disability  Low-income
<b>Amount</b>	Tax credit: up to \$10,000 (10% of total costs)	Non-taxable grant <i>or</i> Forgivable loan: up to \$20,000	Forgivable loan: \$3,500	Loan: Southern Canada = up to \$16,000  Northern Canada = up to \$19,000	Loan for full cost of HMs: Southern Canada = up to \$16,000  Northern Canada = up to \$19,000

Eligible Costs	HMs to help with impairments	Cost of materials and labour of permanent/ fixed HMs	Minor HMs	Bring home up to safety standards	HMs to help with impairments
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### 3.5. Future Research Directions

The need for more research into why older adults do or do not accept HMs is echoed throughout the research (Ahn & Hedge, 2011; Pynoos et al, 2012; Tse, 2005; Wyman et al., 2007). Although there has been some research conducted on HM adoption, there is still a lack of empirical studies in this area (Yuen & Carter, 2006). The following reflects on some of the gaps in this area of research.

First, there is a need for more in-depth studies that can help to identify the differences between older adults who do and do not implement HMs (Cummings et al., 2001). In reviewing the current literature it has been found that several existing studies do not gain a comprehensive view of the decision making process because they only include participants who have either implemented HMs (e.g. Aplin et al., 2013) or participants who have not implemented HMs (e.g. Clemson et al., 1999; Kiata et al., 2008). Therefore, there is a need for studies that include the diverse perspective of both of these opposing groups, as a study including both groups would allow researchers to examine both the differences and commonalities between the individuals.

Reviewing the current empirical literature on HMs also shows that studies often focus on only one aspect of the decision making or implementation process (e.g. falls prevention, finances, proactive measures, health status, readiness, housing satisfaction, intention, process, adherence and/or treatment programs that also involve behavioural modifications) (e.g. Ahn & Hedge, 2011; Clemson et al., 1999; Cumming et al., 2001; Johansson et al., 2009a; Kruse et al., 2010; Mathieson et al., 2002; McNaulty et al., 2003; Slagen-de Kort et al., 1998; Yuen & Carter, 2006). However, focusing on particular factors or aspects does not allow for an in-depth understanding of the complexity and nuances of the decision making process. There is therefore a need for more holistic studies on HMs and HM adoption.

A review of the current literature also identified a number of other areas for future research. For instance, a search of the empirical literature was unable to identify studies that specifically look at gender differences when it comes to HM adoption. There is also a need for more studies that compare older adults in rural and urban locations when it comes to HM adoption, as issues such as access to resources could differ between these groups (Li, 2009b). Additionally, the current empirical literature is lacking when it comes to subjective experiences, as little is known about the HM decision making process from the unique point of view of older adults, therefore, Clemson et al. (1999) suggest that there should be more research into how older adults perceive and address various environmental risks.

Future research also needs to address the methodological issues occurring in much of the current literature on HMs and HM adoption. For instance, many studies on older adults' perception and/or adoption of HM have small and/or homogeneous samples (e.g. Clemson et al., 1999; Johansson et al., 2009a; Kiata et al., 2008; McNulty et al., 2003; Yeun & Carter, 2006). Larger studies would allow for more comparison between groups of individuals. Additionally, the studies on HM adoption tend to be cross-sectional (e.g. Aplin et al., 2013; Heywood, 2005; Wagner et al., 2010). Therefore, it would also be interesting to conduct a longitudinal study which would demonstrate how changing circumstances in older adults' lives (e.g. income, health/function, and/or attachment to place) impacts their opinion of HMs and decision to implement them or not over time.

## Chapter 4.

### Methods

This chapter presents the research design, research setting, sampling and recruitment, informed consent, data collection and analysis, knowledge translation, and future research directions of the proposed study. The research questions of the study are as follows:

1. What is the person-environment fit for community-dwelling older adults in their home environments?
2. What are the primary factors affecting the psychosocial aspects of the decision making process to implement home modifications among community-dwelling older adults?

In order to address the two proposed research questions, both quantitative and qualitative methods of data collection and analysis will be required. A mixed methods design will allow for a more comprehensive and in-depth understanding of the objective and subjective factors influencing older adults' decision to adopt HMs. The sample for phase one will consist of 400 community-dwelling older adults from both urban and rural areas of British Columbia, and data will be collected using the North American Version (Lien, Steggell, Slaug, & Iwarsson, 2015) of the Housing Enabler Tool (Iwarsson & Slaug, 2010) and a quantitative survey. Data collected during phase one will be used to address the first research question and will serve as a starting point in addressing question two as it can address how person-environment fit impacts the adoption of HMs. Quantitative data collected during phase one will also be used in the development of the phase two in-depth interview and in purposefully selecting participants for phase two.

The second phase of the study will include 80 purposefully selected individuals from phase one who will participate in a secondary home evaluation by a trained occupational therapist (OT). Based on the OT's evaluation, the participants will be provided with individualized recommendations for HMs. Participants will then be given a period of time to review the recommendations and engage in their own decision making process. A semi-structured interview will then be conducted to address the second research question. The interviews will be used to gain an in-depth understanding of the

contributing factors and processes that impacted their decision making process. A draft of the proposed interview guide for the semi-structured interviews has been developed based on relevant issues identified in the literature (Appendix C) and it will be further adjusted to reflect the findings from the first phase of the study.

## **4.1. Study Design**

The goal of this study is to gain an in-depth and comprehensive understanding of older adults' decision making process regarding the adoption of HMs by identifying the subjective and objective factors impacting the process. In order to accomplish this goal, the study will utilize a mixed methods approach. Mixed methods research, as defined by Johnson, Onwuegbuzie, and Turner (2007), "is the type of research in which a researcher or team of researchers combines elements of qualitative and quantitative research approaches [...] for the broad purposes of breadth and depth of understanding and corroboration." (p. 123). Quantitative and qualitative approaches have unique strengths and mixed methods research allows researchers to utilize these two methods in ways that complement one another (Morgan, 1998). A mixed methods approach is appropriate for this proposed study as the research questions are exploratory in nature.

## **4.2. Data Collection**

The first phase of the study will involve trained research assistants visiting the homes of community-dwelling older adults in rural and urban British Columbia to conduct in-person surveys and home assessments using the North American version of the Housing Enabler Environmental Assessment (Iwarsson & Slaug, 2010; Lien et al., 2015). In the second phase, the research team will purposefully select a sub-set of the phase one participants to undergo a secondary home assessment with a trained occupational therapist. In this phase, the participants will also take part in semi-structured interviews with trained research assistants.

**Table 4-1 Data Collection Plan**

<b>Phase One Data Collection</b>		
<b>Category</b>	<b>Measures</b>	<b>Duration</b>
<b>Demographic</b>	Age, Sex, Marital Status, Education, Employment, Income, Race/Ethnicity Symptoms List List of Diseases (ICD-10) Visual Acuity	15 minutes
<b>Cognitive Health Status</b>	Short Portable Mental Status Questionnaire (SPMSQ)	5 minutes
<b>Usability</b>	Usability in My Home (UIMH)	10 minutes
<b>Meaning of Home</b>	Meaning of Home Questionnaire	10 minutes
<b>Housing-Related Control Beliefs</b>	Housing-Related Control Beliefs Questionnaire (HCQ)	10 minutes
<b>Coping Style</b>	Questionnaire on Coping Styles (BASE)	5 minutes
<b>Housing Accessibility</b>	North American Housing Enabler Tool: Functional Limitations and Environmental Assessment Assistive Devices/Technical Aids Housing Conditions & Housing Standards Housing Adaptations	30 minutes
<b>Phase Two Data Collection</b>		
<b>Home Modification Recommendations</b>		
<b>Category</b>	<b>Measures</b>	<b>Duration</b>
<b>Home Modification Recommendations</b>	Canadian Occupational Performance Measure (COPM)	60-90 minutes
<b>Semi-Structured Interview</b>		
<b>Category</b>	<b>Measures</b>	<b>Duration</b>
<b>Decision Making Process</b>	Semi-Structured Interview Guide	60 minutes

#### **4.2.1. Phase One: Survey and Home Environment Assessment**

Surveys provide a systematic method to collect quantitative data (Groves, Fowler, Couper, Lepkowski, Singer, & Tourangeau, 2009). Survey data is collected from a subset of individuals in a population of interest and the findings can be used to make broader generalizations about the population from which the sample of survey participants is drawn (Groves et al., 2009). By utilizing a survey method, this study can start to draw conclusions related to the person-environment fit of older adults' homes in British Columbia, as well as

gain preliminary information that can be used in understanding the decision making process.

This proposed study will recruit a total of 400 participants to take part in the survey portion of the study. According to the 2011 Canadian Census, 86% of British Columbians live in urban areas, while 14% reside in rural areas (Statistics Canada, 2011), therefore, in order to be representative of British Columbia's population distribution, participants (n = 400) will be selected from both rural (n = 100) and urban (n = 300) locations. According to Statistics Canada (2012b), British Columbia's population over the age of 65 is closely split between males (46%) and females (54%), additionally the province's population of older adults is almost equally split between those aged 65 to 74 (54%) and those 75 years and above (46%). Therefore, participant recruitment will also aim to include an equal division between males (n = 200) and females (n = 200), as well as individuals age 65 to 74 (n = 200) and older adults aged 75 and greater (n = 200). In phase one participant recruitment will therefore be guided by: location (urban/rural), gender (male/female), and age (65 to 74/aged 75 and older) in order to have a sample representative of older British Columbians. In order to recruit a well representative sample of participants, a site-based approach to recruitment (Arcury & Quandt, 1999), as well as snowball methods, will be utilized, additional information on recruitment can be found in section 4.4.

This survey will consist of several tools utilized in the *Enabling Autonomy, Participation, and Well-Being in Old Age: The Home Environment as a Determinant for Healthy Aging-ENABLE-AGE* Study (Iwarsson et al., 2007). The survey will cover seven categories related to the older individual, her/his home environment, and their person-environment fit. As highlighted in Table 4.2, these categories include (1) demographics, (2) mental health status, (3) housing accessibility, (4) housing usability, (5) meaning of home, (6) housing-related control beliefs, and (7) coping style. The entire survey will take approximately 90 minutes per participant. In order to achieve a wide variety

**Demographics:** The demographic category will collect information on individuals' age, sex, marital status, education, employment, income, and race/ethnicity. The demographics portion of the survey will also collect data related to individuals' physical health. Tibblin et al.'s (1990) 'Symptom List,' the 'List of Diseases (ICD-10)' (World Health

Organization, 2004) and Sachenweger's (1987) 'Visual Acuity' tool will be utilized as a way to gain information related to older adults' functional competence level. Some of the demographic data will be used when purposefully selecting participants for phase two of the study, as the goal is to have a heterogeneous sample, representative of British Columbia's older adult population. In order to be representative, the demographic factors of gender (male/female) and age (65 to 74/aged 75 and older) will once again be considered when recruiting participants. Additionally, participant's socioeconomic status will also be used during phase two recruitment. Participants from a range of socioeconomic backgrounds will be recruited in order to examine the impact items such as cost play on the HM decision making process.

**Cognitive Health Status:** The survey will also include Pfeiffer's (1975) 'Short Portable Mental Status Questionnaire (SPMSQ),' which will provide additional information related to participants' competence. The SPMSQ is a well-established tool that classifies individuals' cognitive functioning as either intact, mild, moderate, or severe (Wobler, Romaniuk, Eastman, & Robinson, 1984). The data collected from the SPMSQ will also be used as a screening tool for purposefully selecting participants for phase two. Only participants who are able to participate in the interview portion of the study with little to no assistance will be selected (i.e. intact or mild).

**Housing Accessibility:** As part of/in conjunction with the North American version of the Housing Enabler Environmental Assessment (Iwarsson & Slaug, 2010; Lien et al., 2015), the survey will also collect data on the assistive devices/technical aids participants use, the condition and standards of participants' homes, and any current HMs present in participants' homes. Additionally, as part of the Housing Enabler Tool (Iwarsson & Slaug, 2010; Lien et al., 2015), the survey will collect data on participants' functional limitations. More information on the Housing Enabler Tool is provided below.

**Housing Usability:** The usability of the home portion of the survey will be conducted using Fange & Iwarsson's (1999) 'Usability in My Home (UIMH)' tool. This portion of the survey will provide additional information related to the environment-fit of older adults' homes. The UIMH tool is a reliable and valid tool designed to assess participants' subjective perception related to the use and support of their homes' physical

environment (Fange & Iwarsson, 1999). This tool has been found to be reliable and valid, and was designed to be used in conjunction with an objective measure, such as the Housing Enabler tool (Fange & Iwarsson, 1999).

**Meaning of Home:** For the meaning of home portion of the survey, the research team will utilize Oswald, Mollenkopf and Wahl's (1999) 'Meaning of Home Questionnaire' in order to obtain data related to participants' subjective perceptions of home. This tool addressed a number of dimensions/concepts related to meaning of home, such as, feelings related to safety, relaxation, and privacy, as well as relationships with other (e.g., family, friends, and visitors) (Oswald et al., 1999).

**Housing-Related Control Beliefs:** The survey will also include the Housing-related Control Beliefs Questionnaire (HCQ) (Oswald et al., 2003). The HCQ is a reliable questionnaire that examines housing-related control beliefs, allowing researchers to understand "the mechanisms underlying the achievement and maintenance of autonomy and well-being in old age" (Oswald et al., 2003, p. 137). Therefore this questionnaire will provide further information related to the person-environment fit of older adults' housing.

**Coping Style:** Finally, the survey will also include the Questionnaire on Coping Styles (Staudinger & Freund, 1992 as cited by Baltes & Mayer, 2001; Iwarsson et al., 2007). This survey was used in both the ENABLE-AGE (Iwarsson et al., 2007) and Berlin Aging studies (Baltes & Mayer, 2001). This questionnaire examines how participants have addressed recent issues in their life. Coping strategies addressed in this tool include: a sense of humor, faith, turning to others, and giving up. This questionnaire will provide preliminary information on how individuals make decisions and therefore will aid in addressing this study's second research question.

### ***Housing Enabler Tool***

The Housing Enabler instrument was developed to determine the person-environment fit within individuals' dwellings (Iwarsson & Slaug, 2010). It acts as a way to screen for issues related to accessibility and can be used in a variety of housing types, such as private family homes and condos (Iwarsson & Slaug, 2010). Testing has shown

high to very high reliability for the Housing Enabler and over time revisions have been made to increase the validity and reliability of the tool (Iwarsson & Slaug, 2010).

Researchers have the choice between the complete Housing Enabler instrument and the Housing Enabler Screening tool (Iwarsson & Slaug, 2010). The complete Housing Enabler instrument consists of three components. The Housing Enabler instrument starts by evaluating individuals' functional competence level. This assessment involves both an interview and observations "in order to assess [...] individual[s] functional limitations (12 items) and dependence on mobility devices according to the personal component (two items)" (p. 18). Next, the Housing Enabler instrument evaluates the exterior, entrance, and interior of the home environment (161 items). Following these two steps, a score is calculated that predicts "the magnitude of accessibility problems" (p. 18) older adults' faces in their homes, meaning it produces a measure of one's functional competence in relation to their surrounding physical environment. The Housing Enabler Screening tool, like the full instrument, evaluates functional competence, examines the environment, and determines the magnitude of accessibility score. For the environmental evaluation portion, the screening tool, like the full instrument, looks at the exterior environment, the entrance to the home, and the interior space of the home, however the screening tool only consists of 60 key environmental features of the larger instrument (Iwarsson & Slaug, 2010).

The standards and guidelines presented in the Housing Enabler instrument are based on the Swedish context, therefore adjustments and adaptations must be made before the instrument can be used in other parts of the world (Iwarsson & Slaug, 2010; Lien et al., 2015). In this study, the research team will utilize the North American version of the Housing Enabler Environmental Assessment developed by Lien et al. (2015). A total of 34 changes were made to the environmental component of the original Housing Enabler instrument in order to fit a North American context (Lien et al., 2015). These changes represent differences in housing standards (Lien et al., 2015). Additionally, metric measurements were converted into imperial measurements and the wording of items was changed to ensure the items were understood in the North American context (Lien et al., 2015). For all 161 items in the North American version of the tool's environmental component, a percentage agreement of over 80% was found, with the results being "in line with previous environmental component adaptations and inter-rater

agreement findings from various European [Housing Enabler] versions” (Lien et al., 2015, p.9). Using the North American Version of the Housing Enabler for this proposed research study will therefore provide the research team with an appropriate measure of the magnitude of accessibility in the homes of older adults throughout the province of British Columbia.

In line with the study’s first research question, person-environment fit measures, produced by the Housing Enabler results, will also be used to help guide phase two participant selection. Participants with a range of magnitude of accessibility scores will be recruited for phase two in order to gain a comprehensive perspective on how the person-environment fit of older participants’ impacts their decision making process when it comes to HM adoption.

#### **4.2.2. Phase Two: Home Modification Recommendations and In-Depth Interview**

##### ***Occupational Therapy Assessments***

In phase two, a total of 80 participants from the phase one sample will be purposefully selected from rural (n = 20) and urban (n = 60) areas of British Columbia. The goal of participant selection will be to obtain a heterogeneous sample that is representative of British Columbia’s older adult population. Phase two selection criteria will therefore include gender, age, cognitive status, socioeconomic status, and magnitude of accessibility score (a measure of person-environment fit). Additionally, any pertinent findings from phase one may also be used to guide participant selection in phase two. A site-based approach (Arcury & Quandt, 1999) and snowballing techniques will be used in participant recruitment, additional information on the phase two sample and participant recruitment can be found in section 4.4.

Trained occupational therapists (OTs) will be hired to conduct assessments with the 80 participants and will provide participants with personalized HM recommendations. The Canadian Model of Occupational Performance (CMOP) is a guiding theory for many OTs (Polatajko, Davis, Stewart, Cantin, Amoroso, Purdie, & Zimmerman, 2007b). The CMOP serves as a visual representation of how individuals, the environment, and

occupation interact with one another to result in occupational performance (Canadian Association of Occupational Therapists [CAOT], 2016; Polatajko et al., 2007b). The CMOP places individuals in the centre of the model, this is crucial as it demonstrates how OTs have a client-centred focus when it comes to their work (CAOT, 2016; L. Kleinschroth, personal communication, February 19, 2016; Polatajko, Cantin, Amoroso, McKee, Rivard, Kirsh, ..., & Lin, 2007a; Polatajko et al., 2007b). Individuals are represented by a triangle, of which each point represents a component of occupational performance (i.e. affect, cognitive, physical), and the centre represents spirituality (Polatajko et al., 2007b). Next, the CMOP shows how individuals are rooted in their own distinctive environmental circumstances (CAOT, 2016; Polatajko et al., 2007b). Therefore, similar to the Competence-Press (Lawton, 1982; Lawton & Nahemow, 1973) and the Disablement Process (Verbrugge & Jette, 1994) Models, the CMOP shows how differing levels of the environment (i.e. physical, social, institutional, and/or cultural) have the potential to impact individuals' occupational performance (L. Kleinschroth, personal communication, February 19, 2016; Polatajko et al., 2007b). Finally, "occupation is depicted as the bridge that connects person and environment indicating that individuals act on their environment through occupation" (Polatajko et al., 2007b, p. 23). According to this model, productivity (i.e. paid/unpaid work, household management, play/school), self-care (i.e. personal care, functional mobility, and community management), and leisure (i.e. quiet recreation, active recreation, socialization) are considered the primary purposes of occupation (Law, Baptiste, Carswell, McColl, Polatajko, & Pollock, 2000; Polatajko et al., 2007b). In recent years, the CMOP has been expanded to focus not just on occupational performance, but occupational engagement as well (Polatajko et al., 2007a; Polatajko et al., 2007b). Therefore, many, such as Polatajko et al. (2007b) have retitled the CMOP, the Canadian Model of Occupational Performance and Engagement (CMOP-E) (Polatajko et al., 2007b).

For the purposes of this proposed study, OTs will utilize the Canadian Occupational Performance Measure (COPM) (Law et al., 2000). The COPM is a standardized tool based on the principles of the CMOP and CMOP-E (Carswell, McColl, Baptiste, Law, Polatajko, & Pollock, 2004; Colquhoun, Letts, Law, MacDermid, & Missiuna, 2012). The COPM is a client-centred tool OTs use to identify self-care, productivity, and leisure related issues which the clients themselves deem as being relevant occupational challenges in their day to day lives (Carswell et al., 2004; Colquhoun

et al., 2012; Law et al., 2000). Assessments using the COPM take approximately 30 minutes. Clients are first asked to identify problems in any of the three areas of occupational performance; leisure (e.g. doing crafts, participating in sports, making phone calls), self-care (e.g. bathing, transfers, shopping), and productivity (e.g. volunteering, laundry, homework) (Carswell et al., 2004; Law et al., 2000). Next, the clients rate the significance of these tasks out of 10 and select 1-5 of these issues for the OTs to address (Carswell et al., 2004; Colquhoun et al., 2012; Law et al., 2000). Individuals then rate their performance of the selected tasks out of 10, following which, individuals then rate their personal satisfaction when it comes to being able to perform each of the selected tasks out of 10 (Carswell et al., 2004; Colquhoun et al., 2012). The OT then takes these scores which “are summed and averaged over the number of problems, to produce scores out of 10” (p. 211) and uses them to help design personalized occupational therapy interventions for clients (e.g. recommend HMs) (Carswell et al., 2004). Additionally, the COPM can be used over time to track the effectiveness of interventions on both performance and individuals’ satisfaction with their performance (Carswell et al., 2004; Colquhoun et al., 2012). The COPM, though developed in Canada, has been used throughout the world and has been translated into a number of different languages (Carswell et al., 2004). Carswell et al. (2004) conducted a systematic review of the literature on the COPM and their findings show positive findings for the tool’s test-retest reliability, validity, and responsiveness. Overall, this review also found “that the COPM was effective in engaging clients in the therapeutic process, in setting appropriate therapeutic goals, in providing effective feedback to team members and clients, and in assessing a wide range of client problems” (Carswell et al., 2004, p. 216).

For this study, OTs will conduct professional assessments with each of the 80 phase two participants. Each assessment will include personalized HM recommendations. The participants will then be given three months to consider and/or begin taking steps to implementing the OT’s recommended HMs. Following the three months, participants will take part in a semi-structured interview about their decision making process related to the adoption (or lack thereof) of HMs. Interview participants need to have firsthand knowledge/experience with the research topic (Charmaz, 2006; Hesse-Biber & Leavy, 2006), therefore the three months in-between the OT’s

assessments and the in-depth interview will provide the participants with time to begin engaging in the decision making process more thoroughly.

### ***In-Depth Interviews***

The basis for conducting in-depth interviews is that individuals have useful information that they are able to share through dialogue (Hesse-Biber, 2006; Patton, 2015). In-depth interviews provide individuals with an opportunity to share their own stories and perspectives (Charmaz, 2006; Hesse-Biber & Leavy, 2006; Patton, 2015). Therefore, interviews allow researchers to gather information that is not observable (Patton, 2015). In-depth interviews are designed specifically to gather rich and detailed data on a specific topic, therefore, interviewees must have firsthand experience/knowledge of the situation being addressed during the interview (Charmaz, 2006; Hesse-Biber & Leavy, 2006). In this study, participants will undergo occupational therapy assessments and be given a sufficient amount of time to engage in the decision making process prior to their participation in an in-depth interview. This will ensure their firsthand experience with the research topic.

In-depth interviews can be designed in one of three ways; structured, semi-structured, or open-ended (Hesse-Biber & Leavy, 2006). On one side of the spectrum, structured interviews focus on utilizing a specific set of questions for every participant in order to ensure consistency and allow for comparison and generalizability (Hesse-Biber & Leavy, 2006). On the other end of the spectrum, open-ended interviews have a topic of focus, but interviewers do not have set questions, instead they make broad queries which allow interviewees to direct the conversation (Hesse-Biber & Leavy, 2006). This proposed study will utilize a semi-structured approach that falls in-between these two extremes. In a semi-structured interview, interviewers have a select number of questions that they use to guide the process, but interviewees are not restricted to these questions alone (Hesse-Biber & Leavy, 2006). This type of structure allows for a more organic form of conversation to develop between interviewers and interviewees, in which participants are able to express thoughts, ideas, and experiences related to the topic which researchers had not considered/expected (Charmaz, 2006; Hesse-Biber & Leavy, 2006). The flexible nature of semi-structured interviews also allows the researcher to instantly respond to the data, therefore researchers are able to follow new lines of inquiry, ask questions, dig deeper

into issues of importance, and confirm statements made by the interviewee (Charmaz, 2006).

Trained research assistants will conduct the semi-structured interviews utilizing an interview guide (Appendix C). Interview guides are “a set of topical areas and questions that the interviewer brings to the interview” (Hesse-Biber & Leavy, 2006, p. 126). They serve as a useful tool for interviewers and ensure all relevant areas are addressed (Charmaz, 2006; Hesse-Biber & Leavy, 2006; Patton, 2015). The interview guide developed for this study is based on the current literature and will be further shaped by any major findings from the quantitative phase of the study. In developing the interview guide for this study, what Patton (2015) calls a standardized open-ended interview approach has and will continue to be used. This approach promotes consistency across interviews as interviewers use the same set of open-ended questions for every interviewee (Patton, 2015). The standardized open-ended question approach is beneficial because it ensures that participants’ responses can be compared, it limits researcher bias, ensures that multiple interviewers are addressing the same topics, ensures effective use of time, and allows outsiders to review/evaluate the tool (Patton, 2015).

When it comes to creating open-ended questions for the standardized open-ended interview approach there are a few things to keep in mind. For instance, how a question is constructed can impact the types of responses interviewees offer (Patton, 2015). Well-formed open-ended “questions are sufficiently general to cover a wide range of experiences and narrow enough to elicit and elaborate the participant’s specific experiences” (Charmaz, 2006, p. 29). Questions should be clear, to the point, neutral and should fit the research topic (Charmaz, 2006; Patton, 2015). With in-depth interviews it is also important to avoid dichotomous questions, as they do not allow interviewees to provide detailed responses related to their own experiences (Charmaz, 2006; Patton, 2015). The standardized open-ended interview approach allows for flexibility in probing during the interview (Patton, 2015). Probes are “a combination of verbal and nonverbal cues” (Patton, 2015, p. 466) that are used along with interview questions to help ensure that the interview stays on topic and the interviewees provides rich data (Hesse-Biber & Leavy, 2006; Patton, 2015).

Throughout the interview process, neutrality and rapport between the interviewer and interviewee are two important concepts to keep in mind. Neutrality refers to the interviewer being non-judgmental, whether it be in a positive or negative manner, towards the interviewee's comments during the interview (Patton, 2015). Rapport refers to the interviewer being respectful of the interviewee (Patton, 2015). These concepts will aid in a positive interview experience. For this study, the interview guides will consist of approximately 10 to 15 questions and the interviews will take approximately 60 to 90 minutes per participant.

### **4.3. Research Setting**

This study will utilize the 2011 Canadian Census to identify rural and urban locations in British Columbia from which the study sample will be drawn. In differentiating between rural and urban areas, Statistics Canada (2012a) uses the term 'Rural Area (RA)' and the term 'population centres (POPCTRs)' in place of 'urban'. The 2011 Canadian Census also utilizes the terms 'core,' 'fringe' and 'rural area' in order to "distinguish between [POPCTRs] and [RAs] within a census metropolitan area (CMA) or census agglomeration (CA)" (Statistics Canada, 2012a, p. 110). According to Statistics Canada (2012a) a CMA or a CA is an "[a]rea consisting of one or more neighbouring municipalities situated around a core. A [CMA] must have a total population of at least 100,000 of which 50,000 or more live in the core [and a CA] must have a core population of at least 10,000" (p. 90). From this, a POPCTRs is defined as an "area with a population of at least 1,000 and no fewer than 400 persons per square kilometre" (Statistics Canada, 2012a, p. 121). Whereas "[RAs] include all territory lying outside [POPCTRs]" (Statistics Canada, 2012a, p. 125).

This study will choose specific research settings in British Columbia based on Census Tracts (CTs). CTs are defined as "small, relatively stable geographic areas that usually have a population between 2,500 and 8,000 persons. They are located in CMAs and in CAs that had a core population of 50,000 or more in the previous census" (Statistics Canada, 2012a, p. 108). CTs defined as RAs and POPCTRs will be chosen based on the proportion of individuals over the age of 65 living in those areas. CTs with higher

proportions of older adults will be strategically chosen to ensure a higher likelihood of participant recruitment.

According to the 2011 Canadian Census, 86% of British Columbians live in urban areas, while 14% reside in rural areas (Statistics Canada, 2011). According to a housing report released by the Seniors Advocate (2015), 17.5% of BC's population is over the age of 65 and a percentage of older adults aged 65 and over can be found in all five of British Columbia's health authorities. Specifically, 22% of the Island Health Authority, 22% of the Interior Health Authority, 16% of the Vancouver Coastal Health Authority, 15% of the Fraser Health Authority, and 13% of the Northern Health Authority are aged 65 years and over (Seniors Advocate, 2015). It is important to include older adults from throughout British Columbia. Therefore, 75 percent of the sample ( $n = 300$ ) will be recruited from urban locations and the other 25 percent ( $n = 100$ ) will be recruited from rural areas. The inclusion of both urban and rural participants will allow the study to explore the differences in the decision making process between older adults living in different areas of the province.

#### **4.4. Sampling and Recruitment**

The goal of participant recruitment in phase one of this study ( $N = 400$ ) is to gain a heterogeneous sample, that is representative of British Columbia's older population, therefore since 86% of British Columbians live in urban areas, while 14% reside in rural areas (Statistics Canada, 2011) the sample will consist of 300 older adults from urban areas (75%), while the remaining 100 will come from rural areas of the province (25%). According to Statistics Canada (2012b) 54% of older British Columbians are female and 46% are male, while 54% of older adults are aged 65 to 74 (54%) and 46% are aged 75 years and above. Therefore, phase one participant recruitment will also aim to include an equal number of males ( $n = 200$ ) and females ( $n = 200$ ), as well as individuals age 65 to 74 ( $n = 200$ ) and individuals aged 75 and greater ( $n = 200$ ). Selection criteria will also include that all participants ( $N = 400$ ;  $n = 100$  rural and  $n = 300$  urban dwelling individuals) must be living in the community (i.e. community –dwelling older adults), they must be fluent in English, and they need to be able to independently answer the survey questions,

meaning they should feel confident in answering the questions without the assistance of a caregiver and/or translator.

Recruitment of phase one participants will initially be conducted using a site-based approach (Arcury & Quandt, 1999), following which snowballing techniques will be used to further grow the sample. A site-based approach (Arcury & Quandt, 1999) to recruitment is recommended for large studies within the community, where possible participants can reach into the thousands. Additionally, a site-based approach is useful when studies involve a large participant commitments, such is the case in this study, with its detailed survey, home assessments, and in-depth interview (Arcury & Quandt, 1999). A site-based approach is recommended for studies with slightly larger commits because this recruitment approach actively recruits interested and committed participants (Arcury & Quandt, 1999).

A site-based approach to recruitment is a five step procedure that ensures a heterogeneous sample, relevant to the study's goals (Arcury & Quandt, 1999). Step one involves identifying key participant characteristics/selection criteria relevant to the study (Arcury & Quandt, 1999), in the case of this study that would include location, gender, and age (see above for more detail on participant recruitment breakdown). Step two involves creating a list of locations throughout the community where individuals fitting the selection criteria can be located (e.g. churches, community centres, neighbourhood houses, public libraries, and coffee shops) (Arcury & Quandt, 1999). Next, step three, involves connecting with individuals at the identified locations to gather data on the locations' patrons (Arcury & Quandt, 1999). The fourth step then involves recruiting participants based on the selection criteria outlined in step one, using the information gathered in step three (Arcury & Quandt, 1999). Recruitment can be done by having the individuals in charge of the selected locations facilitate contact, or it can be done by having the researchers present on the study to groups of potential recruits utilizing said location (e.g. church groups) (Arcury & Quandt, 1999). Additionally, permission will be requested to display/distribute recruitment flyers throughout the selected locations (Appendix B). Finally, the last step involves continuous monitoring of the recruited participants in order to ensure a heterogeneous sample (Arcury & Quandt, 1999). In addition to the site-based approach, advertisements will be placed in the local community newspapers and the

research team will also ask early participants to recommend this study to others fitting the selection criteria (snowball technique).

Phase two participants (N = 80; n = 20 rural and n = 60 urban-dwelling older adults) will be purposefully selected with the goal of obtaining a heterogeneous sample. Selection criteria for phase two, like phase one, will include an equal gender split (50% male; 50% female) and an equal split between older adults aged 65-74 (n = 200) and aged 75 and older (n = 200). A number of other factors will also be considered when recruiting phase two participants. For instance, the data collected from the SPMSQ will be used as a screening tool for phase two, as only participants who are able to participate in the interview portion of the study with little to no assistance will be selected. Selected participants will also come from a variety of socioeconomic statuses in order to examine socioeconomic status's impact decision making process (e.g. cost of HMs). Additionally, in line with the study's first research question, magnitude of accessibility measures will also be used in phase two participant selection to examine if there is any connection between person-environment fit and the adoption of HMs. Finally, any other pertinent findings discovered during phase one may also be used to guide participant selection in phase two.

## **4.5. Informed Consent**

All study participants will be required to sign a consent form which will detail the purpose of the study, what is required by participants, both the risks and benefits of taking part in the study, and participant confidentiality. Additionally, the informed consent will assure participants that they can withdraw themselves from the study at any point they wish. A copy of the informed consent can be found in Appendix A.

## **4.6. Data Analysis**

This study will involve three stages of data analysis. Stage one will involve quantitative data from phase one in order to address the person-environment fit of older adults' homes and begin examining the factors impacting the decision making process.

The second stage of analysis will use phase two qualitative data to delve further into the decision making process and the subjective/objective factors impacting HM adoption. Finally, the third phase will look at both phase one and phase two data to further examine the factors impacting the HM decision making process. A statistical analyst will be hired to assist with analyzing the quantitative data, a transcription service will be used to transcribe the qualitative interviews, and the study's project coordinator and research assistants will conduct the qualitative analysis.

#### **4.6.1. Stage One Data Analysis**

In stage one of the data analysis, the magnitude of accessibility problems in older adults' homes will be calculated using the Housing Enabler. Statistical analysis of the Housing Enabler data can be completed using complementary Housing Enabler Software (available from <http://www.enabler.nu/>) (Iwarsson & Slaug, 2010; Iwarsson, 2014). The Housing Enabler provides a quantitative measure of the degree of accessibility problems in older adults' homes, thus allowing for sophisticated data analysis (Iwarsson & Slaug, 2010). In analyzing the Housing Enabler data, the dichotomous responses from the functional and environmental components of the tool are used to produce a score representative of the degree of accessibility issues in older adults' homes, that can range from zero (no accessibility issues) all the way to 1832 (Iwarsson & Slaug, 2010; Lien et al., 2015). The Housing Enable Software can also rank the environmental barriers, based on the impact they have on the overall magnitude of accessibility problem score, thus allowing researchers to pinpoint how and why accessibility issues in the home arise (Iwarsson & Slaug, 2010; Lien et al., 2015).

Stage one of data analysis will also use hierarchical linear and hierarchical logistic regression analysis to begin examining for relationships between HM adoption and different subjective and objective factors. Hierarchical logistic regression will be used as it is specifically designed for analysing dichotomous variables (Gelman & Hill, 2007; Howell, 2007). Multiple regression (i.e. hierarchical regression) is a statistical method that allows researchers to "[predict] a dependent variable from a set of predictors" (Stevens, 2002). Therefore, allowing researchers to examine how a number of variables impact a dependent variable (Howell, 2007). A number of factors can contribute to human

behaviour, thus making multiple regression analysis a good fit when it comes to predicting complex behaviours such as the decision to adopt HMs or not (Stevens, 2002). For the purposes of this study, hierarchical linear and hierarchical logistic regression will serve as a starting point in exploring the subjective and objective factors impacting HM adoption. For example, predictive models (Stevens, 2002) based on the survey data will be used to look for associations between survey measures and HM adoption. Specifically, respondent's answers to survey questions about previous HM adoption and openness to HMs will serve as dependent variables. Groups of predictive variables, such as demographics, meaning of home, housing control beliefs, and so on will be added to the model one at a time. After each group is added to the model variance will be measured. F-tests will be used for linear and likelihood ratio tests will be used for logistic regression. Models will be dropped from the model if they do not result in variance. Any groups of variables that do not significantly reduce unexplained variability will be dropped from the model. Findings from this analysis may also be used for phase two participant selection and will help to further shape the phase two interview guide.

As previously discussed, the quantitative data collected as a part of this study is similar to that of the data collected during the ENABLE-AGE study (Iwarsson et al., 2007). Findings from the ENABLE-AGE study were able to identify a link between objective and perceived aspects of housing and health (Nygren et al., 2007; Oswald et al., 2007). Stage one data from this study will therefore also be used to examine the link between housing and older adult's health through additional hierarchical linear and hierarchical logistic regression. Understanding the link between aspects of the home (objective and perceived) and health is an important part of this study, because it has the potential to play a role in HM adoption. Furthering shedding light on the link between housing and healthy aging (Iwarsson et al., 2007).

Finally, stage one data analysis will also include descriptive data analysis to provide sample/participant characteristics. Sample statistics will be used to help guide purposeful selection of phase two participants. For instance, the demographic (i.e. age and gender) and socioeconomic (i.e. income) data will be used to ensure a heterogeneous sample (see section 4.4), and the data collected from the SPMSQ will be used as a screening tool for phase two, as only participants who are able to participate in the

interview portion of the study with little to no assistance will be selected. Additionally, magnitude of accessibility scores (i.e. measure of person-environment fit) will also be used to ensure participants with a range of scores are included, in order to measure person-environment fit's impact on HM adoption. Hierarchical linear regression, hierarchical logistic regression, and descriptive data analysis will be completed using SPSS®.

#### **4.6.2. Stage Two Data Analysis**

Stage two data analysis will involve analyzing the qualitative in-depth interviews. In order to complete the second phase of data analysis, the audio of all 80 phase two interviews will be recorded using voice recorders. Recording the interviews is crucial as it ensures comprehensive data is collected and that the interviewee's responses are accurately depicted (Charmaz, 2006; Patton, 2015). A transcription service will then be hired to transcribe all 80 recordings. Next, research assistants will utilize NVivo software to code the transcripts. Coding is the process by which raw data is classified, labelled, organized, and analytically interpreted (Charmaz, 2006; Corbin & Strauss, 1990). Coding gives researchers the opportunity to think about the data in a different way and allows researchers to find key patterns within the data (Corbin & Strauss, 1990). Therefore, coding provides researchers with the building blocks needed for data analysis and theory generation (Charmaz, 2006; Corbin & Strauss, 1990). For the purposes of this study, coding will be carried out in two rounds, initial coding and focused coding (Charmaz, 2006). Initial coding is when researchers examine small portions of the data piece by piece; for this study, research assistants will use a line-by-line procedure (Charmaz, 2006). Line-by-line coding allows researchers "to remain open to the data and to see nuances in it" (Charmaz, 2006, p. 50). During the process of initial coding, it is important that researchers are accepting of all possibilities, the codes are straightforward, and the codes are grounded in the data (Charmaz, 2006). The codes should come from the data, as researchers should not attempt to fit the data into preconceived codes to avoid researcher bias in interpreting the data (Charmaz, 2006). Next is focused coding, during which the most prevalent and/or noteworthy initial codes are grouped into categories (Charmaz, 2006; Corbin & Strauss, 1990). During both initial and focused coding it is important to be constantly comparing the data, codes, and categories against themselves and each other (Charmaz, 2006; Corbin & Strauss, 1990). This process of comparison

helps ensure refinement, precision, and consistency across the analysis, as well as reduce researcher bias when interpreting the data (Charmaz, 2006; Corbin & Strauss, 1990). Research assistants will also engage in memo-writing throughout the coding process as it will assist them in their analysis and reporting of the research (Charmaz, 2006; Corbin & Strauss, 1990).

### **4.6.3. Stage Three Data Analysis**

Finally, stage three of the data analysis will involve a mixed methods procedure for analyzing the stage one quantitative survey and Housing Enabler data in conjunction with the qualitative themes discovered during stage two of the data analysis. The stage three, mixed methods analysis, will be done in order to further identify/examine the key aspects impacting the process of HM adoption amongst older adults. Once the phase one data has been examined using SPSS® and the phase two data has been coded and analyzed in NVivo, both sets of data will be uploaded into the NVivo software (Andrews, Salamonson, & Halcomb, 2008). By using computer programs, such as NVivo, the quantitative findings from phase one (e.g. age), can be used to search for patterns and/or divergences in the qualitative findings, allowing for a deeper interpretation of the data (Andrews et al., 2008). For instance, Andrews et al. (2008) found that mixed method analysis allowed them to spot both similarities and differences between subgroups of participants that were too subtle to detect prior to their mixed method analysis. Therefore, as demonstrated by Andrews et al. (2008), mixed method analysis will aid in creating a clearer and more complete understanding the factors impacting the decision to implement HMs.

## **4.7. Knowledge Translation**

In the extant literature, several terms are used to discuss the dissemination and application of knowledge, such as knowledge transfer, research utilization, research uptake, implementation, and diffusion to name a few (Estabrooks, Thompson, Lovely, & Hofmeyer, 2006; Graham, Logan, Harrison, Straus, Tetroe, Carswell, & Robinson, 2006; Straus, Tetroe, & Graham, 2009). For the purpose of this proposed study, the term 'Knowledge Translation' will be utilized. CIHR defines knowledge translation as “a

dynamic and iterative process that includes synthesis, dissemination, exchange and ethically sound application of knowledge to improve the health of Canadians, provide more effective health services and products and strengthen the health care system” (Canadian Institute of Health Research [CIHR], 2012, p. 1). Knowledge translation is essentially the transformation of research findings into concrete forms of action (Graham et al., 2006). However, despite growing dedication to research in fields such as the health sciences, there is still a lack of attention being paid to turning that knowledge into action (e.g. policy and practice) (Graham et al., 2006; Grimshaw, Eccles, Lavis, Hill, & Squires, 2012).

CIHR is a proponent of knowledge translation and outlines two ways in which knowledge translation can be completed as part of a CIHR grant proposal (CIHR, 2012; Estabrooks et al., 2006; Straus et al., 2009). The first is integrated knowledge translation in which knowledge users serve as partners in the study and therefore are part of the project from start to finish and beyond (CIHR, 2012). The other form of knowledge translation, which this proposed study will utilize, is end-of-grant knowledge translation which “covers any activity aimed at diffusing, disseminating or applying the results of a research project” (CIHR, 2012, p. 12). CIHR presents five factors that grant applicants should consider when addressing end-of-grant knowledge translation in their grant proposal: goals, knowledge-user audience, strategies, expertise, and resources (CIHR, 2012).

First, in a CIHR application individuals “should clearly state and justify their proposed [knowledge translation] goals” (CIHR, 2012, p.13). The two broad goals of knowledge translation include finding ways to increase awareness of a topic and promoting action (CIHR, 2012). In line with CIHR’s (2012) examples and suggestions, the knowledge translation goals of this proposed study include the following. One, to increase awareness related to older adults’ decision making process when it comes to the adoption of HMs amongst professionals in the occupational therapy and housing disciplines and professions. Increased awareness amongst professionals in the housing and occupational therapy fields is critical, as it will encourage professionals to become actively involved in the promotion of HMs. Two, to inform future research on older adults’ decision making process as it relates to the adoption of HMs.

Second, when it comes to identifying the knowledge user audience, or outside of project participants, CIHR states that “[a]pplicants should clearly identify and justify their target audiences” (CIHR, 2012, p. 13). How a research team goes about translating the knowledge gained during the study will differ depending on their audience (CIHR, 2012; Grimshaw et al., 2012; Straus et al., 2009). Therefore, the applicant’s plan for knowledge translation should be shaped by their understanding of the group(s) they are trying to target (CIHR, 2012). For this proposed project, the intended knowledge users include professionals in the occupational therapy and housing disciplines and professions, who can actively work to promote HM adoption, as well as researchers in the academic field.

Third, according to the CIHR (2012), end-of-grant knowledge translation can involve a number of different activities, and both the data collected and the target knowledge users should impact the strategies that the applicant plans to utilize. According to CIHR (2012), applicants can go about knowledge translation in three ways: diffusion (e.g. conference presentations and publications), dissemination (e.g. development of educational materials, workshops and the use of professional knowledge brokers), and application (e.g. putting the knowledge to use and promoting the use of the knowledge). When it comes to reaching professionals, the knowledge “should result in practice that is more evidence-based and is likely to be observable as reflected in changes in professional behaviours and quality indicators” (Grimshaw et al., 2012, p. 14). In order to efficiently disseminate the information, this proposed study will utilize CIHR’s (2012) recommendations of, lay language summaries and a workshop based on the findings. The workshop connected to this study will be prepared specifically for professionals in the occupational therapy and housing disciplines, including OTs, aging in place specialists, property managers, housing developers, and housing policy makers. The workshop will start with a presentation of the study findings, after which the research team and the professionals in attendance will engage in a discussion about how the study findings can best be applied in the real world. The involvement of housing and occupational professionals in these workshops is critical when it comes to knowledge translation for three key reasons. First, they will be able to inform the researchers on how the project’s findings can be applied to the real world context. Second, they will be able to apply the study’s findings in their own practice. Finally, they can help with future dissemination of the information, by promoting the use of the findings in their field and by helping to guide

the development of future workshops for housing and occupational therapy professionals. Workshop attendees will be provided with information packages based on the findings that they can use to inform their own practice. Data from this study will also be published in open-access journals. Information published in this way “has the potential of reaching a much broader audience, thus increasing the likelihood of research uptake by those in the academic community as well as knowledge users and the general public” (CIHR, 2012, p.12). Additionally, when it comes to reaching researchers, the diffusion techniques of conference presentations and publications will also be key (CIHR, 2012).

Fourth, CIHR (2012) also suggests that applicants ensure that the research team they have assembled has the awareness and expertise needed to execute the knowledge translation plan. For this proposed study, the principle applicant and hired project coordinator will have experience in creating conference presentations and preparing manuscripts for publication. The professionals who attend the workshop will bring firsthand knowledge and expertise that will be used to inform best practice when it comes to the application of the findings. Additionally, the research team will consult with the professionals who attend the workshop to ensure that future workshops and materials best suit the professional’s needs.

Finally, it is important that the grant application demonstrates that applicants have the resources needed to make the knowledge translation activities a reality (i.e. personnel and consumables) (CIHR, 2012). For this proposed study, a portion of the project coordinator and research assistants’ time will be committed to creating the plain-language summaries, workshop presentation, manuscripts, and conference presentations and/or posters. Additionally, budget lines will be dedicated to workshop related costs (e.g., material, location rental, and participant food/drinks), open-access publication fees, and conference fees for members of the research team (i.e. registration, hotel, flights, etc.).

## **4.8. Future Directions**

As previously discussed, this is a new area of research, therefore showcasing a need for growth in this area. In line with the first goal of this study, future knowledge translation activities will help to further inform professionals in the occupational therapy

and housing disciplines and professions on the multidimensional nature of their client's decision making process when it comes to HM adoption. Additionally, in line with the secondary goal of this study, there is a need for more research into the decision making process behind the adoption of HMs (e.g. Ahn & Hedge, 2011; Pynoos et al, 2012; Tse, 2005; Wyman et al., 2007). In the future, more research into this area of study will help address the current gaps in the literature and lead to more concrete applications of knowledge. A singular study is not often considered enough evidence when it comes to large-scale knowledge translation activities such as changes in policy, practice, and overall application of research (CIHR, 2012; Grimshaw et al., 2012). Therefore, an increase in research and awareness in this area will also lead to further changes in attitude, behaviour, practice, and technology, in both the professional sector and amongst older adults themselves (CIHR, 2012). The following will highlight some of the future directions needed in this area of study.

First, as previously discussed in chapter three, future studies should address the gaps and methodological issues of the current literature. Although research surrounding HMs and HM adoption exists, there is still a need for more empirical studies (Yuen & Carter, 2006). Expanding the research in this area to include studies more comparative studies could also help to provide a richer perspective on the factors impacting older adults' decision to implement HMs. Comparative studies could include: studies with older adults who do and do not implement HMs (Cummings et al., 2001), studies with men and women, and studies including older adults living in rural and urban locations (Li, 2009b). Studies with larger and more culturally diverse samples could also help to shed light on the subjective and objective factors impacting the HM adoption process. It would also be interesting to conduct a longitudinal study to see how changes over time do or do not impact the decision to implement HMs or not. Finally, in order to ensure a comprehensive understanding of the decision making process, there should be more research on the subjective factors impacting older adults' unique decision making process (Clemson et al., 1999).

Future research and practice in this area should also include more use of theory, such as those presented in chapter two, to guide and frame the work. As previously discussed, many studies on HMs and HM adoption only focus on one aspect of the

process (e.g. Ahn & Hedge, 2011; Clemson et al., 1999; Cumming et al., 2001; Johansson et al., 2009a; Kruse et al., 2010; Mathieson et al., 2002; McNaulty et al., 2003; Slagen-de Kort et al., 1998; Yuen & Carter, 2006). This does not allow researchers to gain the full and comprehensive picture of the decision making process behind HM adoption. The Competence-Press Model (Lawton, 1982; Lawton & Nahemow, 1973), the SOC model (Baltes & Baltes, 1990), and the DPM (Verbrugge & Jette, 1994), as discussed in chapter two, show how a wide variety of factors can impact the HM implementation process, and therefore highlight the importance of a holistic and in-depth perspective in this area of study. Future researchers in this area would benefit from using these three models together to guide/frame their research. Additionally, future research should work towards the creation of conceptual frameworks designed specifically to address the decision making process behind HM adoption.

Finally, there is a need for more knowledge translation activities in this field, including increased collaboration between researchers and professionals in the housing and occupational therapy fields. For instance, future research could lead to the creation/expansion of materials such as brochures, websites, and podcasts (CIHR, 2012), which will further inform professionals in the housing and occupational therapy fields on older adults' decision making process. Workshops, such as the one employed in this study, could continue to be created and fine-tuned in order to best reach those working in the occupational therapy and housing fields. Future studies could also employ knowledge brokers and knowledge translation specialists to more effectively disseminate information to individuals working in fields that promote HMs amongst older adults (CIHR, 2012). This dissemination of knowledge could then lead to professionals in the occupational therapy and housing fields (e.g. service providers and contractors), being able to take this knowledge and use it to further promote HMs. For instance, professionals could find and develop ways to make HMs more desirable amongst older adults. In the future, expanded research in this area could also lead to a greater level of knowledge and acceptance of HMs amongst the general public. Once again, materials and even online forms of media (e.g. websites and podcasts) could be developed specifically for older adults (CIHR, 2012). These materials could then be used to promote the use of HMs in effective and appealing ways. Overall, this study hopes to serve as a starting point from which future research and practice can continue to expand and evolve.

## **Chapter 5.**

### **Grant Proposal**

The following section presents a grant proposal based on the CIHR Project Scheme: 2016 1<sup>st</sup> Live Pilot guidelines, as outlined in Appendix H.

#### **5.1. Proposal Information**

##### **5.1.1. Project Title**

The psychosocial aspects of older adults' decision making process in the adoption of home modifications

##### **5.1.2. Lay Title**

Older adults' decision making process in the adoption of home modifications

##### **5.1.3. Lay abstract**

Canada's population is aging<sup>1</sup> and the vast majority of older Canadians want to age in place, meaning that they wish to grow old in their own homes<sup>2</sup>. However, not all older adults' homes are designed to support the functional declines often associated with later life<sup>3-4</sup>. According to the Competence-Press Model or Ecological Theory of Aging, individuals' behaviour is the function of the person, the environment, and the interaction between the two<sup>5</sup>. Therefore, aging in place is best achieved when there is a balanced person-environment fit, meaning the environment suits individuals' level of competence<sup>5-6</sup>. Home modifications (HMs) are a commonly suggested method to address these concerns and support older adults to age in place as long as possible<sup>2-3,7-10</sup>. Multiple objective and subjective factors have the potential to affect older adults' decision to implement HMs or not<sup>7,11</sup>, yet little is known about the specifics of these factors and how

they impact the decision making process<sup>11</sup>. Therefore, this study will address the following two research questions:

1. What is the person-environment fit for community-dwelling older adults in their home environments?
2. What are the primary factors affecting the psychosocial aspects of decision making process to implement home modifications among community-dwelling older adults?

By addressing these two questions, this study aims to advance our substantive understanding of the link between the home and older adults, and the decision-making process in implementing useful HMs to support aging in place. Question one will provide perspective on how person-environment fit impacts the decision making process, while question two will provide insight into the specific factors impacting the process. The findings will help to inform professionals in occupational therapy and housing fields on the multidimensional nature of their clients' decision making process, as well as identify future research directions in this area.

## **5.2. Complete Summary**

The purpose of this study is to identify the objective and subjective factors affecting community-dwelling older adults' decision to adopt home modifications (HMs). The majority of older adults want to age in place<sup>2-3,12-13</sup>. However, many older adults face age-related declines in physical and/or cognitive status<sup>2,4,14</sup>, which poses a challenge in independent functioning, as not all homes are designed to support the reduced functioning of older adults<sup>3-4</sup>. The built environment of the home plays an important role in a person's ability to independently carry out daily activities, therefore houses that are not suited to an older adults' level of physical and/or cognitive functioning can result in challenges which ultimately limit their ability to age in place safely<sup>3,6,10,12,14-16</sup>. HMs can address a number of concerns related to aging in place and can ultimately allow older adults to remain in their current homes<sup>2-3,7-10</sup>. Yet, there are mixed findings on the extent to which older adults are interested in and/or able to adopt HMs (e.g.<sup>7-8</sup>). The decision to adopt HMs is a complex and individualized process in which multiple subjective and objective factors have the potential to impact the final decision<sup>7,11</sup>. However, there is little empirical evidence on how these different factors directly or indirectly influence the decision making process<sup>11</sup>. This

study aims to expand the limited empirical literature on the psychosocial processes behind older adults' decision to adopt HMs or not, and inform professionals in the occupational therapy and housing fields on the multidimensional nature of their clients' decision making process.

A mixed methods approach will be used in order to gain an in-depth and comprehensive understanding of the objective and subjective factors influencing older adults' decision to adopt HMs and assess the person-environment fit of older individuals' homes. The first phase of the study will involve 400 community-dwelling older adults from urban and rural areas of British Columbia (BC). Trained research assistants will visit participants' homes in order to conduct in-person surveys and home assessments. The survey will address (1) demographics, (2) cognitive health status, (3) housing usability, (4) meaning of home, (5) housing-related control beliefs, (6) coping style, and (7) housing accessibility. The home assessments will be conducted using the North American version of the Housing Enabler Tool<sup>17-18</sup>. The second phase of the study will include 80 purposefully selected individuals from phase one to undergo a secondary home evaluation by a trained occupational therapist (OT). Based on the OT's evaluation, participants will be provided with individualized HM recommendations. Participants will then be given a period of time to review the recommendations and engage in their own decision making process. Next, semi-structured interviews will be conducted with the phase two participants in order to gain an in-depth understanding of the contributing factors and processes that impacted their decision making process. The semi-structured interview guide has been developed based on the relevant literature and will be further refined to reflect findings from the first phase of the study.

*Core expertise: This section will not be included as part of the Capstone requirements, but would be completed in an authentic CIHR grant proposal.*

## **5.3. Complete Summary**

### **5.3.1. Concept**

#### ***Quality of the Idea***

The population is aging; it is projected that by 2063, approximately 25% of Canadians will be over the age of 65<sup>1</sup>. A survey by the Canada Mortgage and Housing Corporation (CMHC) found that 85% of older adults aged 55 and above wish to age in place<sup>2</sup>. Yet, many older adults live in homes that are not designed to support their changing needs and abilities<sup>3-4</sup>. As Canada's population ages, there will be a growing demand for housing and housing related services targeted at meeting the needs of older adults<sup>2</sup>. HMs serve as a potential solution for those wanting to age in place. However, there is little empirical evidence about the objective and subjective factors impacting older adults' decision making process in HM adoption<sup>11</sup>.

The purpose of this study is to expand the limited empirical literature on the psychosocial processes of older adults' decision to implement HMs. The findings of this study will shed conceptual and substantive insights into the nature of the decision making process and the various factors influencing it. For instance, the first question will address how person-environment fit impacts the decision making process and the second question will highlight the specific objective and subjective factors impacting the adoption of HMs. Findings from this study will be used to inform occupational therapy and housing professionals on the multidimensional nature of their clients' decision making process.

#### **Research questions**

1. What is the person-environment fit for community-dwelling older adults in their home environments?
2. What are the primary factors affecting the psychosocial aspects of decision making process to implement home modifications among community-dwelling older adults'?

#### ***Importance of the Idea***

It has been found that individuals' emotional attachment to the home often grows and strengthens over time<sup>19</sup>. For many older adults, their house is more than just four walls

— it is a meaningful and central point in their lives<sup>20</sup>. For many older adults, home is a place where they are able to maintain a sense of autonomy and independence<sup>13,15,19</sup>. However, not all homes are designed to support older adults as they age<sup>3-4</sup>, thus leading to reduced person-environment fit for older adults wishing to remain in their current homes<sup>5-6</sup>. Reduced person-environment fit can lead to a number of negative consequences, such as reduced ability to complete activities of daily (ADLs), increased risk of falls, and subsequently an inability to safely and comfortably age in place<sup>3,6,10,12,15-16</sup>. Research shows that housing plays an important role in healthy aging<sup>12,15</sup>. HMs can play a part in the creation of supportive housing by lessening the environmental press placed on older adults, thus creating a better person-environment fit for those hoping to age in place<sup>2-3,7-10</sup>. By utilizing HMs, older adults can increase their level of safety and independence, better perform ADLs, reduce their risk of falls, and ultimately age in place comfortably<sup>2-3,7-10</sup>. However, HMs can only aid older adults if individuals can and do implement them first<sup>21</sup>. This is a concern because the research shows that not all older adults can or will implement HMs<sup>8</sup>.

The decision making process behind the adoption of HMs is a complex and individualized experience<sup>7,11</sup>. A wide array of both objective (e.g., cost, access to services, and neighbourhood location) and subjective factors (e.g., attachment to place, stigma, and control) have been found to play a role in an older adults' decision to implement HMs or not<sup>7-8,11</sup>. However, there is still a relatively limited amount of empirical evidence about how these factors directly or indirectly influence the decision making process<sup>11</sup>, especially when the decision making process is looked at holistically. Many of the current studies in this area contain small and/or homogeneous samples (e.g.,<sup>8,11,22-23</sup>). Or only include individuals who do not adhere to HM recommendations (e.g.,<sup>8,22</sup>). Therefore, these studies are unable to compare and contrast the factors impacting this population's decision making process to that of individuals who do adhere to HM recommendations. Additionally, much of the current empirical literature on HMs often focuses on only one aspect of the decision making and/or implementation process. For example, there are studies that look solely at individuals' readiness to adopt HMs (e.g.<sup>23</sup>), older adults' reaction to a single HM recommendation, such as removing a rug (e.g.<sup>22</sup>), and older adults' experience implementing HMs (e.g.<sup>10</sup>). Therefore, there is a need for a larger study which takes a more in-depth and holistic look into both the objective and subjective factors

impacting older adults' decision to implement HMs. By taking a broader look at HM adoption, this study will produce conceptual and substantive insights into the nature of the decision making process and the various factors influencing it. Findings from this study can then be used to inform professionals in the occupational therapy and housing professions on the multidimensional nature of their clients' decision making process and aid in the development of ways to promote HM use amongst older adults. Additionally, this study can also help inform future research in this area.

### **5.3.2. Feasibility**

#### ***Approach***

The purpose of this study is to provide conceptual and substantive insights into the nature of the decision making process behind the various factors influencing HM adoption.

#### **Research Questions**

1. What is the person-environment fit for community-dwelling older adults in their home environments?
2. What are the primary factors affecting the psychosocial aspects of decision making process to implement home modifications among community-dwelling older adults'?

#### **Method**

#### **Sample**

Phase one will involve 400 community-dwelling older adults from urban (n = 300) and rural (n = 100) British Columbia (BC). All participants must be community-dwelling older adults, fluent in English, and able to independently answer survey questions. To ensure a heterogeneous sample, and be representative of the age and gender divide amongst older adults in BC, half of the participants will be age 65-74 and half will be aged 75 and older, plus the male/female ratio will be even<sup>24</sup>. Recruitment will use a site-based approach<sup>25</sup> and snowballing.

Phase two will involve 80 purposefully selected participants from phase one (60 urban and 20 rural). The criteria for selection will ensure a heterogeneous and

representative sample, factors will again include an even split in gender and age ranges. Plus, participants with a range of socioeconomic statuses and magnitude of accessibility scores (i.e. measure of person-environment fit) will be included. Additionally, cognitive status will be used as a screening tool. Major findings from phase one may also be used to guide participant selection.

Participants will be required to sign a consent form that details the study's purpose, what is required, the risks/benefits of participation, confidentiality, and the withdrawal process.

### **Setting**

The 2011 Canadian Census shows that 86% of people in BC live in urban areas, while 14% reside in rural areas<sup>26</sup>. According to a housing report released by the Seniors Advocate<sup>27</sup>, 17.5% of BC's population is over the age of 65 and older adults can be found in all five of BC's health authorities. For this proposed study, 75% of the sample (n = 300) will be selected from urban locations and 25% (n = 100) will come from rural areas. This strategy is adopted to collect potentially different subjective perspectives and differences in the factors impacting the decision making process between older adults living in rural and urban areas.

The proposed study will utilize the 2011 Canadian Census to identify rural and urban locations in BC, from which the study sample will be drawn. This proposed study will choose specific research settings based on Census Tracts (CTs). CTs with higher proportions of older adults aged 65 and above will be strategically chosen to ensure a higher likelihood of participant recruitment.

### **Data Collection**

This study will utilize a mixed methods approach, bringing together both quantitative and qualitative approaches of data collection<sup>28</sup>. A mixed methods approach is appropriate for this study as it is explorative in nature. The range of diverse data and information that will be collected in this project will be effective in addressing the research

questions and provide avenues for future research in this area. The project timeline can be found in Appendix D.

## **Phase 1**

Phase one will involve 400 community-dwelling older adults from both urban and rural BC. Participants will complete a structured survey, based on the literature and existing tools, following which trained research assistants will conduct home evaluations using the North American version of the Housing Enabler<sup>17-18</sup>. This phase will gather information on the person-environment fit of the older participants, start addressing the factors impacting HM adoption, and inform phase two.

### ***Survey and Home Assessment***

Surveys provide researchers with a systematic method to collect quantitative data from a sub-set of individuals within a population of interest in order to make larger generalizations about the population from which the sample is drawn<sup>29</sup>. Thus by utilizing a survey approach, this study can start to draw conclusion related the study's two research questions. The survey will consist of several tools utilized in the *Enabling Autonomy, Participation, and Well-Being in Old Age: The Home Environment as a Determinant for Healthy Aging-ENABLE-AGE* Study<sup>12</sup>. The entire survey will take approximately 85 minutes per participant and will collect the following:

- **Demographics:** Basic demographics (e.g. age, sex, marital status, education, employment, income, and race/ethnicity) and health information (symptoms<sup>30</sup>, diseases<sup>31</sup> and visual acuity<sup>32</sup>)
- **Mental Health:** Cognitive status, collected using the 'Short Portable Mental Status Questionnaire' (SPMSQ)<sup>33</sup>
- **Housing Accessibility:** As part of/in conjunction with the Housing Enabler<sup>17-18</sup> the survey will collect data on participants' assistive devices/technical aids, housing condition, dwelling standards, and current HMs (*more information on the Housing Enabler below*)
- **Housing Usability:** The 'Usability in My Home (UIMH)' tool<sup>34</sup> will be used to assess participants' subjective perception of homes' physical environment
- **Meaning of Home:** The 'Meaning of Home Questionnaire'<sup>35</sup> will be used to obtain data related to participants' subjective perceptions of home

- **Housing-Related Control Beliefs:** The 'Housing-Related Control Beliefs Questionnaire (HCQ)<sup>20</sup> will assess participants' housing-related control beliefs
- **Coping Style:** The 'Questionnaire on Coping Styles'<sup>12,36</sup> will gather data on how participants have addressed recent issues in their lives

### ***Housing Enabler***

The Housing Enabler was developed to measure person-environment fit<sup>17</sup>. The Housing Enabler consists of three components<sup>17</sup>. It first evaluates individuals' competence, through an interview and observation, "in order to assess [...] functional limitations (12 items) and dependence on mobility devices [...] (two items)" (<sup>17</sup>, p.18). Next, it evaluates the exterior, entrance, and interior of the home environment (161 items)<sup>17</sup>. Finally, a score is calculated that predicts the magnitude of accessibility issues older adults' face in the home<sup>17</sup>. The standards and guidelines of the Housing Enabler are in the Swedish context, therefore adjustments/adaptations must be made before the instrument can be used in other countries<sup>17-18</sup> therefore the North American version of the Housing Enabler<sup>18</sup> will be used.

### **Phase Two**

The research team will purposefully select 80 participants (60 urban; 20 rural) from phase one to participate in a secondary home evaluation by a trained occupational therapist (OT). Based on this evaluation, participants will be provided with individualized recommendations for HMs. Participants will then be given three months to review the recommendations and engage in their own decision making processes. Research assistants will conduct semi-structured interviews with participants in order to gain an in-depth understanding of the factors and processes impacting the decision making process.

### ***OT Assessments***

Trained OTs will be hired to conduct environmental assessments and provide all 80 participants with personalized HM recommendations. OTs will utilize the Canadian Occupational Performance Measure (COPM)<sup>37</sup>. The COPM is a client-centred tool used to identify the self-care, productivity, and leisure related issues that clients deem as being relevant challenges in their day to day lives<sup>37-38</sup>. Assessments using the COPM take

approximately 30 minutes. First, clients identify problems in any of the three areas of occupational performance: leisure (e.g., doing crafts or making phone calls), self-care (e.g., bathing, transfers, or shopping), and productivity (e.g. volunteering or laundry)<sup>37-38</sup>. Clients then rate the significance of these tasks out of 10 and select 1-5 issues for the OTs to address<sup>37-38</sup>. Next, individuals' rate their performance and satisfaction for each selected task (both out of 10)<sup>38</sup>. OTs take these scores, sum and average them, resulting in final scores out of 10<sup>38</sup>. OTs are then able to use these scores to help design personalized interventions for clients (e.g. HMs)<sup>38</sup>. The COPM, though developed in Canada, has been used throughout the world and shows positive test-retest reliability, validity, and responsiveness<sup>38</sup>. After the participants receive their personal assessments/recommendations, they will be given three months to consider and perhaps start implementing the HMs. Following this they will take part in a semi-structured interview about their decision making process related to the adoption of HMs. Allowing participants three months in-between the assessment and the interview will give them time to begin engaging in the decision making process more thoroughly.

### ***In-depth Interviews***

In-depth interviews are designed to gather rich and detailed data on a specific topic<sup>39-40</sup>. This proposed study will take a semi-structured approach. In a semi-structured interview, the interviewer has a select number of questions to guide the process<sup>40</sup>. This structure allows for more organic conversations to develop between interviewers and interviewees, interviewees are able to express thoughts, ideas, and experiences related to the topic that the researcher had not considered/expected<sup>39-40</sup>. Research assistants will conduct the interviews with the assistance of an interview guide that has been based on the literature and will be further shaped by any major findings brought forward during the first phase of the study. The interviews will take approximately 60 minutes.

### **Data Analysis**

This study will involve three stages of data analysis in order to identify the objective and subjective factors impacting the HM decision making process.

## **Stage One**

First, the magnitude of accessibility problems in older adults' homes will be calculated using compatible Housing Enabler software<sup>17</sup>. Next, hierarchical linear and hierarchical logistic regression (for dichotomous variables)<sup>41-42</sup> will be used to start looking for relationships between HM adoption and different subjective and objective factors identified in the survey. Multiple regression allows researchers to examine how a number of variables impact a dependent variable<sup>42-43</sup>. A number of factors can contribute to human behaviour, thus making multiple regression analysis a good fit when it comes to predicting complex behaviours such as the decision to adopt HMs or not<sup>43</sup>. Predictive models<sup>43</sup> will be used to look for associations between survey measures and previous HM adoption. Groups of predictive variables, such as demographics, meaning of home, housing control beliefs, and so on will be added to the model one at a time. After each addition to the model variance will be measured using F-tests (linear regression) or likelihood ratio tests (logistic regression). Multiple regression will also be used to examine the impact of objective and perceived aspects of housing on health<sup>12</sup>. The link between housing and healthy aging has the potential to impact HM adoption and these findings will shed further light on the link between housing and older adults well-being<sup>12</sup>. Findings will be used to guide phase two participant selection and inform the phase two interview guide. Finally, descriptive data analysis will provide sample statistics that will also be used to help guide purposeful selection of phase two participants. A statistical analyst will be hired to conduct the quantitative data analysis and the analysis will be completed using SPSS®<sup>44</sup>.

## **Stage Two**

All interviews will be recorded to ensure accuracy of the data<sup>39</sup>. A transcription service will then be hired to transcribe all 80 recordings. The project coordinator and research assistants will use NVivo<sup>45</sup> to code the data. Coding is the process by which raw data is classified, labelled, organized, and analytically interpreted<sup>39,46</sup>. Coding gives researchers the opportunity to think about the data in a different way and allows researchers to find key patterns within the data<sup>46</sup>. Therefore, coding provides researchers with the building blocks needed for data analysis and theory generation<sup>39,46</sup>. For the purposes of this study coding will be broken down into two rounds, initial coding and

focused coding<sup>39</sup>. First, initial coding is when researchers examine small portions of the data piece by piece, for this study research assistants will use a line-by-line procedure<sup>39</sup>. Second, focused coding is when the most prevalent/noteworthy initial codes are grouped into categories<sup>39,46</sup>. This process will result in themes representative of the research questions.

### **Stage Three**

The final stage will involve analyzing the quantitative phase one data in conjunction with the qualitative themes found in stage two of the analysis. This will aid in further identify/examining the key aspects impacting the process of HM adoption amongst older adults. Both the quantitative and qualitative data will be imported into NVivo<sup>45</sup> in order to identify patterns across the findings<sup>47</sup>.

### **Knowledge Translation**

The primary goal of this study is to increase awareness and knowledge related to older adults' HM decision making process amongst professionals in the occupational therapy and housing disciplines/professions such as OTs, aging in place specialists, property managers, housing developers, and housing policy makers. By providing professionals in these fields with the findings obtained in this study it can have a positive impact when it comes to policy and practice related to seniors' housing and older adults' ability to age in place. For instance, leaders in these fields can use this information to find ways to encourage HM uptake. In order to reach professionals in these related fields, lay language summaries and a workshop based on the findings will be prepared<sup>48</sup>. Individuals from across disciplines will be invited to take part in the workshop. The research team will present the study findings, following which the research team and professionals will engage in a discussion of the findings and how they can be used to inform practice and policy in the occupational therapy and housing fields. Participants will also be provided with lay summary information packages which they can take with them and use to inform their individual practice.

A secondary goal of this study is to inform future research. In order to reach researchers/academics, the diffusion techniques of conference presentations and

publications will be used<sup>48</sup>. Members of the research team will present findings from the study at annual Canadian Association on Gerontology conferences. Data from this study will also be published in an open-access journal, as information published in this way “has the potential of reaching a much broader audience, thus increasing the likelihood of research uptake by those in the academic community as well as knowledge users and the general public.” (<sup>48</sup> p.12).

To ensure the expertise/resources needed to accomplish these KT projects are available the following steps will be taken. A portion of the project coordinator and research assistant’s time will be committed to creating the lay-language summaries/information packages and workshop presentations. Budget lines will be dedicated to the costs associated with the workshops (i.e., location, information packages, and food and drinks). The professionals who take part in the initial workshop will also be asked to provide input on the event to ensure any and all subsequent workshops meet the needs and expectations of those working in the field. The principal applicant and the project coordinator will have experience in creating conference presentations and preparing manuscripts for publication. Additionally, budget lines will be dedicated to open-access publication fees and conference fees for members of the research team (i.e. registration, hotel, flights, etc.).

### ***Expertise, Experience and Resources***

This section will not be included as part of the Capstone requirements, but would be completed in an authentic CIHR grant proposal.

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## Appendix A.

### Informed Consent

**Title of Research Study:** The psychosocial aspects of older adults' decision making process in the adoption of home modifications

**Investigator Name:** Heather Cowie

**Investigator Department:** Department of Gerontology

**What is the purpose of this study?** The goal of this study is to identify the objective and subjective reasons why older adults do or do not adopt home modifications. This study also aims to evaluate the person-environment fit of older adults' homes in British Columbia

**What will you be required to do?** You will be asked to take part in an approximately 90 minute survey and home evaluation. The survey will address (1) demographics, (2) mental health status, (3) housing accessibility, (4) housing usability, (5) meaning of home, (6) housing-related control beliefs, and (7) coping style. Trained research assistance will conduct the surveys and environmental evaluations in your home.

You may also be asked to undergo a secondary home evaluation with a trained Occupational Therapist, who will offer you personalized home modification recommendations. Following which, you will then be given three months to review the home evaluations and undergo your own decision/implementation process (you are not required to make any of the home modifications). Following which you will be asked to participate in a semi-structured interview on your decision making process. This interview will take approximately 60 minutes and will address the subjective and objective reasons why you did/will or did not/will not implement the recommended home modifications.

**What are the risks of this study?** All information collected during this study will be kept confidential. Participation will result in involve a marginal time commitment. Additionally, participants will be asked to take part in tests to measure functional ability. Phase two participants (home modification recommendations and interview) will be made aware of

environmental hazards/barriers in their home. No other known risks are associated with participation in this study.

**What are the benefits of this study?** Knowledge gained through this study will be used to encourage further research and inform professionals in the occupational therapy and housing disciplines and professions on the multidimensional nature of their clients' decision making process, thus improving the home modification field for all individuals, particularly older adults. For those involved in the second phase of this study (home evaluation and interview) you will receive personalized home modification recommendations from a trained professional.

**Do you have a choice to be in this study?** Participation in this study is voluntary and you are able to withdraw yourself from the study at any point. You can decide not to answer any question(s) you wish during the survey and/or interview. If you decide to withdraw from the study following data collection, the research team may keep and use the already collected information in reports related to the study.

**Statement of confidentiality.** All of the data collected as part of this study will be confidential. Your name, identifying characteristics and any personal information collected during this study (e.g., home address, place of work, etc.) will be kept confidential and will be protected to the fullest extent of the law. Any report or publication based on this study will not include the real names/identifying characteristics of the participants or others (e.g. friends, family, landlords, etc.). The inclusion of participant's names and/or data (e.g. responses and comments) will only be included in reports, published materials, and/or workshops with the participant's expressed and explicit consent. All materials and data will be kept in a secure location.

By signing the consent form you are also granting the research team permission to audio tape and subsequently transcribed your interviews in full.

**Contact of participants at a future time and use of the data in other studies:** Future studies may use the information collected during this project, additionally future researchers may need to contact you. Do you agree to future contact? If so, please initial here: \_\_\_\_\_

Any complaints can be registered with the Heather Cowie or the Director of the Simon Fraser University Office of Research Ethics, Dr. Jeff Toward, at xxx-xxx-xxxx.

Office of Research Ethics  
Simon Fraser University  
8900 Nelson Way, Burnaby BC V5A 4W9  
xxxxxxx@sfu.ca

If you have any questions about this research study or if you wish to obtain copies of the results upon the study's completion you can contact:

Heather Cowie  
Research Associate  
Department of Gerontology  
Simon Fraser University  
2800-515 West Hastings Street Vancouver, BC V6B 5K3  
xxxxxxx@sfu.ca

By signing this form, I ensure that I have read the above in full and agree to participant:

---

Print Name

Signature

Date

## Appendix B.

### Participant Recruitment Flyer

**YOU ARE INVITED TO PARTICIPATE  
IN A RESEARCH STUDY ABOUT THE  
ADOPTION OF HOME MODIFICATIONS**

**We are interested in:**

- Identifying the reasons why older adults do or do not implement home modifications
- The current standard of housing occupied by older adults
- Older adult's ability to comfortably function within their home

**Participants must be:**

- Aged 65 and over
- Fluent in English
- Living in the community/ a private residency



**Participant Involvement:**

- Take part in an in person survey within your home
- Receive an environmental evaluation of your home
- A subset of participants will receive an additional home evaluation, personalized home modification recommendations, and will take part in an interview about the process

**If you wish to participate in this study and/or have any questions please contact Heather Cowie:**

Heather is a Research Associate in the Department of Gerontology at Simon Fraser University and can be reached by phone at (XXX)-XXX-XXXX or email at XXXXXX@sfu.ca

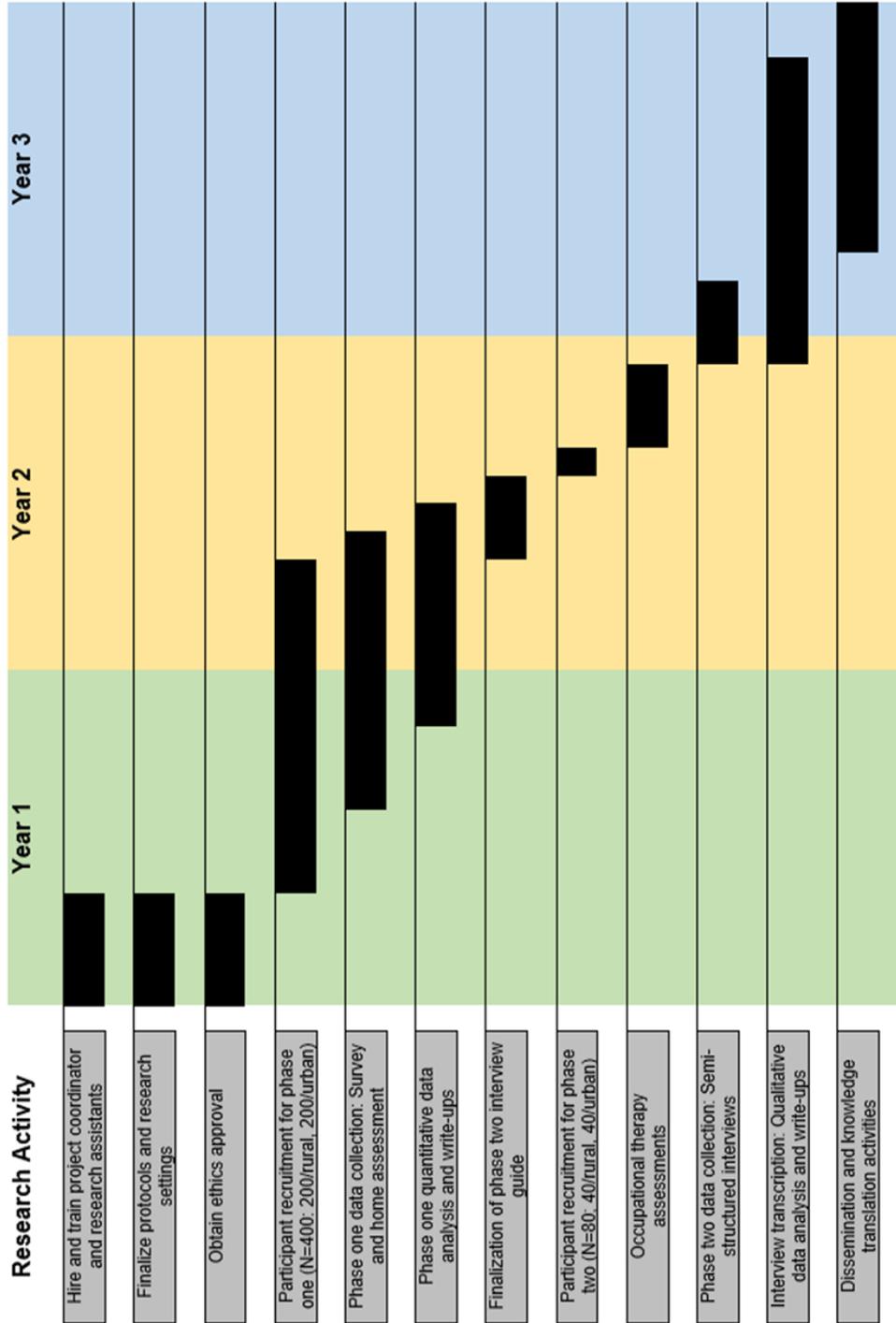
## Appendix C.

### Interview Guide

1. Have you/do you plan to follow through on any of the occupational therapist's recommended home modifications? If so which ones? Why?
2. Which (if any) of the recommended home modifications do you not plan on making? Why?
3. What were the factors you considered before making the decision to implement the HMs or not?
4. Has anyone else been involved in making the decision to implement the HMs or not (i.e. family, friends, caregivers, landlord)? How has their opinion impacted your decision making process?
5. Are there/were there any barriers or difficulties you faced/expect to face in implementing the home modifications? (Probes: structural concerns, financial concerns, regulatory issues, landlord, locating HM material and/or services)?
6. What is your opinion of home modifications? (Probes: effectiveness, aesthetics, etc.)? Do you have any suggestions on how to improve the home modification experience or home modifications themselves?
7. What was your experience with the occupational therapist like? What did you know about home modifications prior to your participation in this study?
8. How have you/how do you plan on financing future home modifications (savings, grants, tax credits, etc.)?
9. Do you plan/hope to age in place? Why/Why Not?
10. Is there anything else you would like to discuss? Anything I may have missed?

# Appendix D.

## Timeline



## Appendix E.

### Budget Information

Period of Support Requested: 3 years 0 Months

Budget Category	Amount (in thousands)
<b>Research Staff</b>	<b>\$447,680 ~ \$448,000</b>
<b>Project Coordinator:</b> $\$32/\text{hr} + 12\% \text{ benefits @ } 30 \text{ hrs/week} \times 50 \text{ weeks/yr} = \$53,760/\text{yr}$ $\times 3 \text{ yrs}$ Responsible for coordinating the project, overseeing research assistants, administrative tasks, participant recruitment, contacting/arranging appointments with participants, and assisting with the preparation of manuscripts, conference presentations, workshops, and lay materials	\$161,280
<b>4 Research Assistants (RAs):</b> $\$20/\text{hr} + 12\% \text{ benefits @ } 20 \text{ hrs/wk} \times 50 \text{ wks/yr} = \$22,400/\text{yr} \times 3 \text{ yrs} = \$67,200$ RAs will be undergraduate students. Tasks will include administering surveys, conducting the interviews, assisting with data analysis, and the preparation of the workshop/workshop materials	\$268,800
<b>4 Occupational Therapists (OTs):</b> $\$110/\text{hr @ } 40 \text{ hrs per OT} = \$4,400$ OT will conduct the home evaluations and provide participants with HM recommendations. 20 participants per OT x 2 hrs per evaluation = 40 hrs per OT	\$17,600
<b>Trainees</b>	<b>\$0</b>
Not applicable for this study.	
<b>Consumables</b>	<b>\$78,405 ~ \$79,000</b>
<b>5-Day training of Housing Enabler Tool for Research Team:</b> Trainer L. Lien. Travel expenses from U.S., hotel and subsistence in Vancouver - \$15,755 <i>Members of the research team will take part in training to ensure proper use of the tool</i>	\$15,755
<b>NVivo Training:</b> \$2,250	\$2,250
<b>Transcription (interviews):</b> 1 hour interview x 4 hours transcription time x 80 interviews x \$35/hour	\$11,200
<b>Statistical Analyst (phase one data):</b> $\$50/\text{hour} \times 200 \text{ hours/year} = \$10,000/\text{year}$ (years 1 & 2)	\$20,000

<b>Data entry service: \$2,600</b>	\$2,600
<b>Travel for Data Collection:</b> Phase 1 Survey and Home Assessment: <i>400 participants @ \$40 each = \$16,000 (year 1)</i> Phase 2 OT evaluations: <i>80 participants @ \$55 each = \$4,400 (year 2)</i> Phase 2 interviews: <i>80 participants @ \$40 each = \$3,200 (year 2/3)</i>	\$23,600
<b>Miscellaneous Costs:</b> office supplies, postage, newspaper ads, etc.: \$1000/year x 3 years	\$3,000
<b>Non-Consumables</b>	<b>\$2,462 ~ \$3,000</b>
<b>HP Pavilion 15.6" Laptop (AMD A10-8700P APU/1TB/8GB RAM/Windows 10/mode #15-AB188CA): \$749.99 + 12% tax</b> A laptop will be purchased for the research team. All work related to this project (e.g. data analysis) shall be completed on this laptop	\$840
<b>Microsoft Office Professional:</b> Microsoft Office Professional 2016 (Word, Excel, PowerPoint, Outlooks, Publisher and Access) will be purchased for the team's laptop	\$520
<b>Housing Enabler Software:</b> Housing Enabler Software will allow the magnitude of accessibility problems to be calculated	\$329
<b>Seagate Backup Plus 4TB 2.5" 5400RPM USB 3.0 Portable External Hard Drive (STDR4000100): \$249.99 + 12% tax</b> An external hard drive will be purchased to properly back up the study information and data	\$280
<b>4 Sony 4GB Digital Voice Recorder (ICDUX533S):</b> <i>\$109.99 per recorder (+ 12% tax) x 4</i> Digital recorders will be purchased for the recording of the phase two interviews	\$493
<b>Knowledge Translation</b>	<b>\$23,387.70 ~ \$24,000</b>
<b>Workshop costs:</b> <b>Room rental:</b> <i>McLean Management Studies Lab at SFU Vancouver - \$425/day</i> <b>Materials:</b> <i>Plain language summaries \$13.74/book x 45 books = \$618.30</i> <b>Food for participants:</b> <i>Lunch = assorted sandwiches and wraps (\$8/each) + water (\$2/each) = \$10/per person x 45 people = \$450</i>	\$1,493.30
<b>Conference Presentations (conference fees, travel. Hotel, taxi, per diem):</b>	\$17,894.40

<p>Travel costs for two team member to attend the Canadian Association on Gerontology Annual Meeting in years 2 and 3:  <i>Registration: \$1,580</i>  <i>Flight: Canadian destination (\$750) from Vancouver: \$7000</i>  <i>Hotel: \$225 incl. taxes/night (12 nights a year) = \$5,400</i>  <i>Per Diem: \$81.55/day/per person x 12 days = \$3,914.40</i></p>	
<p><b>Manuscript/Open Access Journal Publication (preparation costs, publication charges):</b>  \$2000 x 2 = \$4000</p>	<p>\$4,000</p>
<p><b>Other</b></p>	<p><b>\$14,000</b></p>
<p><b>Participant Honoraria:</b>  Phase 1 survey and home assessment:  \$25 x 400 participants = \$10,000  Phase 2 OT assessment and interview:  \$50 x 80 participants = \$4,000</p>	
<p><b>Total Amount Requested for the Entire Period of Support</b></p>	<p><b>\$568,000</b>  <b>~\$570,000</b></p>

## Appendix F.

### Additional Proposal Information

*The following information comes from the 'Project Scheme: 2016 1st Live Pilot Application Instructions' - 'General Application Process' – 'B. Complete a ResearchNet Application' – 'Task 2: Enter Proposal Information' (CIHR, 2016). A full version of this document can be found on the Canadian Institute of Health Research (CIHR) website (<http://www.cihr-irsc.gc.ca/e/193.html>) (CIHR, 2016). Please refer to Appendix H for more information about the 'Project Scheme: 2016 1st Live Pilot Application Instructions' (CIHR, 2016).*

Additional Proposal Information	
Institution Paid	Not Applicable
Is your application for a knowledge translation or commercialization project that includes a partner and/or a knowledge user?	No
Certification Requirements	Not Applicable
Is this a clinical trial?	No
Does this application contain a randomized controlled trial?	No
In order to carry out the proposed research in this application, is an exemption from Health Canada under Section 56 of the Controlled Drugs and Substances Act required?	No
Does this application propose research involving Aboriginal people?	No
Are sex (biological) considerations taken into account in this study?	No
Are gender (socio-cultural) considerations taken into account in this proposal?	Yes

<p><b>If yes, describe how sex and/or gender considerations will be considered in your research design</b></p> <p><b>If no, explain why sex and/or gender are not applicable in your research design</b></p>	<p>Gender is not a primary focus of the study. However gender will be taken into consideration when it comes to purposefully sampling of Phase Two in order to ensure that both male and female perspectives are taken into consideration.</p> <p>Additionally, gender will be taken into consideration during the analysis of the results in order to determine if gender plays a part in the adoption of home modifications.</p>
<b>Containment Level</b>	Not Applicable
<b>Environmental Impact</b>	Not Applicable
<b>Project Descriptors</b>	<p>Home Modifications</p> <p>Mixed Methods</p> <p>Subjective Factors</p> <p>Objective Factors</p> <p>Person-Environment Fit</p> <p>Aging in Place</p> <p>Environmental Gerontology</p> <p>Meaning of Home</p> <p>Psychosocial Adoption Process</p> <p>Older Adults</p>
<b>Areas of Research</b>	<p><i>Primary:</i> Gerontology</p> <p><i>Secondary:</i> Psychosocial/ Health Behaviour Research</p>
<b>Classification</b>	<p><i>Primary:</i> Gerontology</p> <p><i>Secondary:</i> Psychosocial and Behavioural Research</p>
<b>Themes</b>	<p>Health Systems/ Services</p> <p>Social/ Cultural/ Environmental/ Population Health</p>
<b>Suggested Institutes</b>	<p>Aging</p> <p>Health Services &amp; Policy Research</p> <p>Population &amp; Public Health</p>

## Appendix G.

### CIHR Project Scheme References

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## Appendix H.

### Project Scheme: 2016 1<sup>st</sup> Live Pilot Application Requirements

*The following copy comes from the 'Project Scheme: 2016 1st Live Pilot Application Instructions' - 'General Application Process' – 'B. Complete a ResearchNet Application' (CIHR, 2016). A full version of this document can be found on the Canadian Institute of Health Research (CIHR) website (<http://www.cihr-irsc.gc.ca/e/193.html>) (CIHR, 2016).*

#### **Task 1: Identify Participants**

This task collects information on all participants involved in your grant application. Consult the Individual Eligibility Requirements on the CIHR website for more information.

**Note: Participants cannot be added or removed or roles changed at application.**

#### **1.1 Participant Information**

- The applicant that initiated/opened the registration in ResearchNet is identified as the Nominated Principal Applicant for the application.
- All Principal Applicants and Co-Applicants will have access to the application on ResearchNet in order to allow them to contribute to the application.
- **All** Principal Applicants and Co-Applicants must complete the following:
  - Enter their CCV confirmation number.
  - Complete their most significant contributions.
  - Consent.
- Only the Nominated Principal Applicant has the functionality to submit the application.
- The Nominated Principal Applicant will have to wait for all other participants to complete their relevant sections of the application before submitting.

#### **1.2 Most Significant Contributions**

This mandatory sub-task captures information on the Nominated Principal Applicant, all Principal Applicants and all Co-Applicants (not for Collaborators) and cannot exceed 3,500

characters, including spaces. **Note: When cutting and pasting text into the text box, the exact number of characters may vary slightly depending on the type of browser that you are using.**

Please insert information regarding your most significant contributions (maximum of 5) as they relate to the application. Contributions can take the form of:

- Publications, presentations, intellectual property, other knowledge translation activities etc.
- Awards, degrees, credentials, etc.
- Clinical practice, policy development, etc.
- Specialized training, strategic employment positions, etc.

The contributions that you choose to share should be directly relevant to the grant application, and should demonstrate how you will contribute to the application at hand.

### **1.3 Consent**

All Principal Applicants and Co-Applicants on the application must agree to General Conditions and Consent to Disclosure of Personal Information before the Nominated Principal Applicant can submit the application to CIHR. Signed signature pages are not required. Note that the Nominated Principal Applicant will consent in Task #9.

### **Task 2: Enter Proposal Information**

**Note: Information entered at Registration will be prepopulated in the Application.**

**Project Title:** Project titles cannot change at application. The title submitted at Registration is automatically transferred over to the Application stage.

**Lay Title:** Provide a title for your project that is in a language clear to members of the general public. Lay titles are used by CIHR to inform the public and Parliament about the valuable research supported through public funds. Lay titles can change at application.

**Lay Abstract:** Using language accessible to a lay audience, Principal Applicants are asked to describe the proposed research, indicating how the proposed research can

improve personal health, the health of populations and/or the health delivery system. The character limit for the entire task is 2000 characters. This information is used by CIHR to inform the public and Parliament about the valuable research supported through public funds. Lay abstracts can change at application.

**Institution Paid:** The Institution Paid will administer the funds for your project. Consult the Institutional Eligibility Requirements on the CIHR website for more information.

Please note that prior to submitting your completed application, the Institution Paid will have access to view a limited number of application fields while your application is in progress.

**Partnered/Integrated Knowledge Translation (iKT) Projects - Special consideration:**

**Is your application for a knowledge translation or commercialization project that includes a partner and/or a knowledge user?**

This information has been pre-populated from registration and is editable at application. For your application to be deemed eligible for the Partnered/Integrated Knowledge Translation (iKT) Projects - Special consideration, you must answer “**yes**” to this question and your project must include one of the following:

1. A partner AND a knowledge user; OR
2. A partner only; OR
3. A knowledge user only.

At **application**, if you have selected **YES** to the first question, you are required to select one of the three options (as indicated above) to identify the type of approach used in your project (partnered and/or integrated knowledge translation). Also, you are required to identify at least one contributing partner as an Applicant Partner (see sections 5 and 6.3 for more information) **IF** your project includes “a partner **AND** a knowledge user” or “a partner only”. Note: **IF** you select ‘a partner **AND** a knowledge user’ or ‘a knowledge user only’, you must have identified at least one Principal Investigator who is a knowledge user at **registration**.

Peer review for applications that are confirmed eligible and validated for the Partnered/iKT special consideration will be integrated into the competition as a whole. However, at Stage 1 of the peer review process, applications that are deemed eligible for the special consideration will be assessed by both researcher and knowledge user reviewers. For further information regarding the Partnered/Integrated Knowledge Translation (iKT) Projects – Special Consideration, please consult the Project Scheme Frequently Asked Questions.

**Certification Requirements:** If you are awarded a grant, the necessary certification requirements must be met in accordance with policies on ethical conduct of research. Relevant policies:

- Agreement on the Administration of Agency Grants and Awards by Research Institutions
- CIHR Funding Policies

**Note:** For further information on research involving human participants and human biological materials, refer to the TCPS 2-2nd edition of Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans.

**Is this a clinical trial?**

Indicate if this application includes a clinical trial. For more information regarding clinical trials, please refer to the policy on trials.

**Does this application contain a randomized controlled trial?**

Indicate if this application includes a randomized controlled trial.

**In order to carry out the proposed research in this application, is an exemption from Health Canada under Section 56 of the Controlled Drugs and Substances Act required?**

Indicate if your proposed research is such that an exemption from Health Canada under Section 56 of the Controlled Drugs and Substances Act (CDSA) will be required. Consult the Health Canada website for details regarding obtaining an exemption under Section 56 of the CDSA.

**Does this application propose research involving Aboriginal people?**

Indicate if your application proposes research involving Aboriginal people. This information will be used for statistical purposes only. Applicants whose proposed research will involve Aboriginal People should consult Ethics of Health Research Involving First Nations, Inuit and Métis People. Any questions or comments may be sent to the Aboriginal Ethics Guidelines mailbox at [aeg-lda@cihr-irsc.gc.ca](mailto:aeg-lda@cihr-irsc.gc.ca).

**Are sex (biological) considerations taken into account in this study?**

Indicate if sex (biological) considerations are taken into account in this study. For a guide to sex and gender based analysis, please consult the CIHR website.

**Are gender (socio-cultural) considerations taken into account in this proposal?**

Indicate if gender (socio-cultural) considerations are taken into account in this proposal. For a guide to sex and gender based analysis consult the CIHR website.

**If yes, describe how sex and/or gender considerations will be considered in your research design (limit of 2000 characters).**

**If no, explain why sex and/or gender are not applicable in your research design (limit of 2000 characters).**

**Containment Level:** Definitions of Levels may be found in the PHAC laboratory biosafety guidelines.

**Environmental Impact:** Proposals will be reviewed for potential impacts on the environment in accordance with the *Canadian Environmental Assessment Act*.

**Project Descriptors:** Provide keywords to describe your research project, the techniques and the methodologies it will employ, and the areas of interest.

**Areas of Research:** Select the areas of research that best describe your proposal from the list provided.

**Classification:** Select the classifications that best describe your proposal from the list provided.

**Themes:** Select a primary theme classification. Indicate additional theme classifications only if the substance of the grant application significantly overlaps more than one theme. Consult the definition of the four CIHR Themes on the CIHR website for more information.

**Suggested Institutes:** Select a primary CIHR Institute whose research mandate is related to the application's research area(s) and objective(s). Additional Institutes should only be selected if the substance of this grant application significantly overlaps with the research mandate of more than one Institute.

### **Task 3: Complete Summary**

The Summary of Research Proposal completed by applicants at registration has been pre-populated in the application **and can be updated at application.**

The applicant(s) are asked to provide a research summary using scientific or technical terms making sure to provide the following information (as applicable):

- The broad goal(s) of the proposed research and clear linkage indicating how they fit the objectives of the funding opportunity.
- A brief overview of relevant background information and/or rationale for the proposed research.
- Specific research aims with a brief overview of the methodology that will be used to address each of the research aims.
- The nature of the core expertise being brought together to address the proposed research. Information may include important collaborations, within or outside of the research community that will be accessed to achieve the outlined research goals.
- Expected outcomes of the proposed research highlighting the significance of the proposed research and how it will advance knowledge and/or its application to health care, health systems and/or health outcomes.

#### **Note:**

- Your completed summary cannot exceed 3,500 characters (including spaces) or approximately one page. When cutting and pasting text into the text box, the exact number of characters may vary slightly depending on the type of browser that you are using.
- The summary submitted at registration will be one of the key sources of information used to match peer review expertise to applications. This is

necessary to allow us to secure the most appropriate expertise for high quality review of all applications within the competition timelines.

#### **Task 4: Complete Application**

Provide a clear and concise summary for each adjudication criterion outlined below. In addition to the description below, consult the Peer Review Manual: Project Scheme to obtain additional information on how the application will be assessed during the peer review process.

#### **Notes:**

You must enter information for each of the following adjudication criteria in the individual text boxes in ResearchNet. The character limits are described for each criterion and they include spaces. **Depending on the software you use, copying and pasting text from a word processor may not exactly match the character count in ResearchNet.** In some instances, using NotePad may be helpful. **The text boxes will not allow colored text, figures, tables or images.**

#### ***4.1: Adjudication Criteria***

**The following questions are used by reviewers to assess each criterion. Please address them in your application.**

#### **Criterion 1 - Assessment of Concept (50%)**

##### ***Sub-criterion 1.1: Quality of the Idea (25%)***

Limit: 1,750 characters including spaces / approximately half a page.

This sub-criterion is intended to assess the quality of what is being proposed.

- **Is the project idea creative?**
  - The project idea is among the best formulated ideas in its field, stemming from new, incremental, innovative, and/or high-risk lines of inquiry; new or adapted research and knowledge translation/commercialization

approaches/methodologies and opportunities to apply research findings nationally and internationally.

- **Is the rationale of the project idea sound?**
  - The project rationale is based on a logical integration of concepts.
- **Are the overall goals and objectives of the project well-defined?**
  - The goal states the purpose of the project, and what the project is ultimately expected to achieve.
  - The objectives clearly define the proposed lines of inquiry and/or activities required to meet the goal.
  - The proposed project outputs (i.e., the anticipated results of the project) are clearly described and aligned to the objectives.

### ***Sub-criterion 1.2: Importance of the Idea (25%)***

Limit: 3,500 characters including spaces / approximately one page.

This sub-criterion is intended to assess the value of the anticipated project contributions, and any advances in health-related knowledge, health care, health systems, and/or health outcomes.

- **Are the anticipated project contributions likely to advance health-related knowledge, health care, health systems and/or health outcomes?**
  - The context and needs (issues and/or gaps) of the project are clearly described.
  - The anticipated contribution(s) are clearly described, and should be substantive and relevant in relation to the context of the issues or gaps.
  - The anticipated contribution(s) are realistic, i.e., directly stemming from the project outputs, as opposed to marginally related.

## **Criterion 2 – Assessment of Feasibility (50%)**

### ***Sub-criterion 2.1: Approach (25%)***

Limit: 15,750 characters including spaces / approximately four and a half pages.

This sub-criterion is intended to assess the quality of the project's design and plan; including how and when the project will be completed.

- **Are the approaches and methods appropriate to deliver the proposed output(s) and achieve the proposed contribution(s) to advancing health-related knowledge, health care, health systems, and/or health outcomes?**
  - The **research and/or knowledge translation/commercialization** approaches, methods, and/or strategies should be well-defined and justified in terms of being appropriate to accomplish the objectives of the project.
  - Opportunities to maximize project contributions to advance health-related knowledge, health care, health systems and/or health outcomes should be proactively sought and planned for, but may also arise unexpectedly.
- **Are the timelines and related deliverables of the project realistic?**
  - Timelines for the project should be appropriate in relation to the proposed project activities. Key milestones and deliverables should be aligned with the objectives of the project, and be feasible given the duration of the project.
- **Does the proposal identify potential challenges and appropriate mitigation strategies?**
  - Critical scientific, technical, or organizational challenges should be identified, and a realistic plan to tackle these potential risks should be described. An exhaustive list is not expected.

***Sub-criterion 2.2: Expertise, Experience and Resources (25%)***

Limit: 3,500 characters including spaces / approximately one page.

An estimate of the number of hours per week (contribution) for each applicant working on the project should be provided. The name of the participants will appear above the one page text box with an adjacent box for entering their weekly contributions to the research project.

This sub-criterion is intended to assess the appropriateness of the complement of expertise, experience, and resources among the applicants (Nominated Principal Applicant, Principal Applicant(s) and Co-Applicant(s)), and their institutions/organizations, as it relates to the ability to collectively deliver on the objectives of the project.

It is the responsibility of the Nominated Principal Applicant to ensure the proposed project is poised for success.

- **Does the applicant(s) bring the appropriate expertise and experience to lead and deliver the proposed outputs and achieve the proposed contribution(s)?**
  - The applicant(s) should demonstrate the combined expertise and experience needed to execute the project (i.e., deliver the proposed outputs as well as achieve the proposed contribution(s)). The roles and responsibilities of each applicant should be clearly described, and linked to the objectives of the project.
- **Is there an appropriate level of engagement and/or commitment from the applicant(s)?**
  - The level of engagement (e.g., time and other commitments) of each applicant should be appropriate for the roles and responsibilities described.
- **Is the environment (academic institution and/or other organization) appropriate to enable the conduct and success of the project?**
  - Project applicants should have access to the appropriate infrastructure, facilities, support personnel, equipment, and/or supplies to:
  - Carry out their respective roles, and;
  - As a collective, manage and deliver the proposed output(s), and achieve the proposed contribution(s).

#### **4.2: References**

This sub-task is designed to list the references cited within the application (e.g., bibliographic information). A standard reference style is required – APA or a similar format. Please note that information included in this section cannot exceed 7000 characters including spaces (approximately 2 pages).

Note: When cutting and pasting text into the text box, the exact number of characters may vary slightly depending on the type of browser that you are using.

#### **4.3: Attachments**

Allowable attachments pertaining to the research proposal must be included in the "Attachments" sub-task found under the Complete Application Task in ResearchNet. All attachments must adhere to the guidelines for attachments on the Acceptable Application Formats and Attachments.

**The following attachments will be permitted:**

- **Figures** supporting the application (maximum 2 pages)

Note: Be sure to label the figures. Legends should be succinct and should not contain detailed information pertaining to methods.

**Task 5: Identify Application Partners (Optional)**

This task collects information on all partners involved in the application. Partnership contributions can be a combination of cash and/or in-kind contributions. There is no upper limit on partner contributions to a project.

**Note: Identifying Application Partners is a requirement only for partnered projects.**

Information Required from Partners:

A signed letter of support from every partner must be provided at the time of application for all cash and/or in-kind contributions. The letter should include specific incremental cash or in-kind contributions being provided in support of the proposed research.

To enter partner information on ResearchNet, access the Identify Application Partners task and:

1. Click "Add a Partner".
2. In the small textbox on the left, click the search icon. A search tool will appear.
  - Type the partner name, or a portion of the name, and click search.
  - The search will display results and narrow itself as more information is typed.
  - To facilitate search, enter "%" before and/or after your keyword.
  - Select the partner name from CIHR's prepopulated list.
3. If the partner does not appear, select "Other".
4. Enter the required field to create a new organization record.
5. Repeat these steps for every partner on the proposal.

From the Identify Application Partners task root menu, select "Manage Attachments" and upload the PDF letter document.

Repeat these steps for each partner.

### **Task 6: Enter Budget Information**

Outline the budget request and justify that the requested resources are appropriate to financially support the project as described in the application.

To complete the budget request, applicants must:

- Indicate the amount that is required in each budget category, along with a concise, high-level description of what the funds will be used for, in order to support the amount requested.

Information on eligibility of expenses and employment under grants is found in the Tri-Agency (CIHR, NSERC & SSHRC) Financial Administration Guide, Use of Grant Funds.

Please also note the following:

- Applicants will not be expected to provide detailed, line-by-line breakdowns of their budget request within the budget categories.
- All amounts entered in the budget section must be totals for the entire duration of the grant (NOT yearly amounts). CIHR will take the total amount and divide it equally across all years of the proposed project of research.
- All amounts indicated in the budget should be in Canadian dollars.
- Information such as cost quotations are not required as part of the application, and should not be attached to this module.

#### ***6.1: Complete the Budget Request***

Indicate and justify the required amounts to support the proposed project of research.

Applicants will be required to:

1. Select the term for the period of support requested by selecting the years and months.
2. Enter the requested amount for each budget category.
  - Each amount must be rounded to a multiple of \$1,000;

- Budget requests are total amounts for the **entire period of support**; and
  - If a category does not apply, the field can be left blank.
3. Justify the amount requested within each applicable category (maximum 900 characters) in the context of the requirements of the proposed project.

**Notes:**

- The expectation of the budget request is that it is a reasonable estimate that takes into consideration the needs of the research project and any anticipated changes in requirements over the term of the grant.
- The sum of all of the budget categories (total requested budget) must add up to a multiple of \$5,000.
- Individuals paid from grants are not employees of CIHR.
- The budget must include the applicable provincial and federal taxes and should be calculated using the after-rebate tax rates. After-rebate tax rates are available on the Canada Revenue Agency website.

**6.2: Information on the Budget Categories**

This section provides a brief overview on the budget categories and what may be included within the respective categories.

**1. Research Staff:**

- All research staff (research associates, assistants, technicians, etc.) should be determined by the work required for the research and the corresponding technical needs.
- Salaries for Principal Applicants cannot be paid from the grant.
- Stipends for trainees can be paid from the grant.
- Collaborators can be paid for their services from the grant as long as they are not considered an independent researcher eligible to apply for CIHR funding.

**2. Trainees:** Costs related to the training and mentoring of trainees, students and knowledge users (e.g., stipends, salaries and benefits if applicable due to institutional policies) are to be included in this section.

**3. Consumables:** CIHR grant funds may be used to cover only the direct costs of research (materials and supplies, services, travel for research activities, etc.) and may not be used for indirect costs.

4. **Non-Consumables:** Funding for equipment may be requested for this competition. Equipment is defined as any item (or interrelated collection of items comprising a system) of nonexpendable tangible property, having a useful life of more than 1 year and a cost of \$2,000 or more, which is used wholly or in part for research. Maintenance and operating costs of equipment are also eligible expenses.
5. **Knowledge Translation:** Costs associated with dissemination of research results such as manuscript publication, travel for knowledge translation activities (e.g., conferences), etc. are to be included in this section.
6. **Other:** Costs associated with any other expenses related to the proposed project that are not covered in the above categories are to be included in this section.

### **6.3: Complete the Partner Budget Details sub-task (optional)**

List any funding from partners (cash and/or in-kind support) that have been secured, or are expected to be secured. Note that this step should only be completed if this section is relevant to the budget.

**Note: Securing partner funds is a requirement only for partnered projects.**

In order to include any partner funding in the budget section, you must first identify the partner in the Partner Task (section 5). When you do this, a subtask will automatically appear within this sub-section of the Budget Task. Click on the partner name on the navigation column on the left, and complete the following steps:

1. Enter the partner's financial contribution in the cash or estimated in-kind value column for **each year**.
  - If there is no partner contribution for a given year, enter "0" in both the cash and in-kind columns.
2. Describe how the contribution from the partner will be used towards the proposed research project (maximum 900 characters)
3. Repeat these steps for each partner.

### **Task 7: Complete Peer Review Administration Information**

This task collects information used for the purpose of peer review administration.

#### **Suggested Reviewers for this Application**

Suggest Canadian and/or international reviewers that you feel have the expertise to review the application. CIHR reserves the right to make the final selection of reviewers. You should not suggest reviewers in conflict of interest. Consult the Conflict of interest guidelines on the CIHR website for more information.

### **Reviewers to exclude for this Application (optional)**

Provide the names of individuals that you feel cannot provide an objective review of your application and add comments specifying why the reviewer should be excluded from the application.

### **Task 8: Preview**

The Nominated Principal Applicant should review all components of the application and ensure that every participant on the application has completed their required tasks. To mark the preview task as complete, every other task must be marked as complete. The Nominated Principal Applicant should preview the Full Application Package prior to submitting the application to CIHR.

### **Task 9: Consent and Submit**

All Principal Applicants & Co-Applicants on the application must agree to the General Conditions and Consent to Disclosure of Personal Information terms, presented on ResearchNet, before the Nominated Principal Applicant can submit the application to CIHR. There are no signature pages required as part of the application submitted to CIHR.

Once every task is complete, including the consent, the Nominated Principal Applicant must review the terms listed, and respond to the questions regarding consent in order to submit the application.

The Nominated Principal Applicant must click "**Submit to CIHR**". The application will be sent to the Institution Paid, as part of the eApproval process, and ultimately, to CIHR. The CIHR deadline time for receipt of all applications will be 20:00 ET. The Nominated Principal Applicant will receive e-mail confirmation once CIHR receives the application.