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사회복지학박사학위논문

# The Effects of Health on Multidimensional Disability among Older Adults

- An Application of the ICF (International Classification  
of Functioning, Disability and Health) Framework -

건강이 노인의 다차원적 장애에 미치는 영향  
- 국제기능장애건강분류틀(ICF)을 적용하여 -

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사회복지학과

조 상 은



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**The Effects of Health on  
Multidimensional Disability among  
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**- An Application of the ICF (International Classification  
of Functioning, Disability and Health) Framework -**

**SANGEUN CHO**

**A DISSERTATION PRESENTED TO THE  
DEPARTMENT OF SOCIAL WELFARE AND THE  
COMMITTEE ON THE GRADUATE SCHOOL IN  
PARTIAL FULFILLMENT OF THE REQUIREMENTS  
FOR THE DEGREE OF DOCTOR OF PHILOSOPHY  
IN SOCIAL WELFARE**

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# **Abstract**

## **The effects of health on multidimensional disability among older adults**

**- An application of the ICF (International Classification  
of Functioning, Disability and Health) framework -**

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This study aims to investigate the influence of health conditions and service-related environmental factors on multidimensional disability and the moderating effect of service-related environmental factors in the association between health conditions and multidimensional disability among Korean older adults. Advancements in living standards and medical technologies contributed to an increase in the older-adult population and extended life expectancies. On the other hand, these positive developments are causing chronic illnesses and disabilities in older ages. In South Korea (hereinafter “Korea”), 89.7% of older adults have at least one chronic illness, and 70.5% are reported to have more than two chronic illnesses.

Disability in old age exacerbates older adults' burden as it combines the complex characteristics of disability and aging. Thus, older adults with late-life-onset disabilities may have more serious difficulties with physical, psychological, and emotional functions and more restricted experiences in their daily lives and social participation compared to other age groups with disabilities. Furthermore, as disability appears in mid- or late-life, it may change their established life and self-identity.

Chronic illnesses are found to have a negative impact on multiple dimensions of disability among older adults. Chronic illnesses may cause physical impairment, pain, and abnormalities and can lead to damaging psychological aspects such as depression, loss of self-image and independence, and stigma and isolation. Also, chronic illnesses reduce older adults' capacity for activities in their daily living and restrict their participation in physical, social, and economic activities. Although a large amount of literature reveals the close association of chronic illness and disability, some research findings suggest the possibility of an inconclusive causal relationship between the two by showing older adults who function well despite their chronic illnesses. This finding is compelling because it points to the high likelihood of the existence of factors that are able to modify or alleviate the negative effects of chronic illnesses on multidimensional disability.

Among various environmental factors, service is known to interact with older adults' health conditions and to affect their level of disability. In addition, service has a positive effect on health and disability among older adults by providing programs that satisfy their needs. In particular, professional and effective services provided by senior welfare centers and social welfare service centers contribute to improvements

in health status and social relationships and reduce feelings of loss and solitude, which helps older adults lead more active and meaningful lives. These centers are appropriate for older adults who have limited mobility as they are located within communities.

Based on the theoretical background and previous studies, it is important to understand disability as a multidimensional concept, how disability is affected by chronic illnesses and service-related environmental factors and the moderating roles of service-related environmental factors. However, these issues were found to be poorly addressed by previous studies. In order to overcome these limitations, this study established three objectives: first, to investigate whether chronic illnesses influence multidimensional disability among Korean older adults; second, to analyze whether service-related environmental factors affect multidimensional disability; and third, to test whether the association between chronic illnesses and multidimensional disability is moderated by service-related environmental factors.

The present study used a nationally representative data from the 2014 Survey of Living Conditions and Welfare Needs of Korean Older Persons (hereinafter “2014 Survey”). A total of 10,451 Korean older adults aged 65 and over were selected for the study sample. Of all the variables included in this analysis, infrastructure and self-reliance ratio of local government have regional characteristics. The infrastructure variable was obtained from two national statistics data, Ministry of Health and Welfare Statistical Year Book 2015 and the Current State of Elderly Welfare Facilities 2015; they contain data as of 2014. The self-reliance ratio of local government was obtained from Local Finance Integrated Open System “Local Finance 365”. The other variables were obtained from the 2014 Survey. Using the

ICF (International Classification of Functioning, Disability and Health) framework as a conceptual model, the data were analyzed through structural equation modeling.

In the analysis, multidimensional disability was constructed using the following three dimensions: psychological/emotional functions (measured by cognitive ability and depression), activity capacity for daily movement, and participation frequency. Health conditions were measured based on the numbers of chronic illnesses diagnosed by a doctor, and the service-related environmental factors included accessibility and infrastructure. Accessibility represents the duration of time required for older adults to reach senior welfare centers and social welfare service centers; infrastructure represents the total number of senior and social welfare service centers per ten thousand older adults in 16 metropolitan cities and provinces (i.e., Seoul, Busan, Daegu, Incheon, Gwangju, Daejeon, Ulsan, Gyeonggi, Gangwon, Chungbuk, Chungnam (including Sejong), Jeonbuk, Jeonnam, Gyeongbuk, Gyeongnam, and Jeju).

Key findings showed that the higher the number of chronic illnesses, the higher the level of multidimensional disability among older adults. In specific, older adults with higher number of chronic illnesses reported to have lower level of psychological and emotional functions, activity capacity for daily movement, and participation frequency. Better accessibility to senior and social welfare service centers had a positive effect on all three dimensions of disability, and better infrastructure was proven to increase the level of activity capacity for daily movement among older adults, even though it had no statistically significant association with participation frequency. Furthermore, the analysis showed that the better the infrastructure the lower the psychological and emotional functions of older adults. Of the service-

related environmental factors, infrastructure had moderating effects on the association between chronic illnesses and activity capacity for daily movement, and the association between chronic illnesses and participation frequency. However, accessibility had an insignificant moderating effect on the association between chronic illnesses and all three dimensions of disability.

Based on the findings, theoretical, policy, and practice implications were discussed. The ICF framework is not only a simple health and disability model, but, as it is established based on the biopsychosocial approach and the integration of the medical and social models of disability, it will contribute to a more comprehensive understanding of disability at older ages. The ICF construes disability as a multidimensional concept based on the biopsychosocial perspective and delineates how this multidimensional disability is created in the dynamic interactions among older adults' health conditions and their service-related environmental factors. The ICF framework was empirically examined in this study which discovered that it is a well-established tool for explaining the association between health and disability and the mechanisms of disability onset in older age. This finding will contribute to modifying the paradigm of health and disability at older ages and to understanding the concept of multidimensional disability at older ages.

The findings and the ICF framework have important policy and practical implications. Consistent with most previous studies, chronic illnesses negatively affected the three dimensions of disability: psychological and emotional functions, activity capacity, and participation frequency. Thus, development of effective strategies is recommended to prevent or delay the onset of chronic illnesses and to promote health among older adults. Systematic planning is required to ensure an

equally distributed infrastructure. Despite the important moderating effects that senior and social welfare service centers have to mitigate the negative influence of chronic illnesses on older adults' activity capacity and participation frequency, these centers are not distributed in a balanced way. As a more equal establishment of these centers is planned by the Korean government this year, it is expected that older adults will have equal access to the centers, which will have a positive effect on their health and disabilities. The significant moderating role of infrastructure on older adults' chronic illnesses and multidimensional disability has important implications for social work practice. As senior and social welfare centers were found to be key protective factors, these centers should put forth an effort to increase older adults' use by developing health programs, informing them of the centers' locations and services, and providing convenient transportation services. Lastly, it is recommended that policy makers and practitioners pay attention to the use of the ICF framework. The ICF is not only a conceptual framework but one that also provides practical manuals for professionals in various sectors, including practitioners and policy makers; it will be a useful instrument for assessing the levels of older adults' health and disability, and for gathering data and establishing policies for them.

**Keywords:** Multidimensional disability, Health, Chronic illness, Accessibility, Infrastructure, WHO's ICF framework, Older adults, Structural equation modeling

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# Table of Contents

<b>Abstract.....</b>	<b>i</b>
<b>Chapter 1. Introduction.....</b>	<b>1</b>
1.1 Problem Statement .....	1
1.2 Research Questions .....	8
<b>Chapter 2. Theoretical Background.....</b>	<b>9</b>
2.1 Concept of Multidimensional Disability .....	9
2.1.1 Historical Development of Disability .....	9
2.1.2 Utilization of Concept of Disability .....	19
2.2 Chronic Illness and Disability with Aging .....	21
2.3 The ICF Framework .....	26
2.3.1 Components and Targets.....	27
2.3.2 Characteristics of the ICF .....	29
2.4 Importance of Service-Related Environments .....	37
2.5 Summary of Literature Review.....	43
<b>Chapter 3. Research Models and Hypotheses .....</b>	<b>46</b>
3.1 Conceptual Model of the ICF and its Variables .....	47
3.2 Research Models and Hypotheses .....	48

**Chapter 4. Methodology ..... 52**

4.1 Data and Sample ..... 52

4.2 Measurements of Variables ..... 54

    4.2.1 Health Conditions ..... 54

    4.2.2 Multidimensional Disability..... 55

    4.2.3 Service-Related Environmental Factors..... 60

    4.2.4 Control Variables ..... 63

4.3 Data Analysis ..... 69

**Chapter 5. Results ..... 71**

5.1 Descriptive Statistics ..... 71

    5.1.1 Sociodemographic Characteristics ..... 71

    5.1.2 Support and Relationship Factors ..... 73

    5.1.3 Regional Factor ..... 75

    5.1.4 Health and Disability Factors ..... 76

    5.1.5 Service-Related Environmental Factors..... 80

5.2 Data Screening and Estimation..... 82

5.3 Structural Equation Modeling for Multidimensional Disability.... 87

    5.3.1 Measurement Model..... 87

    5.3.2 Structural Model ..... 89

**Chapter 6. Discussion ..... 97**

6.1 Summary of Findings..... 97

6.2 Discussion..... 101

    6.2.1 Health Conditions and Multidimensional Disability in Old Age... 101

    6.2.2 Main Effects of Service-Related Environmental Factors..... 103

    6.2.3 Moderating Effects of Service-Related Environmental Factors ..... 108

6.3 Implications .....	119
6.3.1 Theoretical Implications.....	120
6.3.2 Implications for Social Welfare Policies .....	123
6.3.3 Implications for Social Work Practice.....	129

**Chapter 7. Limitations and Directions for Future Research**  
..... **133**

<b>Korean References (English).....</b>	<b>137</b>
<b>Korean References .....</b>	<b>147</b>
<b>English References .....</b>	<b>154</b>
<b>Appendix.....</b>	<b>164</b>
<b>Korean Abstract.....</b>	<b>165</b>
<b>Chinese Abstract .....</b>	<b>170</b>

## List of Tables

Table 1. Categories and Variables.....	68
Table 2. Sociodemographic Characteristics .....	72
Table 3. Characteristics of Support and Relationship Factors .....	74
Table 4. Self-Reliance Ratio of 16 Regions .....	75
Table 5. Descriptive Characteristics of Health and Disability .....	78
Table 6. Frequency of Diagnosed Chronic Illnesses .....	79
Table 7. Descriptive Statistics of Accessibility .....	80
Table 8. Descriptive Statistics of Infrastructure .....	81
Table 9. Missing Rate and Normality of Major Variables .....	83
Table 10. Correlation Matrix of Variables .....	86
Table 11. Model Fit of Structural Model.....	89
Table 12. Path Coefficients of Structural Model.....	90

## List of Figures

Figure 1. Dimensions of Consequences of Disease (ICIDH).....	13
Figure 2. Disablement Process Model.....	15
Figure 3. WHO’s ICF Framework.....	27
Figure 4. The Conceptual ICF Framework and its Variables.....	47
Figure 5. Hypothesized Model on the Association between Health Conditions and Multidimensional Disability.....	48
Figure 6. Hypothesized Model on the Association between Service-Related Environmental Factors and Multidimensional Disability.....	49
Figure 7. Hypothesized Model on the Moderating Effects of Service-Related Environmental Factors .....	51
Figure 8. Test of Measurement Model .....	88
Figure 9. Structural Model for Research Question 1.....	92
Figure 10. Structural Model for Research Question 2.....	93
Figure 11. Structural Model for Research Question 3.....	95
Figure 12. Moderating Effect of Infrastructure in the Chronic Illnesses– Activity Capacity Association.....	109
Figure 13. Moderating Effect of Infrastructure in the Chronic Illnesses– Participation Frequency Association.....	111



# Chapter 1. Introduction

## 1.1 Problem Statement

In South Korea (hereinafter “Korea”), disability is naturally thought of as a “*registered disability*”.<sup>1</sup> This uncritical perception is even true for disabilities incurred at older ages. Several distinct social and cultural characteristics of Korean society might have caused this perception. The long-time dominance of the medical model<sup>2</sup> has arguably normalized this perception and the disability registration system in Korea might contribute to this perception. In this system, the term *disability* encompasses physical and psychological impairments that are officially registered in the Welfare of Disabled Persons Act (National Law Information Center, 2015). Other factors shaping the public’s perception of disability are activities of daily living (ADLs) and instrumental activities of daily living (IADLs), which are instruments used in the Long Term Care Insurance system to measure older adults’ eligibility (LTCI, 2016). But is this the most accurate approach to “disability” in old

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<sup>1</sup> Korea uses a disability registration system. According to article 32 of the Welfare of Disabled Persons Act, people who have a disability should register as “a person with a disability” (Ministry of Health and Welfare, 2016). Registered individuals are referred to as people with a “registered disability” and are officially eligible for related services such as government-funded medical attention and financial assistance. The registered disabilities listed in the Welfare of Disabled Persons Act consist of 15 disability types: physical, visual, auditory, brain lesion, intellectual, mental, kidney, linguistic, autism, respiratory, ostomy, liver, epilepsy, heart, and face (National Law Information Center, 2015).

<sup>2</sup> The medical model of disability views disability as an individual-level problem that is caused by disease, trauma, or other health conditions and that requires personalized, professional medical care (WHO, 2001: 12).

age? Might there be other approaches?

A more comprehensive perspective is required to understand disability at older ages as the older population in Korea is no longer homogeneous (Bae, 2011, p. 3). People with early-onset disabilities are said to “age with a disability” or to be “aging with a disability” whereas those with mid- or late-life onsets are said to have a “disability with aging” (Verbrugge & Yang, 2002, p. 253). A late-life-onset disability<sup>3</sup> develops in older age and can be due simply to the aging process or can result from geriatric disease (Paik & Roh, 2009, p. 74). Disabilities that occur at older ages are more complex (Heikkinen, 2003, p. 7) because they are a mixture of age and disability. Thus, older adults with a disability might have several other needs in their life compared to people with a childhood-onset disability (Lee, 2005), as the disability more greatly affects older adults’ body functions, ability to stay active, and involvement in society.

Due to the characteristics of disabilities with aging, it is necessary to measure multiple dimensions of disability. Previous studies on late-life-onset disabilities have emphasized the multidimensionality of disability theoretically, but most of them operationalized the construct one dimensionally in their empirical analysis. Some studies have considered dimensions such as impairment (Han & Kim, 2014), activity limitation (den Ouden, Schuurmans, Mueller-Schotte, Brand, & van der Schouw, 2013; M. A. Lee, 2010; Li, 2005; Yu, Chen, Chiang, Tu, & Chen, 2015), and participation restriction (Arnadottir, Gunnarsdottir, Stenlund, & Lundin-Olsson,

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<sup>3</sup> In the present study, I use Verbrugge and Yang’s (2002) recommended term *late-life-onset disability* to indicate “disability with aging”.

2011; Ha, Chung, & Jeong, 2015; Hur, 2014) separately, but these studies did not include multiple dimensions together as outcome variables. In this regard, the previous findings provide only a partial understanding of the disability concept.

Extended life expectancies have lengthened the period of old age and significantly increased the older-adult population. However, the longer lifespan has also increased the number of older adults with a chronic illness (Park & Hwang, 2015, p. 26) and the number with a disability (Koo & Seok, 2012, p. 994). The prevalence rate of chronic illness among adults 60 years old or over is 2 to 5 times higher than the rates for other age groups, and the rate for adults 65 years or older is 2 to 3 times higher than the rates for other age groups (Choi & Jang, 2010, p. 145). Furthermore, recent statistics show that older adults with a chronic illness comprise 89.7% and 70.5% of cases of comorbidity (i.e., having two or more chronic health conditions; Ministry of Health and Welfare & KIHASA, 2014). Older adults face many other risk factors, such as injuries, malnutrition, and communicable diseases (Chappell & Cooke, 2010, p. 2; Choi & Jang, 2010, p. 145), but researchers have focused on chronic illness (Heikkinen, 2003). Although improvements in living conditions and medical advancements to prevent fatal diseases allow people to live longer now, people are increasingly come living with chronic illness and, therefore, are more likely to experience a disability later in life (Chappell & Cooke, 2010, p. 1). Moreover, having one or more chronic illnesses results in greater difficulties in daily life (Choi & Chang, 2010, p. 145). In addition, older adults are likely to experience pain, physical difficulty, extreme stress, limitations in daily life, restrictions in social participation, and economic difficulties (Kim & Choi, 2007; Park & Hwang, 2015, p. 26) due to increase in chronic illnesses at older ages.

Although people at any age can have any form of chronic illness, older adults have shown to have the highest occurrence rate (Larsen & Lubkin, 2009). Likewise, although aging and disability happens to most people at some stage in life, disabilities have a more serious impact as older adults age (WHO, 2006). This old-age population may suffer from triple difficulties of aging, chronic illness, and disability, which makes them some of the most vulnerable people in society.

However, aging and disability researchers have focused one question in particular: will an increase in chronic illness inevitably result in disability? Indeed, the two contradicting standpoints are cause for ongoing debate (I. J. Lee, 2010, p. 57). Some studies have found that many older adults with various levels of acute and chronic illnesses are successfully dealing with their daily living activities (Femia, Zarit, & Johansson, 2001; Roe, Whattam, Young, & Dimond, 2001). However, other studies have found that older adults were having difficulties in accomplishing their daily activities even though they did not have any acute or chronic illness (Fried, Ettinger, Lind, Newman, & Gardin, 1994). These contradictory findings are compelling. They imply that although chronic illness is closely related to disability, other factors can affect a disability or change the degree to which a chronic illness negatively influences a disability. However, we cannot entirely deny the negative impact of chronic illnesses on disability. Indeed, a large body of literature confirms a negative relationship between chronic illness and disability among older adults in their physical and psychological functions (Han & Kim, 2014; Hong, Lee, Park, & Oh, 2010, p. 193; Pollin, 1994), activity limitations (den Ouden et al., 2013; Fauth, Zarit, & Bo, 2008; Fauth, Zarit, Malmberg, & Johansson, 2007; I. J. Lee, 2010; Li, 2005; Yu et al., 2015), and social involvement (Arnadottir et al., 2011; Fairhall,

Sherrington, Kurrle, Lord, & Cameron, 2011). Furthermore, Lee (2012) and Hong et al. (2010) explained that, with the onset of chronic illness, all three of these aspects of disability are highly likely to influence one another. This illustrates how the vicious cycle of disabilities continues. Therefore, scholars argue that people are highly likely to encounter chronic illness and concomitant disability as they age (Heikkinen, 2003).

In addition to the direct association between chronic illness and disability among older adults, environmental factors can alleviate the negative effects of chronic illness on a person's disability or delay the onset of disability (Brandt & Pope, 1997, p. 75; Verbrugge & Jette, 1994; Wang, Badley, & Giganac, 2006; WHO, 2001).

In general, the environment is defined as the contexts or situations that occur around individuals and that elicit responses from them (Law, 1991, p. 175); thus, the environment can include many factors, ranging from broad contexts, such as culture and nature, to specific stimuli, such as assistive services and devices (WHO, 2001). In particular, intervention services are intimately related with older adults' health and provide important, practical support. Services help people cope with their internal and external problems by themselves, facilitate their development, and help them easily access necessary programs by providing personalized information and assistance (Kahn & Kamerman, 1977). Thus, services are beneficial to improvement of health, quality of life, and independence (Barker, 2003).

Prior studies on late-life-onset disabilities have emphasized services (Heikkinen, 2003, p. 3), arguing that conceptualizations of disability assume that interactions between environmental factors and an older adult's personal capabilities can influence the seriousness of the disability (Heikkinen, 2003, p. 3). The welfare

facilities in communities such as senior welfare centers and social welfare service centers help older adults overcome social isolation, enhance their quality of life, and encourage them to lead a healthy life (Choi, 2006, p. 120; Suh, 1994). Given that older adults, in general, walk short distances, senior and social welfare service centers are more helpful when they are located nearby their users' residences. Favorable geographic distance to and sufficient quantity of service centers will increase older adults' use of these services.

So far, this dissertation has addressed the issues around disability in older age, with attention to the multidimensional characteristics of disabilities, the effects of chronic illnesses on disabilities, the influence of service-related environmental factors on disabilities, and the moderating effects of service-related environmental factors (i.e., infrastructure and accessibility). Despite the importance of these issues, previous studies have not measured disability at older age as a multidimensional construct or investigated the factors that influence those dimensions. Thus, this study attempted to address these limitations by addressing the following research topics.

First, the effect of health conditions on three disability dimensions (i.e., body function, activity, and participation) was examined. The health condition factor was operationalized as the number of chronic illnesses older adults have. The multidimensional disability was composed of psychological and emotional functions, activity capacity for daily movement, and participation frequency. The findings show the associations between chronic illnesses and each dimension of disability among a sample of older adults and provide practical and policy implications for the importance of preventing and promoting health in old age.

Second, the influence of service-related environmental factors on three

dimensions of disability was tested. The service-related environmental factors were composed of accessibility and infrastructure. Accessibility to senior welfare centers and social welfare service centers was measured by the duration of time required for older adults to reach these centers on foot. Infrastructure was measured by the total number of senior welfare centers and social welfare service centers per ten thousand older adults in 16 geographic regions. Findings indicate how the service-related environmental factors and multidimensional disability were associated and, thereby, identify which predictors are most important in decreasing the impact of each dimension of disability among older adults.

Third, the moderating effects of accessibility and infrastructure in the association between health conditions and dimensional disability were examined. The significance of the moderating effects of accessibility and infrastructure provide practical points of intervention and policy implications for alleviating the negative effects of chronic illnesses on each of three dimensions of disability.

As a theoretical framework, a health and disability model called International Classification of Functioning, Disability and Health (ICF) was employed. The ICF provides a new perspective on late-life-onset disabilities. Including multiple dimensions of disability and their interrelations overcomes the traditional disablement process model, which views disability as a unidimensional concept and as a direct consequence of a health condition. Also, the ICF perspective views disability as an outcome of the dynamic interactions among older adults' health conditions and their environmental factors (WHO, 2001), which provides a rationale for examining environmental factors in the development of disabilities.

## **1.2 Research Questions**

The foci of this study were health and multidimensional disability in old age. The aims were to investigate the association between health conditions and multidimensional disability, to examine the association between service-related environmental factors on multidimensional disability, and to analyze how this association was moderated by service-related environmental factors such as accessibility and infrastructure. To serve these purposes, three major research questions were established:

### **[Research Question 1]**

Do health conditions influence three dimensions of disability (i.e., body function, activity, and participation) among older adults?

### **[Research Question 2]**

Do service-related environmental factors (i.e., accessibility and infrastructure) influence three dimensions of disability (i.e., body function, activity, and participation) among older adults?

### **[Research Question 3]**

Do service-related environmental factors (i.e., accessibility and infrastructure) moderate the association between health conditions and three dimensions of disability (i.e., body function, activity, and participation) among older adults?

## **Chapter 2. Theoretical Background**

This chapter addresses multidimensional disability and why it is important among older adults, how chronic illnesses are related to multidimensional disability, and the roles of service-related environmental factors in the association between chronic illnesses and multidimensional disability among older adults. Additionally, the strengths and limitations of the ICF, a theoretical framework for this study, are addressed. These theoretical background and literature reviews will provide understanding of health and disability at older ages.

### **2.1 Concept of Multidimensional Disability**

#### **2.1.1 Historical Development of Disability**

This part explains how the concept of disability is understood and discussed by numerous researchers. There are two important concepts in discussing the concept of disability: disability and disablement. Before the emergence of WHO's health and disability framework (i.e., the ICF) in 2001, disability was understood as a final or a mediating stage in disablement process. In this regard, disability was defined as cessation or restriction in carrying out activities of daily living and other social roles (The Finnish Center for Interdisciplinary Gerontology, 2004, p. 1) as a component of disablement process (Nagi, 1965; 1991; Verbrugge & Jette, 1994; WHO, 1980),

while disablement itself referred to the whole process of disabling usually starting from a person's decline in his or her health condition (Verbrugge & Jette, 1994). Some researchers even used two concepts interchangeably to indicate 'disability' (Fougeyrollas & Beauregards, 2001), but they are certainly different in meanings. Before 2001, disability was understood in the context of the disablement process, but after the development of the ICF in 2001, disability was understood differently: disability was no longer understood within the disablement process. Disability was positioned as an upper concept including three dimensions of disability, which are body function, activity, and participation. In addition, disability was defined in the interaction of a person's health conditions and his or her contextual factors (WHO, 2001, p. 19), which makes it relational. In this subchapter, either disability or disablement was used according to how they were originally used in previous studies, but disability was used throughout this study unless it was a concept that clearly indicated the process of disabling.

In the 20th century, researchers paid great attention to health, disease, or disorder and their subsequent consequences. These concerns became a trigger for developing a myriad of conceptual models that converged into the disablement process. The concept disablement refers to the impact chronic and acute conditions have on the functioning of specific body systems and on people's abilities to act in necessary, usual, expected, and personally desired way in their society (Verbrugge & Jette, 1994, p. 3). The term process reflects interest in the dynamics of disablement; that is, the trajectory of functional consequences over time and the factors that affect their direction, pace, and patterns of change (Verbrugge & Jette, 1994, p. 3).

The emergence of disablement process contributed to the work of Saad Nagi, a

sociologist, at the end of the 1950s. He began with sociological considerations and later, believing that medicine was exerting too strong a control over the issues linked to disablement, decided to shed light on the role played by factors that were not necessarily linked to pathology and impairments in shaping disablement (Masala & Petretto, 2008, p. 1234). Nagi developed a model that described the process whereby an individual with a specific active pathology could have functional limitations and disabilities (Masala & Petretto, 2008, p. 1234). He introduced a dynamic view of disablement and of the functional consequences of the pathology by developing a model that described disablement through four concepts: active pathology, impairment, functional limitation, and disability (Masala & Petretto, 2008, p. 1234).

Nagi (1965; 1991) defined active pathology as “a state of the body’s defense and coping mechanisms” caused by infections, trauma, metabolic imbalance, degenerative disease processes, or other pathologies. The next stage is impairment, meaning “a loss or abnormality at the tissue, organ, and body system level”. The third stage is functional limitation, which is defined as “limitations in the individual’s ability to perform the tasks and obligations of these usual roles and normal daily activities”. The final stage is disability, an “expression of a physical or mental limitation in a social context”. It contributes to specific definition for the four concepts, pathology, impairments, functional limitation. and disability, which have been used as synonyms until that point in time (Masala & Petretto, 2008, p. 1234). The Nagi’s disablement model has proven useful as a language to delineate consequences of disease and injury at the level of body systems, a person, and society (Jette, 2009, p. 1165). However, this model has its limitation in that it regards the pathway from pathology to disability as linear and one-directional. It also does not

specify other internal and external factors that affect the disablement process.

Professionals in disability fields have continuously tried to reorganize the established perspectives on disability, which were the medical model<sup>4</sup> and linearity. The change occurred in the United Kingdom in the 1970s by people who had disabilities. They were dissatisfied about paternalist interventions and actions that limited their freedom and their human and social rights, and so they organized Disabled People's International (DPI) (Masala & Petretto, 2008, p. 1236). The DPI formed Union of the Physically Impaired against Segregation (UPIAS), and in 1975, UPIAS developed its own disablement model that is now known internationally as the social model of disability. This model attempts to understand why people who have bodily functional or structural deficiencies are being excluded from society. As a result of increasing emphasis upon the importance of social factors in the maintenance of disability, the inadequacies inherent in clinical models of disability were thrown into focus (Llewellyn & Hogan, 2000, p. 159).

With the effect of the social model of disability against the medical model,

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<sup>4</sup> The World Health Organization (2001: 20) depicts the differing characteristics of the medical model and the social model of disability. The medical model views disability as an individual-level problem that is caused by disease, trauma, or other health conditions and that requires personalized, professional medical care. Management of the disability is aimed at cure or the individual's adjustment and behaviour change. Medical care is viewed as the main issue, and at the political level the principal response is that of modifying or reforming health care policy. The social model of disability, on the other hand, sees the issue mainly as a socially created problem, and basically as a matter of the full integration of individuals into society. Disability is not an attribute of an individual, but rather a complex collection of conditions, many of which are created by the social environment. Hence the management of the problem requires social action, and it is the collective responsibility of society at large to make the environmental modifications necessary for the full participation of people with disabilities in all areas of social life. The issue is therefore an attitudinal or ideological one requiring social change, which at the political level becomes a question of human rights. For this model disability is a political issue.

which came into force in 1975, WHO published the International Classification of Impairments, Disabilities and Handicaps (ICIDH) in 1980 and proposed new perspectives on disabilities (See Figure 1). The ICIDH introduced for the first time taxonomies of the different dimensions of experiences related to organic, personal, and above all, social consequences of disease and trauma (Fougeyrollas & Beauregard, 2001, p. 176). Thus, it was the first internationally shared conceptual formulation aiming at analyzing, describing, and classifying the consequences of diseases into three aspects: impairment, disability, and handicap. The ICIDH make the resolute shift away from the biomedical model by including the term handicap.

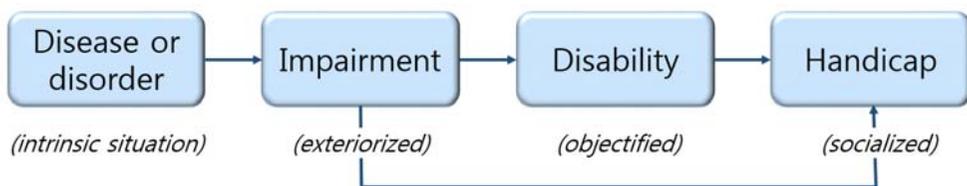


Figure 1. Dimensions of Consequences of Disease (ICIDH)

(De Kleijn-de Vrankrijker, 2003, p. 562)

In the ICIDH, impairment is defined as “any loss or abnormality of psychological, physiological, or anatomical structure of function” (WHO, 1993, p. 47); disability as “any restriction or lack (resulting from an impairment) of an ability to perform an activity in the manner or within the range considered normal for a human being” (WHO, 1993, p. 143); and handicap as “a disadvantage for a given individual, resulting from an impairment or a disability, that limits or prevents the fulfillment of a role that is normal (depending on age, sex, and social and cultural

factors) for that individual” (WHO, 1993, p. 183). The term handicap has no parallel concept in the Nagi model (Verbrugge & Jette, 1994, p. 2). As such, the ICIDH intended to emphasize how a situation can impose a social disadvantage rather than an impairment or functional limitation of people. This conceptual scheme facilitated international discussions on disablement (Verbrugge & Jette, 1994, p. 2). However, the ICIDH was criticized since it was another example of an individualistic approach with a medical base that contained an explicit reference to the causal and direct link between impairments, disability, and handicap whereby impaired people were made responsible for their reduced integration into society (Masala & Petretto, 2008, p. 1236). In addition, although the ICIDH addressed the role of personal and environmental factors to an occurrence of handicap, it did not specify them in details (Üstün, Chatterji, Bickenbach, Kostanjsek, & Schneider, 2003, p. 566). The ICIDH attempted to include the influence of society in causing disadvantages for people with disabilities, but it was seriously criticized because it still did not comprehensively understand the disablement process and causes of disability.

During the 1990s, the Nagi model underwent a revision process (Nagi, 1991), and the ICIDH yielded the first results of the revision that lasted throughout the 1980s. In both cases, the revisions concerned the acknowledgement of the role played by the physical and social environment in shaping disablement process (Masala & Petretto, 2008, p. 1237). In 1991, Nagi himself revised his first model, and his basic framework was adopted by an Institute of Medicine (IOM) panel whose published report gave the Nagi’s revised model rapid and great visibility. This model is now often called the IOM scheme (Verbrugge & Jette, 1994, p. 2). This model clarified the importance of environmental factors in the pathway linking pathology

to disability. Yet still, in the IOM scheme, the disablement process was perceived as a function of the characteristics of the medical status, of impairments, and of people's related functional limitations. In addition, it maintained one-direction, inexorable progression to disability and thus had no discussion of ways to reverse disability (Masala & Petretto, 2008, p. 1237). Despite the modified Nagi model that listed several factors that could operate and mediate the link between impairments, functional limitations, and disabilities (Masala & Petretto, 2008, p. 1237), the social factors were restrictively specified and not clear enough to be influential in the dynamics of disablement.

In 1994, the second revision was conducted to the initial Nagi model by Verbrugge and Jette. Upon reviewing the Nagi model and the ICIDH, they made extensions and innovations in their model and designated it disablement process model (DPM). Figure 2 shows the visual representation of the DPM (Verbrugge & Jette, 1994).

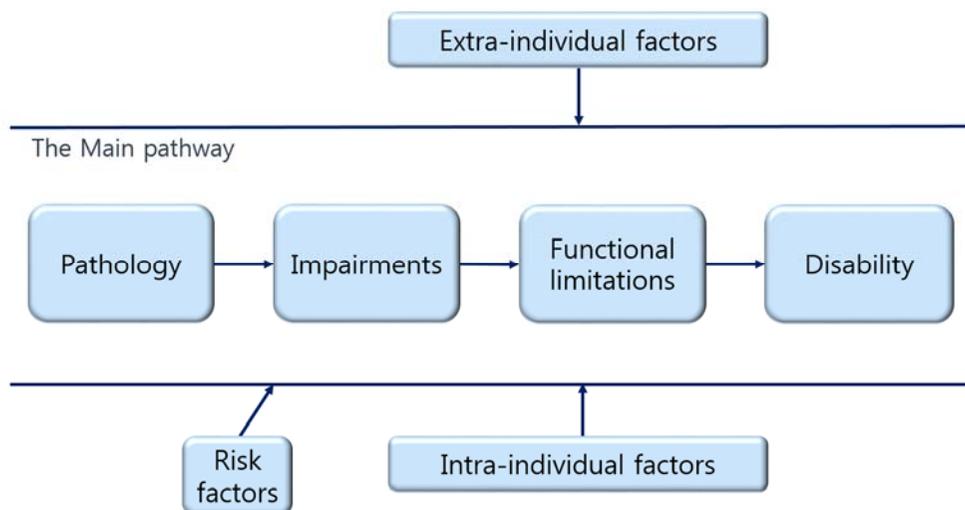


Figure 2. Disablement Process Model (Verbrugge & Jette, 1994)

While the Nagi model and the ICIDH schemes focus centrally on delineating the pathway from pathology to various kinds of functional outcomes, the DPM includes contextual factors such as personal and environmental factors that speed up and slow down the pathway (Verbrugge & Jette, 1994, p. 2). However, it was not systematically listed. These factors are specified as predisposing and introduced factors. The former refers to intrinsic and extrinsic risk factors that include demographic, social, life-style, behavioral, psychological, environmental, and biological characteristics of an individual that can affect the presence and severity of impairment, functional limitation, and disability (Verbrugge & Jette, 1994, p. 8). The latter is composed of intra- and extra-individual factors, intervention, and exacerbators.

The intra-individual factors include lifestyle and behavior changes (e.g., overt changes to alter disease activity and impact), psychosocial attributes and coping (e.g., positive affect, emotional vigor, prayer, locus of control, cognitive adaptation to one's situation, confidant, and peer support groups), and activity accommodations (e.g., changes in kinds of activities, procedures for doing them, frequency or length of time doing them).

The extra-individual factors consist four categories: medical care and rehabilitation (e.g., surgery, physical therapy, speech therapy, counseling, health education, and job retraining), medications and other therapeutic regimens (e.g., drugs, recreational therapy/aquatic exercise, biofeedback/meditation, and rest/energy conservation), external supports (e.g., personal assistance, special equipment and devices, standby assistance/supervision, day care, respite care, and meals-on-wheels), and built, physical, and social environment (e.g., structural

modifications at job/home, access to buildings and to public transportation, improvement of air quality, reduction of noise and glare, health insurance and access to medical care, laws and regulations, and employment discrimination).

The intervention factors are those made by individuals on their own and by others to reduce restrictions or difficulties; they serve as “buffers” (Verbrugge & Jette, 1994, p. 8). Interventions are not predisposing, but instead are inserted during the disablement process in an effort to avoid, retard, or reverse outcomes (Verbrugge & Jette, 1994, p. 8). They include all the intra- and extra-individual factors.

The exacerbators, on the other hand, are less common than interventions, but they can have power in prompting or maintaining dysfunctions (Verbrugge & Jette, 1994, p. 8). They can happen in three ways: interventions can go awry; in response to their health and function problems, people sometimes adopt behaviors or attitudes that have pernicious consequences, actually increasing their limitations and disability; or society often places impediments in the path of limited or disabled people so they cannot do the things they want and are able to do (Verbrugge & Jette, 1994, p. 8).

Particularly, the DPM acknowledges full role of social and physical environments in the dynamic of disablement (Masala & Petretto, 2008) and points out feedback effects within disablement process over time and feedback loops after onset of new disease (Verbrugge & Jette, 1994, p. 7). The comprehensiveness and practicality of the DPM increases its use by many researchers. Nevertheless, the DPM has several limitations. It still weighs toward a main path that links pathology to its functional consequences (Masala & Petretto, 2008). Additionally, where exactly the intra- and extra-individual factors fit into the model and what types of effects they

have in the disablement process have yet to be determined (Peek, Ottenbacher, Markides, & Ostir, 2003, p. 413).

Even if the Nagi's first and second modified models (i.e., the IOM model in 1991 and Vebrugge & Jette's model in 1994) acknowledged the role of physical and social environments in disablement and tried to describe some of the variables that could mediate and moderate the disablement process, they still refer to a main path that link pathology to its functional consequences (Masala & Petretto, 2008, p. 1238). Regarding disablement as a consequence of the interaction between an individual and an environment was the original element in the work made by the IOM in 1997 (Masala & Petretto, 2008, p. 1240), which was the third revision of the original Nagi model. Brandt and Pope in the IOM wondered whether disablement was an inevitable consequence of pathologies (on the basis of the vicious circle of disablement) or whether this vicious circle could be broken to activate a virtuous circle of enablement (Masala & Petretto, 2008, p. 1239). In the 1997 IOM model, the four components (pathology, impairment, functional limitation, and non-disability) were identified by means of two-direction arrows to point to the possibility of mutual influences and to cancel the inevitability of the links among the various levels (Masala & Petretto, 2008, p. 1239). It clarified that disablement is no longer part of an individual, but it is a function of the interaction between the individual and the environment (Brandt & Pope, 1997, p. 75).

In parallel with the reviews of the Nagi model and of the works by the IOM, a major revision process of the ICIDH was undertaken from 1993 to 1999 (De Kleijn-de Vrankrijker, 2003). Following debates on the ICIDH revision process, another model, designated as the Disability Creation Process (DCP) was developed by the

Quebec Committee on the ICIDH. The DCP is an interactive, anthropological, universal, person-environment interaction model where roles of environmental factors are described in disablement process (Fougeyrollas, 1995). As such, the historical flow from the Nagi model in the 1950s to the final revision to ICIDH in 1999 shows how these disablement-related models gradually acknowledge and elaborate roles of environmental factors in disablement process and admit that disablement is consequence of the interaction between an individual and his or her environment. As the product of this long developmental process, WHO finally endorses the conceptual framework for disability and health, known as International Classification of Functioning, Disability and Health (ICF) in 2001. The ICF shows different characteristics from the previous models. First and most importantly, it defines disability in multidimensional and relative perspectives. It is multidimensional because disability serves as an umbrella term for three perspectives of disability (body, individual, and societal) (WHO, 2001, p. 211) and relative because it is created as a result of complex relationship between an individual's health conditions and his or her contextual factors (WHO, 2001). As such, the ICF reflects the current trend of understanding disability (WHO, 2001, p. 211).

### **2.1.2 Utilization of Concept of Disability**

The previous section addressed how the views on disability changed from a medical model to social model and the integration of the two, the importance of environments in relation to health and disability, and multifaceted and relational

characteristics of disability. This section will focus on how the concept of disability was defined and used in previous studies.

One of the main contributions of the ICF in conceptualization of disability is that it acknowledges the interrelations among the three dimensions of disability: impairment, activity limitation, and participation restriction. It is the noticeable characteristic that distinguishes the ICF from the other traditional disablement process models such as the Nagi model (Nagi, 1965), the IOM model (Institute of Medicine, 1991), or the ICIDH (WHO, 1980), which all view disability as a single concept. These multidimensional aspects of disability are important to address as they are the outcome of converging the individual and social models of disability and they imply the objection to the linear sequence of pathology to disability or the irreversible linear process of disablement from pathology to impairment to functional limitation and finally to disability, which was argued for by the traditional disablement models.

However, in spite of the importance of multifaceted characteristics of disability, a large number of previous studies on disability of older adults have paid less attention to its multidimensional aspects. Literature reviews pointed out that the prior studies theoretically acknowledged multiple dimensions of disability, and thus they attempted to analyze relationships among three dimensions of disability: body function and structure, activity, and participation. Yet, among these previous studies, a large proportion of them regarded disability as a unidimensional concept. Thus, the outcome variable was restricted to either impairment (Han & Kim, 2014), activity limitation (Femia et al., 2001; I. Lee, 2010), or participation restriction (Arnadottir et al., 2011; Fairhall et al., 2011). Nonetheless, a handful of studies attempted to

investigate multiple dimensions of disability (H. J. Lee, 2011). One study analyzed the mutual influence between body function and activity. H. J. Lee (2011)'s study based on the hypothetical model of the Alzheimer's pathological cascade and the Disablement Process Model investigated the reciprocal relationship between cognitive function and functional disability among older adults with and without dementia. The result found a significant mutual influence between the cognitive function and the functional disability, which empirically rejected the sequential process from cognitive function to functional disability. Notwithstanding its contribution, only two dimensions of disability, impairment and activity limitation, were examined.

To my knowledge, no other studies investigated multidimensional disability in relation with chronic illnesses at older ages.

## **2.2 Chronic Illness and Disability with Aging**

It is likely that the older adults' lives will be accompanied by more chronic illnesses and disabilities as the result of longer life spans (Zimmer & Chappell, 1994). The increase in the number of older adults, in other words, indicates the growing possibility of experiencing chronic illnesses and disabilities. Chronic illness exists in all ages, yet as people age, the prevalence rate of the chronic illness increases; thus, the elderly group is the most vulnerable group in terms of chronic illness (Wolff, Starfield, & Anderson, 2002).

In general terms, chronic illness is defined as continuous, unstable, progressive, and irreversible long-term disease, though it is hard to draw a unanimous definition

as it has various causes, progressions, and consequences (Harvey & Miller, 2000, p. 132). With a paradigm shift in the perception of disability and expansion in its concept (Jeon, Kwon, Lee, & Kim, 2011, p. 171), disability serves as some restrictions in health components, which implies that it is something that anyone can have due to a chronic illness or accident (Bury, 2004). According to the 2014 Survey of Living Conditions and Welfare Needs of Korean Older Persons (Ministry of Health and Welfare & KIHASA, 2014), approximately 90% of the older adults aged 65 and over in Korea reported to have at least one chronic illness such as arthritis, high blood pressure, and neuralgia. Older adults point out a health problem as the most difficult experience in their life. In Jeon et al.'s (2011) study on health service utilization by older adults with a disability, 92% of the participant aged 60 and over reported having chronic illnesses. They were suffering from clinically complex symptoms and serious diseases compared to the adult group (Jeon et al., 2011, p. 174).

The aging population is far from a homogenous group (Zarb & Oliver, 1993). Disability at older ages can be divided into “aging with disability” and “disability with aging” (Verbrugge & Yang, 2002). People who incur disability at birth or in childhood are said to “aging with disability” and those free of disability until mid- or late-life are said to experience “disability with aging” (Verbrugge & Yang, 2002, p. 253). Just like disability at older ages has two meanings, the term “an older adult with a disability” is sometimes used to indicate older disabled people (Verbrugge & Yang, 2002); however, it is used as a complex term to indicate both groups with “aging with disability” and “disability with aging” (Choi & Jang, 2010, p. 453; Paik & Roh, 2012; 2009, p. 72). The “aging with disability” group is a main target for the

disability field, whereas the “disability with aging” group is more often studied in gerontology (Avlund, Lun, Holstein, & Due, 2004), indicating that these groups of older adults with disabilities have been separately studied. Voluminous studies dealing with disability at older ages seem to focus on “aging with disability” (Zarb & Oliver, 1994). Especially, in Korea, in “aging with disability”, disability refers to one of 15 types of official types of disability (e.g., visual, hearing, physical, and mental disabilities). This may be because researchers in gerontology use the term “disability” (Koo & Seok, 2012; White et al., 2010) but they more often use the specific status of an older adult to indicate his or her disability, not the term “disability” itself. For example, to indicate multiple dimensions of disability, researchers used depressive symptoms, functional limitations, physical activity, and social activity (Fauth, Gerstorf, Ram, & Malmberg, 2014; James, Boyle, Buchman, & Bennett, 2011; Keysor et al., 2010; Kim, Park et al., 2010). These two groups may have common ground, but compared to the elderly with “aging with disability”, the elderly with “disability with aging” had more physical limitations, higher severity, and longer duration in sensory and communication limitations (Verbrugge & Yang, 2002, p. 261). Moreover, the latter group feels loss keenly when disabilities occur (Verbrugge & Yang, 2002, p. 263) because disability is a sudden and new experience that negatively impacts their life. The former group has more disability identity as the duration of their disability is much longer. In the period of increasing life expectancy, more focus is required for disability in old age.

The impact of chronic illness on older adults is significant. Although it develops gradually and thus is controllable to some degree, it is inextirpable and repeats improvement and exacerbation for a long time as the possibility of complete

recovery gradually decreases (Han, 2003). Thus if the chronic illness occurs, it impacts a person in all domains of life (Lee, 2012, p. 238). At an individual level, chronic illness causes impairments physically such as complications, pain, and abnormality of body structure (e.g., Hong et al., 2010, p. 193) and psychologically such as depression (Han & Kim, 2014), fear for loss of mastery, self-image and independency, feeling of being thrown away, stigma, anger, and isolation (Pollin, 1994). Also, chronic illness has a negative influence in that it places a limitation on the activity capacity of the older adults. The previous studies revealed that most activity limitation was measured by ADLs and IADLs when included as an outcome. The number of chronic illnesses (den Ouden et al., 2013; I. J. Lee, 2010; Li, 2005) and comorbidities of disorders (Yu et al., 2015) and disease severity (Fauth et al., 2007; 2008) were negatively associated with ADLs and IADLs among the older adults. At a societal level, chronic illness had an impact on the participation of older adults as it led to a decrease in involvement in physical, social, and economic activities (Arnadottir et al., 2011; Fairhall et al., 2011; Lee, 2012, p. 239). This narrowness of participation in life domains again causes negative psychological status such as social isolation and change in identity (Lee, 2012, p. 239) as well as emotional status such as sadness, anger, despair, and low self-esteem (Biordi & Nicholson, 2009), and in turn these prevent older adults from participating in society more vigorously. These findings indicate that chronic illness, impairments, activity limitation, and participation restriction are significantly correlated. This vicious circle continues among the chronic illness, physical, psychological, and emotional aspects of body functions and the participations among older adults. Thus, in analysis, disability should be constructed as multifaceted including the three parts of body

function, activity, and participation together. The influence of chronic illness on multidimensional disabilities should be investigated in order to fully consider their associations. The relationship between a chronic illness and disability is conceptually illustrated in the ICF. It illustrates how the health conditions as a trigger stimulate the occurrence of disability and provides new perspective on the relationship among the different aspects of disability, not associated in a linear but a mutually influencing way.

However, regardless of this important relationship, previous studies that take the association between chronic illness and multidimensional disability into consideration are scarce. Although the previous studies reflect older adults' health conditions as a starting point, most of them investigate the influence of chronic illnesses respectively on body functions and structures (Han & Kim, 2014), activities (den Ouden et al., 2013; Fauth et al., 2007, 2008; I. J. Lee, 2010; Li, 2005; Yu et al., 2015), and participation (Arnadottir et al., 2011; Fairhall et al., 2011; Ha et al., 2015; Hur, 2014).

Good quality of health is a premise that enables older adults to maintain their normative physical functions and live independently (Lee, 2012, p. 235). Also, good quality of health provides opportunities for social activities and the expansion of social relationships, plus it affects the establishment of identity by granting a social role through social performances and formation of relationship with others (Lee, 2012, p. 235). Then, what about the older adults with a health condition? Young, Frick, & Phelan's (2009) study points out that successful aging and presence of chronic illness can coexist within an individual. Thus, it is essential to investigate how successful aging can be reached; in other words, how the impact of a disability

can be reduced or how the negative association between the health condition and the disability can be removed or alleviated.

These studies indicated that the relationships among health and disability for older ages are addressed in literature, including many issues such as the intimacy, causes, types of disability at older ages, and the societal aspect of a disability. These complicated discussions on health and disability in old age are an expression of researchers' interests in the issues. Nonetheless, it is important to note that all older adults desire a high quality of life and independent living irrespective of their health conditions and disability. Although disabilities are likely to afflict them during old age, the idea remains that a disability is not a characteristic of the individual per se but rather of the intersection between the individual and their environment and the potential of environments to maintain or increase quality of life for the older adults (Chappell & Cooke, 2010, p. 1). The importance of environment in the association between health and disability among older adults will be reviewed later in this chapter. Thus, an important starting point for successful preventive interventions is discounting the old myth that the risk of diseases is a normal part of old age and therefore not amenable to change, and that the old body cannot respond positively to changes in lifestyle (Heikkinen, 2003, p. 12).

### **2.3 The ICF Framework**

WHO's International Classification of Functioning, Disability and Health (ICF) is the product of more than past five decades of efforts in elaborating disability started from the Nagi model (Nagi, 1965) in the 1960s. The ICF is a universal

classification of health and disability for all human beings whose overall aim is to provide a framework for the description of all aspects of health (See Figure 3). As the ICF is important to this study, it is discussed in details.

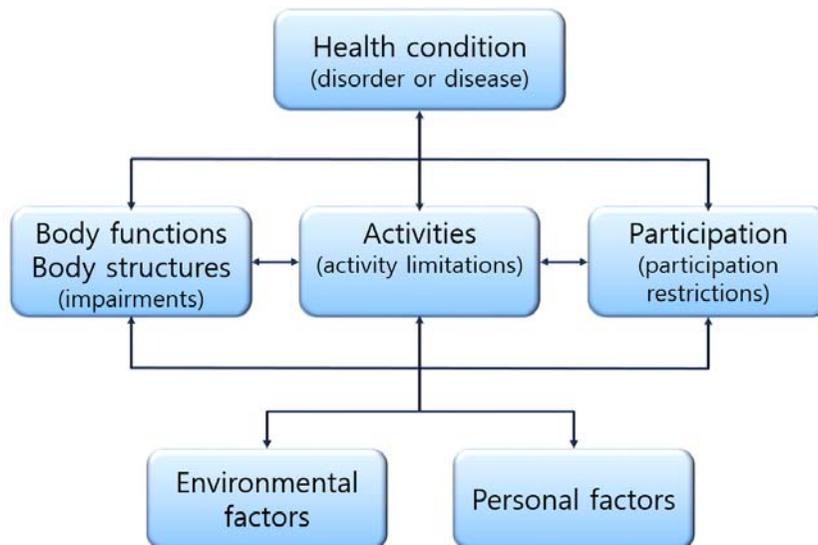


Figure 3. WHO's ICF Framework (WHO, 2001)

### 2.3.1 Components and Targets

The explanation of a person's overall functioning or disability status starts from his or her health conditions. They serve as an umbrella term for disease (acute or chronic), disorder, injury, or trauma and can be a trigger or a starting point. The ICF systematically organizes a person's health-related information in two parts: functioning and disability, and contextual factors. Each part has two components: the former part covers body functions and structures and activities and participation,

while the latter deals with environmental factors and personal factors.

All parts and their subdomains are illustrated both in positive and negative terminology. In the part of functioning and disability, when the body component is approached from a positive aspect, it is classified as body functions and structures; when from a negative aspect, it is called impairment. The body functions refer to the physiological functions of body systems, including psychological functions; the body structures are the structural or anatomical parts of the body such as organs. The impairment is defined as a loss or abnormality in body structure or physiological function (including mental functions) of an individual.

The second components are the activities and participation in positive terminology, and activity limitation and participation restriction in negative terminology. Activity is defined as the execution of a task or action by an individual. As it is measured with level of personal capacity, it represents the individual perspective of functioning. That is, it indicates the individual with a health condition can do in a standard environment (WHO, 2002, p. 2). On the contrary, the activity limitations refer to difficulties an individual may have in executing activities. Participation represents the societal perspective of functioning, indicating an individual's involvement in a life situation, or what the individual can actually do in his or her usual environment (WHO, 2002, p. 2). It is measured with the level of performance in his or her life domains. However, if the person experiences problems in involvement in life situations, it is classified as participation restrictions.

The ICF covers all human beings and is not restricted to persons with disabilities only (WHO, 2001, p. 7). It acclaims that it introduced new disability language that replaces the previous terminology that divided healthy and disabled

individuals or populations (Jette, 2009, p. 1165). Previously, the ICIDH has been an instrument to measure disability statuses and eligibility to compensation programs targeting people with disabilities, thus stigmatizing them in a way. Contrary to this, the ICF is not an assessment tool to categorize people with and without a disability, but it can be seen as a classification scheme, framework, or a standard language that codes health-related information (Jette, 2009), and thus it is neutral and non-stigmatizing. However, although based on the aforementioned premise, in terms of subject of main interest, its focus is on an individual with a health condition (WHO, 2001, p. 212). This idea is easily understood by the ICF figure where the starting point is a person's health condition. These basic premises expanded applicable target groups, which provided a rationale for applying the ICF framework on older adults with and without chronic illnesses in this study.

### **2.3.2 Characteristics of the ICF**

The ICF has remarkable characteristics that are different from the traditional disablement models such as the DPM by Verbrugge and Jette (1994) or the ICIDH (WHO, 1980) in several aspects: a) an effort of positive approach in description of disability, b) conceptual expansion to multidimensional disability, c) the integrated perspectives on disability by converging the individual and the social models of disability, and d) the consideration of the influence of environmental factors in disability. In addition, multiple applicable ways of the ICF and its limitations are addressed as well, and these applications and limitations follow.

## **1) A Positive Perspective in Description of Disability**

The ICF delineated disability with a positive approach. The term disability was moved out from the ICF framework and only mentioned in WHO's ICF report as a theoretical concept (WHO, 2001) in order to explain the negative side of functioning. As mentioned above, the ICF adopts positive and neutral terminology. Compared to the ICIDH which used impairment, disability, and handicap as three components of disablement process, in the ICF, impairments, activity limitation, and participation restriction were utilized as positive alternatives describing body functions and structures, activities, and participation. The ICF clearly mentions its objective is to provide a standard language for description of a person's health and health-related domains (WHO, 2001). Although the ICF does not dictate a fixed boundary between the above two, the former can be defined as primary responsibility of the health system while the latter is not likely to be the primary responsibility of health system but rather of other systems such as education and employment contributing to overall well-being related to health (WHO, 2001, p. 212). In this way, the ICF put the notion of health and disability in a new light (WHO, 2002, p. 3).

## **2) Conceptual Expansion to Multidimensional Disability**

In the ICF, disability is composed of three dimensions that are impairments, activity limitation, and participation restriction. As can be seen in Figure 3, these three dimensions are connected to each other with bidirectional arrows. These bidirectional arrows suggest two important points.

Initially, using the bidirectional arrows indicate denial of a unidirectional, cause-and-effect link between a health condition and its consequences as in the past disablement process models. The traditional disability-related models have perceived that disability occurs through the sequential stages from chronic illness to impairment to functional limitation and finally to disability. However, as findings of the prior studies regarding chronic illness and disability accumulate, they admit that this linear association is not always empirically supported (Femia et al., 2001; Roe et al., 2001). With the consideration of new findings regarding the health condition and disability and the roles of other factors not directly linked to disability, the ICF used the bidirectional arrows to depict real situations happening in people's health statuses.

Next, by linking the trilogy of disability with the bidirectional arrows, it implies the likelihood of interrelations among them. Suppose an older adult has arthritis and rheumatic disease, which is common at an older age. These chronic illnesses (a "health condition" in the ICF) cause pain ("body function" in the ICF), and this pain causes joint deformity ("body structure" in the ICF) and difficulty in daily living ("activity" in the ICF). As a person experiences difficulty in daily living, it will cause a decrease in involvement in a life domain ("participation" in the ICF) (Sokka et al., 2008). This decrease in performance in turn causes weakening of muscle strength ("activity"), which causes falls. The fracture ("body structure") caused by the fall hinders performance ("participation"). This vicious circle can repeat and repeat for a lifetime. As it is difficult to think separately of each event separately, the current graphic representation seems more realistic. This perspective on disability expands the established view that generally regarded disability as unidimensional (DPI, 1982;

Nagi, 1965; 1991; WHO, 1980).

### **3) The Integrated Perspectives on Disability**

The ICF supports the biopsychosocial model of disability rather than preferring a single medical or social model (Kwon, 2008, p. 511) that provides a coherent view of different perspectives of health and disability from a biological, individual, and social perspective (WHO, 2013, p. 45). As mentioned in the history of disability models, although the traditional models such as the Nagi model attempted to interpret disability in social context, it was tilted toward a medical model. Contrary to this, the social model of disability viewed disability as various negative environments such as physical barriers, lack of opportunity, and discrimination. Due to the emergence of the social model of disability, the subsequent traditional disability models attempt to take environmental factors into consideration and their impact on disability. As such, the previous models have adopted the influence of social model into their original medical-oriented perspectives. Eventually in the ICF, the environmental factors are officially included as one of the main components of the framework. In the ICF, body functions and structures and activities are the reflection of the medical model of disability, whereas participation and the contextual factors follow the social model. Particularly in disability-related area, regardless of practitioners and researchers, it is clear that they are oriented toward the social model of disability. However, in reality, it is not easy to exclusively choose one over the other; they should use both models complementarily according to the situation of an individual with a health condition. Thus, the ICF, an integrated

classification for health and disability be a useful tool for approaching older adults' health and multidimensional disability issues.

#### **4) The Influence of Environmental Factors in Disability**

One of the main contributions of the ICF is consideration of the contextual factors that represent the complete background of an individual's life and living (WHO, 2001, p. 16). They include two components: environmental and personal factors. The emphasis on the contextual factors is in line with the social model of disability, which underscores the importance of environment and the disabled people's self-determination and choice of an appropriate environment (Kim, 2002, p. 170). Also, the disability in the ICF is free from the traditional perspective that emphasized an individual's adjustment to disability, but the framework reconfirms the significance of the environmental factors (Yun & Jo, 2014, p. 25).

The environmental factors refer to all aspects of the external or extrinsic world (e.g., the physical, social, and attitudinal environment) that form the context of the individual's life and, as such, have an impact on his or her functioning (WHO, 2001, p. 214). The environmental factors are fully explained in the ICF through five chapters and sub-domains: products and technology (e.g., food, drugs, assistive equipment, transportation, and assets); natural environment and human-made changes to environment (e.g., physical geography, population, and climate); support and relationships (i.e., the amount of physical and emotional support a person or animal provides); attitudes (i.e., the observable consequences of customs, practices, ideologies, values, norms, factual beliefs, and religious beliefs); and services,

systems and policies (i.e., benefits, structured programs, and operations; administrative control and organizational mechanisms; rules, regulations, conventions, and standards). The environmental factors are coded from the perspective of the person whose situation is being described (WHO, 2001, p. 171). In addition, the ICF provides negative and positive scales for the extent to which an environmental factor acts as a barrier or a facilitator to further investigate their roles in a person's health or disability. Regarding the personal factors, they relate to an individual such as age, gender, social status, and life experiences. They are not currently classified in the ICF because of the large social and cultural variance associated with them (WHO, 2001, p. 8), but users may incorporate in their applications of the classification (WHO, 2001, p. 214).

## **5) Multiple Applicable Ways of the ICF**

The ICF is generally introduced as a simple health classification, but their multi-purpose utilization deserves attention (WHO, 2002, p. 2). According to several ICF guidelines, the ICF can be used for defining disability, measuring and coding a health level of an individual or planning, and making policy to list a few (WHO, 2002). They also introduce in details how the ICF can be applied to clinical setting, peer counseling, education systems, data collection, and advocacy and empowerment purposes (WHO, 2013). Thus, the ICF should be continuously studied by social workers, practitioners, policy makers, and professionals in other sectors related to older adults.

## **6) Limitations of the ICF**

Regardless of all the advancements the ICF has made, this framework still possesses some limitations as well. The most noticeable limitations are the two that follow.

First, as the ICF is not intended to be a dynamic model (Freedman, 2009, p. 1172) but can be seen as a classification scheme or framework, it is criticized as being less practical in conducting empirical analysis. Some scholars point out that the ICF seeks to show that all aspects of disability are related to all other aspects, with all arrows going in both directions (Guralnik & Ferrucci, 2009, p. 2). Thus, they assume that a decision is made not to impose the concept of a pathway at all on the model. Unlike Nagi's original model and the 1991 IOM framework, the ICF does not present a model of disability or enablement/disablement as a dynamic process (IOM, 2007, as cited in Freedman, 2009). Thus, it is criticized that it has limitations in clearly explaining the responsibility of the environment in the dynamics of disablement. This indicates that further studies are required to prove that the ICF can provide scientific basis for understanding disabilities.

Second, clarifying the subdomains of activities and participation would be an important next step for the improvement of the ICF (Jette, 2009). It provides the lists of activities and participations and two qualifiers (i.e., capacity and performance qualifiers, measured in the extent of difficulty) to measure each concept. However, as the ICF's lists of activities and participation are in a single category including nine domains (i.e., learning and applying knowledge, general tasks and demands, communication, mobility, self-care, domestic life, interpersonal interactions and

relationships, major life area and community, and social and civic life), ambiguity exists in the definition of the two. Some researchers say it is a realistic categorization since activities and participation are often hard to detect in reality (Hwang, 2004, p. 132). Others, however, criticize that it is the most detectable limitation of the ICF. The capacity and performance qualifiers handle this issue to some degree. Capacity describes an individual's ability to execute a task or an action and is measured in a uniform or a standard environment and thus reflects the environmentally adjusted ability of the individual (WHO, 2001, p. 123). Performance describes what an individual does in his or her current environment. As the current environment brings in a societal context, performance can be understood as the lived experience of people in the actual context in which they live (WHO, 2001, p. 123). Empirical studies have been conducted to clarify the difference between the two (Freedman, 2009; Jette, Haley, & Kooyoomjian, 2003; Jette, Tao, & Haley, 2007). Some researchers attempt to divide participation into objective and subjective ones such as participation frequency and perceived participation restriction (Arnadottir et al., 2011; Whiteneck & Dijkers, 2009; Yueng & Towers, 2014). Regardless of the limitation, inclusion of participation has meaning in a sense that the ICF attempts to reflect the concept of social inclusion of the vulnerable groups such as older adults with a health condition.

In sum, the ICF is an internationally accepted, up-to-date conceptual scheme illustrating disability and is characterized as a person-environment interaction model that describes the role of environment in disability creation (Masala & Petretto, 2008). It is also noted that this multidimensional conceptual model potentially provides a scientific basis for understanding the outcomes associated with health

conditions and established a common language for describing functional states (Wang et al., 2006, p. 13). Regarding research, the ICF provides open space for researchers to explore. It can be seen as a language that provides the building blocks for users who wish to create models and study different aspects of the process of functioning and disability (WHO, 2001, p. 18). This openness for unlimited possible research models provides an opportunity to examine health and disability issues among older adults in various ways.

## **2.4 Importance of Service-Related Environments**

The importance of the environment within diverse generic approaches of human development and within the concept of health has been considered since the end of nineteenth century and the beginning of the twentieth century (Fougeyrollas & Beauregard, 2001, p. 174). Researchers in the disability area began stressing the important of the environment since the Second World War, but after the emergence of the social model of disability in 1975, more emphasis was put on studying the impact of the role of environmental factors in creating disabilities. With the reflection of significant moderating roles of environmental factors in understanding disability of an older adult, WHO (2001) views disability within his or her environmental context.

Environment is defined as the contexts or situations which occur outside individuals and elicit responses in them (Law, 1991, p. 175). Environment is a very broad and multifaceted concept in its effects. Environmental factors make up physical, social and attitudinal environments in which people live and conduct their

lives (WHO, 2011, pp. 169, 171). Thus, the term environment covers a wide range of factors for older adults, such as their personal and social relationships, their neighborhood, services, systems and policy for the elderly, social construct such as society's attitude and beliefs, and even natural environments (WHO, 2001). However, when intervention is considered, service-related environmental factors are more likely to provide space for intervention and change in the field of social welfare. Due to increased life expectancy, older adults live longer than the past. However, their filial support is more difficult because of the increasing tendency of nuclear families as opposed to multigenerational families, aging in their adult children's home, and older adults' discomfort with dependent on their adult children (Lee, 2009). Thus, elderly people increasingly seek formal support from the society or a national entity (Lee, 2009). The social construct for support is an important area for older adults' overall well-being, and it is modifiable to some extent, but it is hard to expect change in a short period of time. Natural environments are also modifiable, but this is less of a concern for the social welfare field.

Services for elderly who have disabilities are one environmental factor that, in concert with an older adult's personal capabilities, affect the likelihood of becoming more or less disabled (Heikkinen, 2003, p. 3). Thus, service-related environmental factors are more desirable than other kinds of environmental factors as a buffering factor. Services are defined as something that provides benefits, structured programs, and operations in various sectors of society designed to meet the needs of individuals; these even includes those people who provide services (WHO, 2001, p. 192). By sector, services can be categorized in social welfare and policy, medical, rehabilitation, psychology, and counseling areas. Among these, social welfare is

defined as the service provided to meet the social needs of people (Y. G. Lee, 2011) such as health, education, opportunity for work, social adaptation, and social participation, all of which can lead to high quality of life (Sung, 1993).

Along with the increase in the elderly population, social services<sup>5</sup> provided by social welfare facilities has become a focus of interest (Kang & Yoon; 2007, p. 370). Of the social welfare facilities, senior welfare centers and social welfare service centers are located in the community and provide professional and effective services to enable the elderly to meet their needs (Choi, 2006, p. 120). Senior welfare centers specialize in gathering information on the characteristics and welfare needs of elderly community residents and providing services to those residents (Choi, 2006, p. 120). They belong to public sector. Social welfare service centers have similar functions except that their users include all age groups. These senior and social welfare service centers are beneficial to older adults' health and disability in that they provide various programs such as health promotion, leisure activities, education, counseling, and space for meeting people, which is important for older adults who have a low scope of movement due to aging (Choi, 2006, p. 120). These programs help older adults have social relationships, lead active and meaningful lives, reduce their health deterioration, and minimize a feeling of loss and solitude (Choi, 2006, p. 120; Hancock, 1990, p. 245; Lee, Lee, & Lim, 2005, p. 138). Older adults, due to their health problems, have difficulty when they use senior and social welfare service centers if these centers are in a remote place in relationship to their residence (Seo,

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<sup>5</sup> The social services indicate physical, psychological, and social services to reduce social dysfunction of older adults and their family and prevent their problems (Mo, 2005).

1994). Thus, living close to these centers will enhance older adults' quality of life (Seo, 1994).

Older adults' approach to senior and social welfare centers, use of the programs provided by these centers and other factors that influence entry use are related to access. Although access is not a well-defined term (Aday & Anderson, 1975; as cited in Penchansky & Thomas, 1981, p. 127), most researchers recognize that access is related to the timely use of services according to need (Campbell, Roland, & Buetow, 2000) and is more often employed in research to characterize factors that influence entry or use of services (Penchansky & Thomas, 1981, p. 127). The dimensions of access can be somewhat different according to the focal areas of a researcher. Five dimensions of access are availability, accessibility, accommodation, affordability, and acceptability; these are included in Penchansky and Thomas' (1981) study, whereas Peters and his colleagues (2008) included the same dimensions (except for accommodation).

According to these researchers, availability refers to the volume and type of existing services; accessibility as the physical distance or travel time from service delivery point to user; accommodation as the relationship between the manner in which the supply resources are organized to accept users and the user's ability to accommodate to these factors and the users' perception of their appropriateness; affordability as price of services; and acceptability as users' attitudes about personal and practice characteristics of providers and vice versa. Of these five dimensions, accommodation and acceptability are related to attitude, and the affordability of services will be less problematic in the senior and social welfare service centers as most programs are free of charge or request a minimal fee (Jang, 2003, p. 115). Thus,

accessibility and availability will be the main influential factors for older adults in use of the centers.

In aging and disability research, the moderating effect of environmental factors is particularly important because they illustrate the mechanism where they affect disability (e.g., Wang et al., 2006, p. 136). The specification of the role of environmental factors also has practical implications in relation to disability (Wang et al., 2006, p. 139). In spite of the importance of service-related environmental factors in the relationship between health condition and disability among older adults, fewer studies were found on the moderating effects of accessibility or availability. A considerable amount of literature can be found on disability use with the environmental factors as independent (Arnadottir et al., 2011; Bang, Ryu, & Kim, 2011; den Ouden et al., 2013; Fairhall et al., 2011; Han & Kim, 2014; Lee, 2009; Lee & Kim, 2010; Richard, Gauvin, Gosselin, & Laforest, 2009; White et al., 2010; Yu et al., 2015; Yun & Jo, 2014) or confounding factors (Ha et al., 2015; Hur, 2014). When focused on the specific environmental factors as accessibility or availability, only a handful of studies were found that focus on their main effects on older adults' health or disability (Joung & Lee, 2015; Richard et al., 2009; Yang, Kim, & Park, 2013a; Yun & Jo, 2014).

In Joung and Lee's (2015) study, the influence of older adults' satisfaction with medical service on their subjective health was investigated; the researchers found out that the older adults' satisfaction with service positively affected their health. Yang et al.'s (2013a) study examined the association between service-related environmental factors and depression/solitude among older adults. He operationalized the service-related environmental factors as use of the programs

provided by a social welfare center. In their study (Yang et al., 2013a), the use of the programs significantly decreased the level of depression and solitude among older adults. Yun and Jo's (2014) study operationalized the service-related environmental factors as the need for public services such as care and transportation services. They investigated the relationship between the need for public services and older adults' activity limitation, but they found no significant effect of the needs factor. Richard et al.'s (2009) study focused on the effects of accessibility to services on older adults' participation and found that the accessibility had a significant positive effect. Previous studies (Joung & Lee, 2015; Richard et al., 2009; Yang et al., 2013a; Yun & Jo, 2014) showed that the relationships between the service-related environmental factors and disability were inconclusive among older adults. However, these findings are difficult to compare as these service-related environmental factors were defined differently; although the previous studies used environmental factor variables, the way they were operationalized was not the same. In addition, the outcome factors were different as well.

Although it is important to consider the moderation effect of service-related environmental factors, virtually no studies examine the moderating effect of these factors. Also, only a few studies were found to consider the effects of the service-related environmental factors on older adults' health and disability. The present study attempted to examine the moderating effects of service-related environmental factors on the association between health and each dimension of disability (i.e., body function, activity, and participation) in old age. Of the service-related environmental factors, this study focused on accessibility and availability, which were operationalized as accessibility and infrastructure of senior welfare centers and

social welfare service centers. The significant moderating effects of these service-related environmental factors will provide an empirical basis for an intervention to alleviate the negative effect of poor health condition on disabilities among older adults.

## **2.5 Summary of Literature Review**

In the above sections, a literature review was conducted on multidimensional disability, health and disability among older adults and the moderating effects of service-related environmental factors. Several limitations of the previous studies were summarized and the main issues that this study intends to focus were addressed.

First, less attention to multifaceted characteristics of disability in old age indicates lack of comprehensive understanding toward disability. Disability can be differently conceptualized by what paradigm a researcher takes. If a researcher draws upon the medical model of disability, she or she will interpret disability as physical or psychological impairment or a limitation in an activity capacity. However, if a researcher upholds the social model of disability, he or she will view disability as an environmental barrier that makes people disabled. Understanding the disability as multidimensional is significant as it influences planning, establishment and implementation of services. For example, in Korea, because disability is evaluated on the medical model, only those who have physical or mental impairments are eligible for disability services, which is restrictive in provision and stigmatizing as well.

Although the paradigm on disability has changed from the competition between the individual and social models of disability to an integrated approach that includes

both, multidimensional disability is not fully conceptualized in the previous studies (e.g., Fauth et al., 2008; Li, 2005). However, as older adults' disability in areas of body, individual capacity, and social involvement are all related and different levels of disability may happen at the same time (WHO, 2001), it will be more accurate and realistic to reflect multidimensionality in understanding older adults' disability.

Second, the previous studies failed to consider the importance of the moderating effect of service-related environmental factors. Although disability in old age is a relational concept, the previous studies did not interpret it in an environmental context. It is relational because disability itself is not designated as a problem, but it is defined based on whether environment acts as a facilitator or barrier. Of the various kinds of environmental factors, service-related factors such as accessibility and availability of senior welfare centers and social service welfare centers are known to be important protective factors for older adults' health and disability (Choi, 2006; Hancock, 1990, p. 245; Lee et al., 2005, p. 138). Thus, the moderating effect of service-related environmental factors is an important area to be examined. This indicates that methodologically, environmental factors should be analyzed as a moderator to investigate how the interaction between environmental factors and chronic illnesses influence the level of disability. However, the moderation by accessibility and availability of services in the association between chronic illnesses and multidimensional disability among older adults was found to be less studied in the previous studies. Only a few studies examined the main effect of accessibility and infrastructure respectively on older adults' subjective health (Joung & Lee, 2015), depression and solitude (Yang et al., 2013a), activity limitation (Yun & Jo, 2014), and participation (Richard et al., 2009).

In conclusion, considering the importance of multifaceted disability and limitations of the previous studies, the present study constructed disability as multidimensional including these three aspects: body function, activity, and participation. In addition, in order to overcome the limitation of the previous studies, this study analyzed the moderating effects of service-related environmental factors (i.e., accessibility and infrastructure) in the association between chronic illness and multiple dimensions of disability among older adults to see how disability is created within the service-related environmental context of older adults.

## **Chapter 3. Research Models and Hypotheses**

Based on literature reviews on health and disability among older adults, the previous chapter addressed the incomplete understanding of multidimensional disability in old age, the lack of consideration of the association between chronic illnesses and multidimensional disability, and the lack of consideration of the importance of moderating effects of service-related environmental factors in the association between chronic illnesses and multidimensional disability.

The ICF is an appropriate conceptual framework to overcome the aforementioned limitations in the previous studies. The conceptual model of the ICF is shown in Figure 4 and the three research models used in this study are presented in Figure 5, Figure 6, and Figure 7.

### 3.1 Conceptual Model of the ICF and its Variables

Figure 4 is a graphical representation of the ICF. For the convenience of matching the conceptual model of the ICF and how its components are represented in the research models, the variables of interest are converged into the ICF framework as shown below.

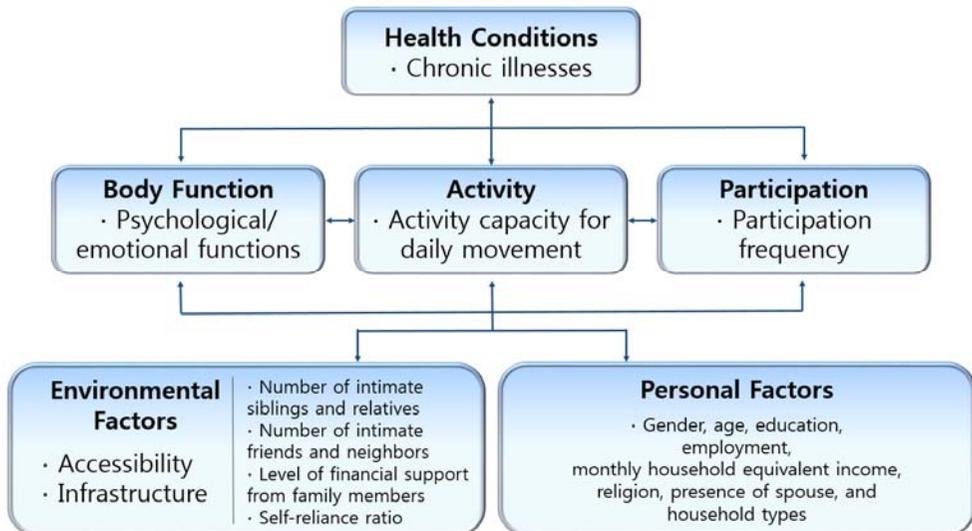


Figure 4. The Conceptual ICF Framework and its Variables

## 3.2 Research Models and Hypotheses

Figure 5 shows a research model based on [Research Question 1] “Do health conditions influence three dimensions of disability (i.e., body function, activity, and participation) among older adults?”. The research question was tested by examining the direct effects of chronic illnesses on psychological/emotional functions composed of cognitive ability and depression, activity capacity for daily movement, and participation frequency in social activities. The hypotheses are as follows:

H1. Health conditions will influence body function.

H2. Health conditions will influence activity.

H3. Health conditions will influence participation.

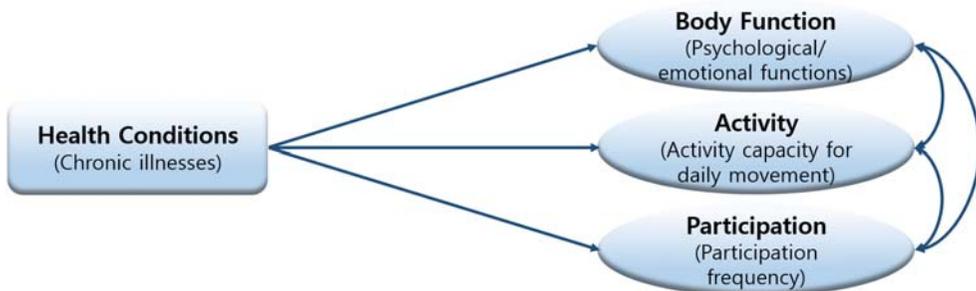


Figure 5. Hypothesized Model on the Association between Health Conditions and Multidimensional Disability

Based on [Research Question 2] “Do service-related environmental factors (i.e., accessibility and infrastructure) influence three dimensions of disability (i.e., body function, activity, and participation) among older adults?”, a research model is established as shown in Figure 6. Three hypotheses are established based on Research Question 2-1 and 2-2.

[Research Question 2-1] Does accessibility influence three dimensions of disability among older adults?

- H1. Accessibility will influence body function.
- H2. Accessibility will influence activity.
- H3. Accessibility will influence participation.

[Research Question 2-2] Does infrastructure influence three dimensions of disability among older adults?

- H4. Infrastructure will influence body function.
- H5. Infrastructure will influence activity.
- H6. Infrastructure will influence participation.

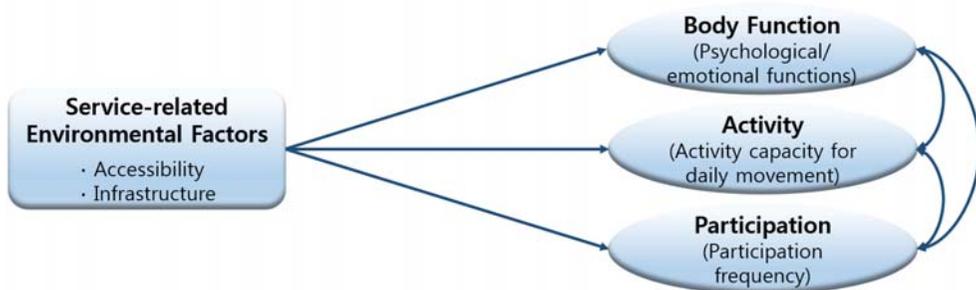


Figure 6. Hypothesized Model on the Association between Service-Related Environmental Factors and Multidimensional Disability

A research model established based on **[Research Question 3]** “*Do service-related environmental factors (i.e., accessibility and infrastructure) moderate the association between health conditions and three dimensions of disability (i.e., body function, activity, and participation) among older adults?*” is presented in Figure 7. Research Hypothesis 3 was tested by analyzing whether the association between chronic illnesses and psychological/emotional functions, the association between chronic illnesses and activity capacity for daily movement, and the association between chronic illnesses and participation frequency differ by the level of accessibility and infrastructure. In this analysis, the moderating effects of accessibility and infrastructure was examined using the interaction terms of Chronic Illnesses × Accessibility and Chronic Illnesses × Infrastructure. Research Question 3-1 and 3-2 each have three hypotheses.

**[Research Question 3-1]** Does accessibility moderate the association between health conditions and three dimensions of disability among older adults?

- H1. Accessibility will moderate the association between health conditions and body function.
- H2. Accessibility will moderate the association between health conditions and activity.
- H3. Accessibility will moderate the association between health conditions and participation.

**[Research Question 3-2]** Does infrastructure moderate the association between health conditions and three dimensions of disability among older adults?

- H4. Infrastructure will moderate the association between health conditions and body function.
- H5. Infrastructure will moderate the association between health conditions and activity.
- H6. Infrastructure will moderate the association between health conditions and participation.

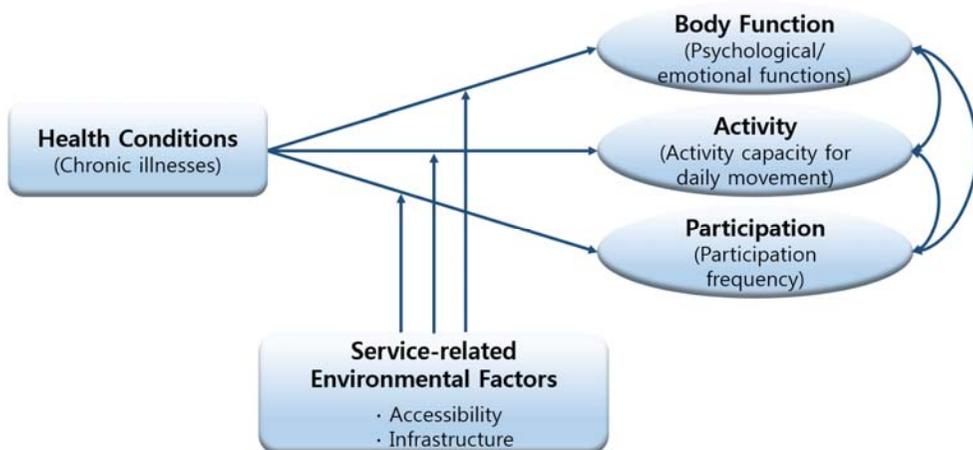


Figure 7. Hypothesized Model on the Moderating Effects of Service-Related Environmental Factors

## **Chapter 4. Methodology**

### **4.1 Data and Sample**

This study used two sets of data as merged data: the 2014 Survey of Living Conditions and Welfare Needs of Korean Older Persons (henceforth “the 2014 Survey”) (Ministry of Health and Welfare & KIHASA, 2014) and national statistics data. The national statistics data were gathered from Ministry of Health and Welfare Statistical Year Book 2015 (Ministry of Health and Welfare, 2015a) and the Current State of Elderly Welfare Facilities 2015 (Ministry of Health and Welfare, 2015b), which included regional data as of 2014.

The 2014 Survey is a representative national study that was conducted based on the Elderly Welfare Act, article 5 (National Law Information Center, 2016b), enactment of survey of living conditions and welfare needs of older adults. According to the aforementioned Act (National Law Information Center, 2016b), the series of surveys were implemented in 2008, 2011, and 2014. The 2014 Survey was the third one conducted. The population of the 2014 Survey was older adults aged over 61 in 2010 from the 2010 Population and Housing Census. The target population for the 2014 Survey was older adults aged 65 and over in 16 metropolitan cities and provinces (Seoul, Busan, Daegu, Incheon, Gwangju, Daejeon, Ulsan, Gyeonggi, Gangwon, Chungbuk, Chungnam, Jeonbuk, Jeonnam, Gyeongbuk,

Gyeongnam, and Jeju<sup>6</sup>). It was collected from 11 June to 4 September 2014. A total number of 10,451 older adults aged 65 years or older were selected for the study sample in this study. A general older population with and without chronic illnesses were selected for the study sample rather than those having a registered disability. This survey does not ask whether an older adult has a registered disability but asks whether they are eligible for Long Term Care Insurance. As of December 2014, about 3.2 % (n=335) of this sample were using it (Ministry of Health and Welfare & KIHASA, 2014). As their portion is small and they are not people with a registered disability, it is presumed that their characteristics will not differ from the rest and thus, the total of older adults is included as the study sample.

The number of senior welfare centers were obtained from the Current State of Elderly Welfare Facilities 2015 (Ministry of Health and Welfare, 2015b). The number of social welfare service centers were collected from Ministry of Health and Welfare Statistical Year Book 2015 (Ministry of Health and Welfare, 2015a). The Current State of Elderly Welfare Facilities 2015 (Ministry of Health and Welfare, 2015b) and Ministry of Health and Welfare Statistical Year Book 2015 (Ministry of Health and Welfare, 2015a) contained data for 2014.

In analysis, the total number of the senior welfare centers and social welfare service centers per ten thousand older adults in each of the 16 metropolitan cities and provinces were included. The ratio was calculated to standardize the ratio of the

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<sup>6</sup> Sejong was included in Chungnam as of 2014 when the data was collected for the 2014 Survey (Ministry of Health and Welfare & KIHASA, 2014).

number of senior and social welfare service centers and of older adults<sup>7</sup>.

## **4.2 Measurements of Variables**

### **4.2.1 Health Conditions**

The 2014 Survey originally included 30 types of chronic illnesses for older adults. These chronic illnesses include high blood pressure, stroke, hyperlipidemia, angina/cardiac infarction, other cardiac disorders, diabetes, thyroid disease, ostarthritis/rheumatoid arthritis, osteoporosis, backache/sciatic neuralgia, chronic bronchitis/chronic obstructive pulmonary disease (COPD), asthma, (pulmonary) tuberculosis, cataract, glaucoma, chronic otitis media, cancer (malignant neoplasm), gastroduodenal ulceration, hepatitis, cirrhosis, chronic renal failure, prostatism, urinary incontinence, venereal disease (syphilis etc.), anemia, skin disease, depressive symptoms, dementia, fracture, dislocation and sequel following accident, and other illnesses. However, in this study, depressive symptoms and dementia were excluded due to their conceptual overlap with depression and cognitive ability that were used to construct psychological and emotional functions. Thus, 28 chronic illnesses were included in this study.

The total number of chronic illnesses diagnosed by a doctor is included as a health condition variable. The participants were asked to answer if they were

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<sup>7</sup> Resident registration population as of December 31 2014 was used to collect the total number of older adults aged 65 and over in each 16 metropolitan cities and provinces (Statistics Korea, 2015).

suffering from any of 28 chronic illnesses for more than three months and reported only those that were diagnosed by a doctor. If an older adult had a diagnosed chronic illness, it was coded '1', whereas if he or she did not have a diagnosed chronic illness, it was coded '0'. Then, these 28 questionnaires were summated to represent the total diagnosed chronic illnesses older adults had as of 2014. The total number of chronic illnesses calculated was included as a continuous, manifest variable in the research mode: that is, this variable included in a research model as a continuous variable (compared to a bivariate variable) and a manifest variable (compared to a latent variable).

#### **4.2.2 Multidimensional Disability**

Based on literature review and the ICF framework, disability is constructed by three dimensions: impairments, activity limitations, and participations (WHO, 2001), which can be used to indicate problems (WHO, 2001, p. 8). On the other hand, their positive alternatives are body functions, activities, and participations, respectively, which can indicate nonproblematic aspects of health and health-related states (WHO, 2001, p. 8). In support of the ICF's idea to use positive language when describing disability, multidimensional disability is operationalized as psychological and emotional functions, activity capacity for daily movement, and participation frequency in social activities among older adults in the present study.<sup>8</sup>

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<sup>8</sup> This study operationalizes multidimensional disability in a positive way, as explained above. Similarly, in discussing the effects of chronic illnesses on psychological and emotional functions, activity capacity for daily movement, and participation frequency, these three dimensions are perceived as positive, just

In addition, throughout this study, older adults' disability is conceptualized as disability with aging, which indicates a disability that occurred in later life or due to a geriatric illness in the aging process (Paik & Roh, 2009, p. 72; Verbrugge & Yang, 2002).

## **1) Body Function**

Body functions are operationalized as psychological and emotional functions among older adults. Each function was measured respectively by cognitive ability and depression. Although body functions are defined as changes in physiological, psychological, and emotional systems in the ICF (WHO, 2001, p. 7), the physiological aspect is partially reflected in the activity dimension in this study, body function mainly focused on older adults' psychological and emotional aspects. It is known that cognitive decline and depression are one of notable characteristics of older adults due to aging (Park, 2007). Decline in cognitive ability contains the possibility of the onset of dementia and depression, which are serious problems in old age and are of great concern (Ministry of Health and Welfare, 2011).

Cognitive ability and depression composed a body function dimension of disability in the conceptual model of the ICF, and they were components of the latent variable for psychological and emotional functions in the research model.

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as they are measured. However, in discussing the association between chronic illnesses and multidimensional disability, I unavoidably must refer to multidimensional disability as a type of negative outcome variable.

## **(1) Psychological Function: Cognitive Ability**

Cognitive ability can be understood by explaining what dementia and cognitive impairment are. Dementia is a generic term that refers to a group of symptoms that reflect the loss of intellectual capabilities that interfere with daily functioning (Loring, 1999). Cognitive impairment refers to alterations in cognitive functioning, ranging from mild or occasional forgetfulness to severe forgetfulness, that may progress to dementia (Mesulam, 2000). Thus, in this study, cognitive ability is defined in the psychological aspect as a cognitive status that is in normal range of intellectual capabilities without any forgetfulness due to alterations in cognitive functioning.

The cognitive ability of older adults was assessed by the Korean version of Mini-Mental State Examination for Dementia Screening (MMSE-DS; Kim, Jhoo, et al., 2010). MMSE-DS, originally designed to screen for dementia, is an instrument currently used extensively to assess cognitive status in clinical and community settings (Wood, Giuliano, Bignell, & Pritham, 2006, p. 45). The total score of MMSE-DS is used as a continuous variable in this study. Higher scores represent better cognitive functions. The variable was included as a part of the latent variable psychological and emotional functions.

For reference, in order to classify older adults with and without cognitive decline, the total score of MMSE-DS should be calculated based on gender, age, and education and compare the score to the criteria table (See Appendix). Each combination has its own criteria. If an older adult's total score of MMSE-DS is below the relevant criterion, he or she requires a diagnostic examination.

In presenting the descriptive characteristics of health conditions in Table 5 (p.

78), the descriptive statistics on older adults with and without cognitive decline was conducted based on the MMSE-DS criteria.

## **(2) Emotional Function: Depression**

Depression is an affective disorder that presents anxiety, depressed mood, loss of interest or pleasure, decreased energy, feeling of guilt or low self-worth, disturbed sleep or appetite, and poor concentration (Battle, 1978). However, it does not only indicate pathological or problematic condition, but it also indicates a change in one's mood in a normative range (Battle, 1978). In general, because depression has a negative meaning as described above, it is actually more accurate to say that it is a component of impairments in the ICF. However, it is a trend to express it in a positive term, so body function is used instead of impairment to represent one dimension of disability in this study. Thus, depression was included as one of a component of body function. In this study, depression is defined as depressed, frustrated, or anxious mood or feelings in the emotional aspect.

Depression is measured with the Short Form of Geriatric Depression Scale (SGDS) (Sheikh & Yesavage, 1986), a reliable and valid screening tool for older adults (Yesavage et al., 1983). SGDS was specifically developed as an instrument for older adults and is composed of 15 questions in a Yes/No format. In the original version, a higher total score for the depression variable indicates a higher level of depression. However, in order to include depression as one of the sub-dimensions of a body function latent variable, the five positive questions (i.e., "Are you basically satisfied with your life?", "Are you in good spirits most of the time?", "Do you feel happy most of the time?", "Do you think it is wonderful to be alive?", and "Do you

feel full of energy?") were recoded '1', whereas the ten negative questions were recoded '0'. All of the 15 questions were summated. A higher value represents a lower level of depression. This reversed depression variable was included as a part of the latent variable for psychological and emotional functions.

For reference, SGDS has cut-off criteria that can be used to classify older adults with and without depressive symptoms. Of a total score range of 0 to 15, 1 to 7 refers to a group without depressive symptoms, whereas 8 to 15 refers to a group with depressive symptoms (Ministry of Health and Welfare & KIHASA, 2014, p. 312). The cut-off was used to present the percentage of older adults with and without depressive symptoms in the descriptive characteristics of health conditions in Table 5 (p. 78).

## **2) Activity: Activity Capacity for Daily Movement**

Activity is the second sub-dimension of disability and refers to an individual's ability to execute a task or an action (WHO, 2001, p. 7). Based on this definition, activity is operationalized as an older adult's activity capacity for implementing daily movement. Daily movements include six items: running around the ground (400 meters), walking around the ground (400 meters), climbing up 10 stairs without rest, bending body, crouching and kneeling, extending one's hands to touch an object above his or her head, and lifting and shifting an object weighing about 8 kilograms. The response scale ranges from not difficult at all (coded 4) to unable to do it at all (coded 1). The six items construct a latent variable of activity capacity for daily movement. A higher value represents higher capacity in the activities.

### **3) Participation: Participation Frequency**

Participation is the third sub-dimension of disability. It indicates performance; that is, what an individual does in his or her current environment (WHO, 2001, p. 7). Based on the definition, participation is operationalized as the frequency of social activities. The participation frequency was measured by the summation of six specific performances (i.e., continuing education, leisure and cultural activities, club, social gathering, political organization, and volunteering work). The participants are asked to respond whether they have joined in each of five activities during the last year in a Yes/No format. For the volunteering work, the period is during the last month. Yes is coded '1', and these six activities were summated. The sum of participation frequency in six activities represents older adults' actual participation; higher values represent higher frequencies of social participation.

In the research model, this variable was finally included as a latent variable participation frequency, although it was originally constructed as a manifest variable in order to analyze correlations among three dimensions of disability.

#### **4.2.3 Service-Related Environmental Factors**

The service-related environmental factors were composed of accessibility and infrastructure. Senior welfare centers are eligible for older adults aged 60 and older based on Article 31 of the Elderly Welfare Act (National Law Information Center, 2016b). All community residents are eligible for social service welfare centers, but these centers provide services primarily to the more vulnerable groups such as older

adults, people with disabilities, or others in need based on the fifth clause of Article 34 in the Social Welfare Services Act (National Law Information Center, 2016c).

## **1) Accessibility**

Accessibility to senior welfare centers and social service welfare centers is assessed by the elderly participants in a self-reported format in the 2014 Survey. They were asked to answer a question measuring the duration of time spent to reach the senior welfare centers and social service welfare centers on foot. Accessibility to each center was asked in separate questions. The response range used a four Likert scale, from 1 for less than 5 minutes on foot to 4 for more than 30 minutes on foot. In order to make the accessibility variable reflect that higher score indicate better accessibility, the original response options were reversely coded: 1 for more than 30 minutes on foot and 4 for less than 5 minutes on foot.

The responses to each center were aggregated first, calculated by mean score, included as a single moderator, and designated as accessibility in this study. In the 2014 Survey, in addition to these two welfare facilities, medical institutions such as hospitals for health centers were also included. Yet, as the medical institutions are related particularly to body dimension of disability and focuses main in medical treatment, they were not included in this study.

## 2) Infrastructure

Infrastructure<sup>9</sup>, a regional factor, was measured by the total number of senior welfare centers and social welfare service centers per ten thousand older adults in 16 metropolitan cities and provinces, and obtained from national statistics data. According to the Elderly Welfare Act (National Law Information Center, 2016b), there are six types of welfare facilities for older adults: senior housing, senior medical care facilities, senior leisure facilities, residential home facilities, senior protection facilities, and agency for senior job placement. Of these, the senior welfare centers, senior community centers, and senior class comprise senior leisure facilities. The present study mainly focused on the senior welfare centers because they provide various health-related programs and services with professional knowledge and skills (Park, 2010, p. 457) when compared to other senior leisure facilities. In addition, the senior welfare centers provide services for various social activities and hobbies for older adults' social participation and education programs. Social welfare service centers provide similar programs and services as senior welfare centers do.

The data on senior welfare centers and social welfare service centers were summated by 16 regions and divided by elderly residents in these regions to establish a merged infrastructure variable: the total numbers of senior and social welfare

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<sup>9</sup> In the planning stage of this study, infrastructure was operationalized as senior welfare budget in each 16 regions. However, as the senior welfare budget was included in the same category with child welfare budget, it was impossible to decompose. Thus, the total number of welfare facilities per ten thousand older adults at regional level was operationalized as a proxy of regional senior welfare budget.

centers per ten thousand older adults in 16 regions. This final infrastructure variable was included in the research model.

### **3) The Interaction Terms**

The moderating factors of accessibility and infrastructure were examined by the cross product terms of Chronic Illnesses  $\times$  Accessibility and Chronic Illnesses  $\times$  Infrastructure, which are made by multiplying chronic illnesses with accessibility and chronic illnesses with infrastructure. These two interaction terms were analyzed to investigate whether the moderating effects of accessibility and infrastructure exist in the association between chronic illnesses and the three dimensions of disability (i.e., psychological and emotional functions, activity capacity for daily movement, and participation frequency).

#### **4.2.4 Control Variables**

Other influential factors of multiple dimensions of disability were reviewed to control their effects. The factors found to be associated with each disability were largely characterized as the sociodemographic factors and social support and relationship factors. Based on the ICF categorization, sociodemographic factors belong to a personal factor category, and social support and relationship factors are included in the environmental factor category. A regional factor (i.e., self-reliance ratio of local government) was also controlled to adjust regional effect in analysis.

The personal factors indicate the sociodemographic characteristics of the

elderly participants. The previous studies showed the sociodemographic variables that were related to disability in old age such as gender, age, education, employment, monthly or annual income, religion, presence of spouse or marital status, and living conditions. For the impairment dimension of disability, gender, education, and participation in religious activity were found to be significantly related to depression of older adults (Han & Kim, 2014; King et al., 2011). Gender, age, and presence of spouse were significant factors related to cognitive function among older adults (H. J. Lee, 2011). For the activity limitation dimension of disability, gender, age, education, presence of spouse, and living condition (living alone) were significant factors (I. S. Jang, 2006; Yun & Jo, 2014). When participation frequency was an outcome variable, age and education were significantly associated (Arnadottir et al., 2011), whereas when the outcome variable was perceived participation restriction, the significant factors were age and employment (Arnadottir et al., 2011; Fairhall et al., 2011). According to the dimensions of disability and how the outcome variables were measured, the influential factors were different. Thus, those found to be common important factors related to the multidimensional disability among older adults were included as control variables.

The social support and social relationship are known as crucial factors in explaining disability among older adults in voluminous literatures (Bang et al., 2011; Peek et al., 2003). In the previous studies, these variables were operationalized in various ways such as perceived social support (Bang et al., 2011; Han & Kim, 2014; Yun & Jo, 2014), emotional support (Peek et al., 2003; Yu et al., 2015), and social network (Yu et al., 2015). These studies empirically examined the importance of the perceived social and emotional support in decreasing activity limitations (i.e., ADLs

and IADLs) and enhancing their psychological functions (i.e., lowering depression level), participation (i.e., social interaction), and overall health status among the older adults. Yet, some studies revealed different findings. Social support operationalized as family support was found to be insignificant to the cognitive ability of older adults (H. J. Lee, 2011). Park (2007) examined the moderating effect of social support in the association between stress and depression among female older adults aged 65 and over and showed that the social support factor was insignificantly related. Although this social support variable is important in disability research, the present study attempted to focus on the service-related environmental factors to find environmental modifications at the societal level by examining the moderating effect of accessibility and infrastructure of senior welfare centers and social welfare service centers. Thus, these informal support factors were controlled in this study.

The investment in welfare services and infrastructure for older adults was executed using the social welfare budget of a local government (Ko & Lee, 2015, p. 369). The regional factors that influence social welfare expenditure in local government were found to be the self-reliance ratio of local government, the rate of economic expenditure to the total local government expenditure, the increased rate of social welfare expenditure to the previous year, the rate of recipients of National Basic Livelihood Security, and the rate of elderly population (Lee & Kim, 2007). Of these, the first four factors relate to fiscal capacity and vulnerability of local government (Oh, 1988, p. 267) and the last factor indicates the portion of elderly residents compared to the total residents in a region. For the principle of parsimony, the self-reliance ratio of local government was selected as a representative regional

factor as it is useful to indicate fiscal imbalance in terms of the level of the financial independence of local government (Breuss & Ellder, 2004, p. 5; Oh, 1988, p. 267). The rate of the elderly population was not included because the numbers of older adults in each 16 regions was already considered in establishing the infrastructure variable.

### **1) Personal Factors**

Eight personal factors are included as covariates: gender (male and female), age (65 and over), education (uneducated to the university level), employment, monthly household equivalent income (log transformed), presence of a spouse, household types (single and couple elderly households vs. living with others), and religion.

### **2) Social Support and Relationship Factors**

Social support and relationship factors are measured by the number of intimate siblings and relatives, the number of intimate friends and neighbors, and level of financial support from family members. They are included as control variables in the analysis.

### **3) A Regional Factor**

Self-reliance ratio of local government is defined as ratio of own-source revenues to total local revenues (Kwon, 2003, p. 6). It is operationalized as the

financial independence of each 16 regions. In this study, self-reliance ratio of local government is calculated by their own revenues divided by their total revenues and multiplied by 100 to make it a ratio (See Formula 1). The own revenues are composed of local tax (excluding local education tax) and non-tax revenue. The total revenues contain own revenue, grants (local share tax, metropolitan city revenue sharing/province revenue sharing, and subsidies), and local borrowing and deposit withdrawal (Ministry of Interior, 2014). The data as of 2014 was obtained from the Local Finance Integrated Open System ‘Local Finance 365’ operated by Ministry of the Interior. The self-reliance ratio of Sejong was included in that of Chungnam.

$$\text{Self-reliance ratio} = \frac{\text{Own revenues of a local government}}{\text{Total revenues of a local government}} \times 100 (\%)$$

Formula 1. Self-Reliance Ratio of Local Government

Table 1 shows six categories and the variables in the research model.

Table 1. Categories and Variables

Categories		Variables
Health Conditions	Chronic illnesses	· The total number of chronic illnesses diagnosed by a doctor
Body Function	Psychological and emotional functions	· Total score of cognitive ability · Total score of depression
Activity	Activity capacity	· Activity capacity for six daily movements
Participation	Participation frequency	· Summation of six activities (i.e., continuing education, leisure and cultural activities, club, social gathering, political organization, and volunteering activity)
Service-Related Environmental factors	Accessibility	· Accessibility to senior welfare centers and social welfare service centers (1=over 30min. on foot, 4=less than 5min. on foot)
	Infrastructure	· The total number of senior welfare centers and social welfare service centers per ten thousand older adults in 16 regions
	Interaction terms	· Moderator 1: Chronic Illnesses × Accessibility · Moderator 2: Chronic Illnesses × Infrastructure
Control Variables	Personal factors	· Gender (1=male, 0=female) · Age · Education (1=uneducated, 5=college/university+) · Employment (1=employed, 0=unemployed) · Monthly household equivalent income (Ln) · Presence of spouse (1=yes, 0=others) · Household types (1=single and couple elderly households, 0=living with others) · Religion (1=yes, 0=no)
	Social support and relationship factors	· Number of intimate siblings and relatives · Number of intimate friends and neighbors · Level of financial support from family members (summation)
	Regional factor	· Self-reliance ratio of local government

### **4.3 Data Analysis**

The present study used the analyses below to examine the research hypotheses. The Statistical Package for Social Sciences (SPSS) 22.0 was used to manage raw data and perform descriptive statistics. AMOS 22.0 was used to perform structural equation modeling (SEM) for three research hypotheses.

Prior to performing the main analyses, a preliminary screening was conducted using SPSS in order to confirm accuracy of data, transform necessary scoring, screen for outliers and univariate normality. Missing data is treated with Full Information Maximum Likelihood (FIML) estimation using AMOS. FIML handles data based on missing at random (MAR) (Bae, 2014, p. 161). It is preferred method for modeling incomplete data than list-wise, pair-wise, and data imputation because it produces less biased, efficient, and consistent parameter estimates (Enders, 2001; Newman, 2003).

Descriptive statistics were computed for all independent and dependent variables and moderators to describe the sample demographics and the major variable used in the analysis. The sociodemographic characteristics of the older adults in the sample and descriptive findings of the focal variables such as chronic illness, three dimensions of disability (psychological and emotional functions, activity capacity for daily movement, and participation frequency), accessibility, and infrastructure were analyzed.

The three research hypotheses (the association between chronic illnesses and three dimensions of disability; the association between accessibility and infrastructure and three dimensions of disability; and the moderating effects of

accessibility and infrastructure in the association between chronic illnesses and three dimensions of disability) were tested through SEM with an estimation of FIML. The tests of Research Hypotheses 1, 2, and 3 were conducted simultaneously in the same structural model. Before proceeding an analysis, for the convenience of interpretation, mean centering was conducted for all the variables in the analytic model except the dependent variables by subtracting a mean from every value of the variables (Hong & Jung, 2014). The cross product terms of Chronic Illnesses  $\times$  Accessibility and Chronic Illnesses  $\times$  Infrastructure were made as interaction terms in order to examine the moderating effects of the service-related environmental factors.

After the completion of data management, the analysis was conducted in a two-step approach by implementing a test of measurement model first and a test of structural model next (Anderson & Gerbing, 1988). The measurement model represents whether manifest variables (or observed variables) properly explains a latent variable (Bae, 2014, p. 8). The structural model indicates how latent variables are associated in a research model (Bae, 2014, p. 8).

The goodness-of-fit of the overall models was tested with a  $\chi^2$  statistic, IFI, CFI, and RMSEA. The value of  $\chi^2/df$  less than 3, IFI and CFI  $\geq .90$ , and RMSEA  $< .08$  indicate satisfactory model fits (Browne & Cudeck, 1993; Hair, Anderson, Tatham, & Black, 2009; Kline, 2005).

# Chapter 5. Results

## 5.1 Descriptive Statistics

### 5.1.1 Sociodemographic Characteristics

Table 2 presents the sociodemographic characteristics, social support, and social relational characteristics among the sample. More than half of sample were female (59%) and 41% were male. Older adults in their 70s were 54.1%, followed by 60s (26.8%) and 80s (19%), with the mean age of 74.01 years (SD=6.215). A majority of older adults had middle school education or less (79.2%) and 20.8% reported more than high school education. Among the older adults, a large portion of them were unemployed (68.4%), while 31.6% were employed. Monthly household equivalent income was approximately 115.1 (SD=114.699) (unit: 10,000 Korean Currency). Sixty-two percent of older adults had a spouse, while 38% were single, divorced, separated, or widowed. A large portion of the older adults were living alone or with their spouses (70.9%) and the rest 29.1% were living with their married or unmarried children or in other types. Having no religion was the largest with 35.3%, followed by Buddhist (32%), Protestant (21.1%), Catholic (9.4%), and others (2.3%). The largest portion of the older adults was residing in Gyeonggi (13%), followed by Seoul (9.2%), Gyeongnam (8%), Gyeongbuk (7.7%), Jeonbuk (6.9%), Jeonnam (6.8%), Chungnam (6.6), Gangwon (5.9%), Busan (5.7%), Chungbuk

(5.6%), Daegu (4.6%), Incheon (4.3%), Ulsan (4%), Jeju (3.9%), Daejeon (3.8%), and Gwangju (3.8%).

Table 2. Sociodemographic Characteristics

Variables (n=10,451)	Categories	Frequency (%)	Mean (SD)	Range
Gender	Male <sup>a</sup>	4,282 (41.0)		
	Female	6,169 (59.0)		
Age	65-69	2,804 (26.8)	74.01	65-105
	70-79	5,658 (54.1)	(6.215)	
	80+	1,989 (19.0)		
Education	No education <sup>a</sup>	3,469 (33.2)		
	Elementary	3,468 (33.2)		
	Middle school	1,340 (12.8)		
	High school	1,503 (14.4)		
	College/university+	671 (6.4)		
Employment	Employed <sup>a</sup>	3,299 (31.6)		
	Unemployed	7,152 (68.4)		
Monthly household equivalent income (unit: 10,000 KRW)			115.10 (114.699)	0- 6,338.17
Presence of spouse	Yes <sup>a</sup>	6,476 (62.0)		
	No (single, bereavement, divorce, separation and others)	3,975 (38.0)		
Household types	Single and couple elderly households <sup>a</sup>	7,413 (70.9)		
	Others (living with married children, living with unmarried children and other types of household)	3,038 (29.1)		
Religion (n=10,450)	No religion	3,685 (35.3)		
	Buddhist <sup>a</sup>	3,341 (32.0)		
	Protestant <sup>a</sup>	2,204 (21.1)		
	Catholic <sup>a</sup>	978 (9.4)		
	Others <sup>a</sup>	242 (2.3)		

Residence	Gyeonggi	1,360 (13.0)
	Seoul	960 (9.2)
	Gyeongnam	840 (8.0)
	Gyeongbuk	800 (7.7)
	Jeonbuk	721 (6.9)
	Jeonnam	710 (6.8)
	Chungnam	688 (6.6)
	Gangwon	621 (5.9)
	Busan	600 (5.7)
	Chungbuk	590 (5.6)
	Daegu	481 (4.6)
	Incheon	450 (4.3)
	Ulsan	420 (4.0)
	Jeju	410 (3.9)
	Daejeon	400 (3.8)
	Gwangju	400 (3.8)

*Note.* <sup>a</sup> indicates a variable is coded as '1'.

### 5.1.2 Support and Relationship Factors

Table 3 shows social support and social relationship characteristics of sample. The older adults reported of having 1.06 (SD=1.306) intimate siblings and relatives on average. Older adults having no siblings and relatives were more than 45% and about 41.1% had one to two close siblings and relatives. Having more than three were 13.2%. Regarding the number of intimate friends and neighbors, the older adults had 1.57 (SD=1.641) on average. More than 40.6% had one or two intimates, but having none also occupied 35.8%. The findings show that 35.8% to 45.7% of older adults did not have any intimate siblings, relatives, friends, and neighbors, indicating a lack of informal social support systems. The level of financial support

was measured by both regular and irregular financial support from their children and/or their spouses' parents in cash and kind. The mean level of financial support from family members was about 2.7 (SD=1.238) on a score of 0 to 7.

Table 3. Characteristics of Support and Relationship Factors

Variables	Valid N or Frequency (%)	Mean (SD)	Range
Number of intimate siblings and relatives	10,281 (100.0)	1.06 (1.306)	0-5
none	4,701 (45.7)		
1 person	2,613 (25.4)		
2 persons	1,619 (15.7)		
3 persons	687 (6.7)		
4 persons	294 (2.9)		
5 persons	367 (3.6)		
Number of intimate friends and neighbors	10,281 (100.0)	1.57 (1.641)	0-6
none	3,683 (35.8)		
1 person	1,910 (18.6)		
2 persons	2,266 (22.0)		
3 persons	1,137 (11.1)		
4 persons	478 (4.6)		
5 persons	434 (4.2)		
6 persons	373 (3.6)		
Level of financial support from family members	10,451 (100.0)	2.70 (1.238)	0-7

### 5.1.3 Regional Factor

The self-reliance ratio of 16 regions is presented in Table 4 from the highest to the lowest in order. The region with the highest self-reliance ratio was Seoul (84.17%) followed by Ulsan (70.64%) and Gyeonggi (68.68%). Jeonnam (27.13%) had the lowest self-reliance ratio among the 16 regions followed by Jeonbuk (29.38%) and Gangwon (29.57%).

Table 4. Self-Reliance Ratio of 16 Regions

(unit: 1,000,000 KRW, %)			
Local governments	Own revenues of local government (A)	Total revenues of local government (B)	Self-reliance ratio of local government (A/B×100)
Seoul	15,882,554	18,869,553	84.17
Ulsan	1,913,798	2,709,275	70.64
Gyeonggi	17,336,174	25,241,902	68.68
Incheon	4,176,552	6,229,892	67.04
Busan	4,551,559	8,049,848	56.54
Daejeon	1,734,185	3,077,304	56.35
Daegu	2,914,070	5,359,993	54.37
Gwangju	1,756,977	3,543,621	49.58
Gyeongnam	5,288,873	11,789,133	44.86
Chungnam <sup>a</sup>	3,783,818	9,403,840	40.24
Jeju	1,115,723	2,906,267	38.39
Chungbuk	2,385,249	6,480,818	36.80
Gyeongbuk	4,121,957	12,985,645	31.74
Gangwon	2,373,186	8,026,040	29.57
Jeonbuk	2,482,551	8,448,753	29.38
Jeonnam	2,993,158	11,031,989	27.13

Note. <sup>a</sup> Chungnam includes Sejong.

## 5.1.4 Health and Disability Factors

The descriptive characteristics of health and disability of older adult sample are presented in Table 5. The mean number of the chronic illnesses diagnosed by a doctor was 2.59 (SD=1.786), ranging from 0 to 15 with possible range of 0 to 28 chronic illnesses. The older adults without chronic illness occupied 10.3%, but 89.7% had at least one chronic illness. Having more than three chronic illnesses occupied 47%. Table 6 shows the most frequently reported chronic illnesses among the sample. More than a half of them reported to have high blood pressure (56.4%) and ostarthritis/rheumatoid arthritis also had high proportion of 35.9%. Backache/sciatic neuralgia (23.2%), diabetes (22.4%), hyperlipidemia (17.8%), osteoporosis (14.9%), and other illnesses not specified (13.8%) were also the chronic illnesses that older adults experienced a lot. The level of body functions of older adults was measured by the total score of cognitive ability and depression. The mean score of the cognitive ability was 23.42 (SD=4.733) and that of the depression was 9.65 (SD=4.556). Of the total older adults, 25.1% suffered from cognitive decline and 32.5% experienced depressive symptom. On average, older adults reported 3.2 (SD=.654) out of 4 on daily movement scales indicating overall high levels of functioning. Among the six items measured in the daily movement, the highest mean score was 3.78 (SD=.541) in 'Extending one's hands to touch an object above his or her head' indicating almost no difficult in doing so and the least was 2.19 (SD=.932) in 'Running around the ground (400 meters)' indicating significant difficulty in running. The older adults were asked if they participated in any of following social activity: leisure and cultural activities, continuing education, club, social gathering, political organization, and

volunteering activity. On average, they participated in 1.62 (SD=.798) activities. A majority of them (98.6%) spent their time in 'leisure and cultural activities' and the second largest activity was social gathering (41.9%), followed by continuing education (13.4%), club (4.5%), volunteering activity (3.6%), and political organization (0.4%).

Table 5. Descriptive Characteristics of Health and Disability

Variables	Valid N or Frequency (%)	Mean (SD)	Range
<b>Chronic illnesses</b>			
Number of chronic illnesses diagnosed by a doctor	10,451 (100)	2.59 (1.786)	0-15
None	1,072 (10.3)		
1 chronic illness	2,011 (19.2)		
2 chronic illnesses	2,455 (23.5)		
More than 3 chronic illnesses	4,913 (47.0)		
<b>Psychological/emotional functions</b>			
Total score of cognitive ability <sup>10</sup>	10,260 (100)	23.42 (4.733)	0-30
Without cognitive decline	7,683 (74.9)		
With cognitive decline	2,577 (25.1)		
Total score of depression <sup>11</sup>	10,281 (100)	9.65 (4.556)	0-15
Without depressive symptom	6,941 (67.5)		
With depressive symptom	3,340 (32.5)		
<b>Activity capacity for daily movement</b>			
Running around the ground (400 meters)	10,451 (100)	3.20 (.654)	1-4
Walking around the ground (400 meters)	10,369 (99.2)	2.19 (.932)	
Walking around the ground (400 meters)	10,444 (99.9)	3.38 (.834)	
Climbing up 10 stairs without rest	10,423 (99.7)	3.21 (.860)	
Bending body, crouching, and kneeling	10,451 (100)	3.22 (.864)	
Extending one's hands to touch an object above his or her head	10,451 (100)	3.78 (.541)	
Lifting and shifting an object weighing about 8 kilograms	10,448 (100)	3.43 (.830)	
<b>Participation frequency</b>			
Leisure and cultural activities	10,451 (100)	1.62 (.798)	0-6
Continuing education	10,306 (98.6) <sup>a</sup>		
Club	1,403 (13.4) <sup>a</sup>		
Social gathering	466 (4.5) <sup>a</sup>		
Political organization	4,384 (41.9) <sup>a</sup>		
Volunteering activity	42 (0.4) <sup>a</sup>		
Volunteering activity	378 (3.6) <sup>a</sup>		

Note. <sup>a</sup>Of the total older participants, those participated in each activity are presented.

<sup>10</sup> The cut-off criteria for cognitive ability is presented in Appendix.

<sup>11</sup> The cut-off criteria for depression is as follows: 1-7 no depressive symptoms; 8-15 depressive symptoms.

Table 6. Frequency of Diagnosed Chronic Illnesses

Variable (n=10,451)	Frequency (%)	
	Yes	No
High blood pressure	5,898 (56.4)	4,553 (43.6)
Ostarthritis/rheumatoid arthritis	3,757 (35.9)	6,694 (64.1)
Backache/sciatic neuralgia	2,423 (23.2)	8,028 (76.8)
Diabetes	2,336 (22.4)	8,115 (77.6)
Hyperlipidemia	1,856 (17.8)	8,595 (82.2)
Osteoporosis	1,562 (14.9)	8,889 (85.1)
Other illnesses	1,443 (13.8)	9,008 (86.2)
Cataract	1,010 (9.7)	9,441 (90.3)
Prostatism	833 (8.0)	9,618 (92.0)
Stroke	770 (7.4)	9,681 (92.6)
Gastroduodenal ulceration	733 (7.0)	9,718 (93.0)
Other cardiac disorders	731 (7.0)	9,720 (93.0)
Angina/cardiac infarction	715 (6.8)	9,736 (93.2)
Cancer (malignant neoplasm)	466 (4.5)	9,985 (95.5)
Thyroid disease	329 (3.1)	10,122 (96.9)
Asthma	326 (3.1)	10,125 (96.9)
Anemia	309 (3.0)	10,142 (97.0)
Fracture, dislocation and sequel following accident	277 (2.7)	10,174 (97.3)
Urinary incontinence	259 (2.5)	10,192 (97.5)
Skin disease	258 (2.5)	10,193 (97.5)
Glaucoma	198 (1.9)	10,253 (98.1)
Chronic bronchitis/chronic obstructive pulmonary disease	187 (1.8)	10,264 (98.2)
Chronic renal failure	113 (1.1)	10,338 (98.9)
Chronic otitis media	84 (0.8)	10,367 (99.2)
Hepatitis	84 (0.8)	10,367 (99.2)
Cirrhosis	62 (0.6)	10,389 (99.4)
(pulmonary) Tuberculosis	34 (0.3)	10,417 (99.7)
Venereal disease (syphilis etc.)	1 (0.0)	10,450 (100.0)

### 5.1.5 Service-Related Environmental Factors

The descriptive characteristics of the service-related environmental factors, accessibility and infrastructure, were presented in Table 7. The largest portion of older adults (60.4%) reported of taking 30 minutes or longer on foot to senior welfare centers and social welfare service centers. About 30% of older adults took 10 to 30 minutes, 8.8% took 5 to 10 minutes and 1.1% took less than 5 minutes.

Table 7. Descriptive Statistics of Accessibility

Variable (n=10,451)	Categories	Frequency (%)	Mean (SD)	Range
Accessibility	Over 30min. on foot	6,309 (60.4)	1.43 (.630)	1-4
	10 to 30min. on foot	3,106 (29.7)		
	5 to 10min. on foot	920 (8.8)		
	Less than 5min. on foot	116 (1.1)		

Table 8 shows the total number of senior welfare centers and social welfare service centers in 16 metropolitan cities and provinces (i.e., Seoul, Busan, Daegu, Incheon, Gwangju, Daejeon, Ulsan, Gyeonggi, Gangwon, Chungbuk, Chungnam, Jeonbuk, Jeonnam, Gyeongbuk, Gyeongnam, and Jeju).

The number of the elderly population in each region as of December 2014 was presented to calculate the number of senior welfare centers and social welfare service centers per ten thousand older adults. There was 1.22 senior welfare centers and social welfare service centers per ten thousand older adults on average. Ulsan (1.85), Gwangju (1.81), and Daejeon (1.71) had the highest number of senior welfare centers

and social service welfare centers per ten thousand older adults. Gyeongbuk (0.64), Gyeonggi (0.89), and Chungnam (0.91), on the other hand, had the lowest number of these centers per ten thousand older adults.

Table 8. Descriptive Statistics of Infrastructure

Variables (n=10,451)	Regions	Number of senior welfare centers	Number of social welfare service centers	Total Number of centers (%)	Number of older adults	Number of centers per 10,000 older adults
		(A)	(B)	(A+B)	(C)	(D <sup>a</sup> )
Infrastruc- ture (per 10,000 older adults)	Ulsan	10	8	18 (2)	97,250	1.85
	Gwangju	10	19	29 (4)	159,822	1.81
	Daejeon	6	21	27 (3)	158,329	1.71
	Busan	30	53	83 (11)	492,116	1.69
	Seoul	74	98	172 (22)	1,216,529	1.41
	Chungbuk	17	13	30 (4)	228,900	1.31
	Daegu	13	26	39 (5)	303,537	1.28
	Jeonnam	32	16	48 (6)	383,808	1.25
	Incheon	18	19	37 (5)	297,951	1.24
	Jeonbuk	23	17	40 (5)	322,626	1.24
	Jeju	1	9	10 (1)	82,411	1.21
	Gangwon	12	18	30 (4)	255,930	1.17
	Gyeongnam	18	31	49 (6)	449,017	1.09
	Chungnam	14	18	32 (4)	350,584	0.91
Gyeonggi	52	60	112 (14)	1,254,445	0.89	
Gyeongbuk	14	16	30 (4)	467,352	0.64	
Mean						1.22
(SD)						(.329)
Total		344	442	786	6,520,607	

Note. <sup>a</sup> D = (A+B) / C × 10,000

## 5.2 Data Screening and Estimation

Data screening was performed to assure whether the data were appropriate to run the main analyses (See Table 9).

Prior to data screening, descriptive statistics and frequencies were examined to confirm whether all data were in the practical range of each variable. Missing data were handled by Full Information Maximum Likelihood (FIML). With the FIML, the amount of missing data in a given variable becomes almost a non-significant issue. Newman (2003) and Enders and Bandalos (2001) showed that studies in which the amount of missing data exceeded 25%. The missing rate in this study was low (0 to 1.86%). One of the ways to examine the normality of data is by assessing the univariate distributions (Kline, 2005). Skewness and kurtosis of each variable included in this study were examined. It is generally suggested that skewness larger than 3.0 and kurtosis larger than 10.0 are indicative of potential normality problems (Kline, 2005). All variables except monthly household equivalent income had absolute value of .168 to 2.77 for skewness and .092 to 8.134 for Kurtosis, suggesting univariate normality. As the absolute value of skewness and kurtosis of original monthly household equivalent income (unit: 10,000 KRW) were 18.079 (SD=.024) and 855.635 (SD=.048), it was log transformed. The absolute value of skewness and kurtosis of the log-transformed monthly household equivalent income were .063 (SD=.024) and 3.158 (SD=.048).

Table 9. Missing Rate and Normality of Major Variables

Variables	Valid N	MR <sup>a</sup> (%)	Skewness (SD)	Kurtosis (SD)
<b>Chronic illnesses</b>				
Number of chronic illnesses	10,451	.00	.869 (.024)	1.303 (.048)
<b>Psychological/emotional functions</b>				
Total score of cognitive ability	10,260	1.86	-.892 (.024)	.579 (.048)
Total score of depression	10,281	1.65	-.514 (.024)	-1.00 (.048)
<b>Activity capacity for daily movement</b>				
Running around the ground (400 meters)	10,369	.79	.477 (.024)	-.591 (.048)
Walking around the ground (400 meters)	10,444	.07	-1.152 (.024)	.398 (.048)
Climbing up 10 stairs without rest	10,423	.27	-.807 (.024)	-.247 (.048)
Bending body, crouching, and kneeling	10,451	.00	-.754 (.024)	-.463 (.048)
Extending one's hands to touch an object above his or her head	10,451	.00	-2.770 (.024)	8.134 (.048)
Lifting and shifting an object weighing about 8 kilograms	10,448	.03	-1.320 (.024)	.807 (.048)
<b>Participation frequency</b>				
Participations in 6 activities	10,451	.00	1.120 (.024)	1.542 (.048)
<b>Environmental factors</b>				
Accessibility	10,451	.00	1.471 (.024)	1.811 (.048)
Infrastructure	10,451	.00	.168 (.024)	-.318 (.048)
<b>Personal Factors</b>				
Gender	10,451	.00	.367 (.024)	-1.866 (.048)
Age	10,451	.00	.634 (.024)	.092 (.048)
Education	10,451	.00	.727 (.024)	-.578 (.048)
Employment	10,451	.00	.793 (.024)	-1.371 (.048)
Monthly household equivalent	10,429	.21	18.079 (.024)	855.635 (.048)

income (unit: 10,000 KRW)				
· Monthly household equivalent income (Ln)	10,429	.21	.063 (.024)	3.158 (.048)
Presence of spouse	10,451	.00	-.493 (.024)	-1.757 (.048)
Household types	10,451	.00	-.922 (.024)	-1.150 (.048)
Religion	10,450	.01	-.617 (.024)	-1.620 (.048)
<b>Social support and relationship factors</b>				
Number of intimate siblings and relatives	10,281	1.65	1.333 (.024)	1.244 (.048)
Number of intimate friends and neighbors	10,281	1.65	1.000 (.024)	.316 (.048)
Level of financial support from family members	10,451	.00	.473 (.024)	.808 (.048)
<b>Regional factor</b>				
Self-reliance ratio of local government	10,451	.00	.402 (.024)	-1.076 (.048)

*Note.* <sup>a</sup> MR indicates missing rate

The correlation matrix of major variables and covariates in the research model is presented in Table 10. The correlation matrix computes the correlation coefficients among variables to examine the magnitude and direction of correlation. Correlation with absolute value over .85 is suggestive of high collinearity (Kline, 2005).

In the present study, the statistically significant correlation coefficients ranged from .016<sup>#</sup> to -.545<sup>\*\*\*</sup>, indicating no highly correlated variables. In bivariate associations, the number of chronic illnesses were negatively correlated with psychological/emotional functions ( $r = -.269, p < .001$ ), activity capacity for daily movement ( $r = -.337, p < .001$ ) and participation frequency ( $r = -.094, p < .001$ ).

In addition, three dimensions of disability had positive correlations each other. Psychological/emotional functions were positively correlated with activity capacity for daily movement ( $r = .537, p < .001$ ) and participation frequency ( $r = .399, p < .001$ ). Activity capacity for daily movement and participation frequency were positively correlated ( $r = .308, p < .001$ ).

The service-related environmental factors (i.e., accessibility and infrastructure) were positively correlated with three dimensions of disability. Accessibility was positively correlated with psychological/emotional functions ( $r = .077, p < .001$ ), activity capacity for daily movement ( $r = .055, p < .001$ ) and participation frequency ( $r = .073, p < .001$ ). Infrastructure also was positively correlated with psychological/emotional functions ( $r = .017, p < .10$ ), activity capacity for daily movement ( $r = .069, p < .001$ ) and participation frequency ( $r = .031, p < .001$ ). These findings indicate that better accessibility and more infrastructure will likely increase functioning of older adults in three aspects: psychological/emotional functions, activity capacity for daily movement, and participation frequency.

Table 10. Correlation Matrix of Variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. Male	1																	
2. Age	-.039***	1																
3. Education	.390***	-.232***	1															
4. Employed	.125***	-.199***	-.042***	1														
5. Monthly household equivalent income (Ln)	.104***	-.217***	.336***	.082***	1													
6. Presence of spouse	.418***	-.252***	.329***	.141***	.155***	1												
7. Household types <sup>a</sup>	.067***	-.001	.024*	.050***	-.345***	.142***	1											
8. Religion	-.162***	-.020*	.062***	-.045***	.086***	-.057***	-.045***	1										
9. Number of siblings and relatives	.01	-.192***	.136***	.081***	.135***	.108***	.013	.050***	1									
10. Number of friends and neighbors	.055***	-.145***	.182***	.075***	.151***	.078***	.033**	.054***	.374***	1								
11. Level of financial support	-.107***	.095***	-.086***	-.087***	.285***	-.087***	-.545***	.055***	.004	.01	1							
12. Self-reliance ratio	.006	-.047***	.150***	-.173***	.150***	-.029**	-.150***	.074***	-.022*	-.032**	.026**	1						
13. Chronic illnesses	-.195***	.097***	-.152***	-.131***	-.103***	-.152***	.016	.079***	-.092***	-.094***	.035***	.031**	1					
14. Accessibility	.018#	-.054***	.079***	-.053***	.040***	.003	.000	-.003	.031**	.046***	-.047***	.125***	.009	1				
15. Infrastructure	.020*	-.059***	.072***	-.105***	.044***	-.005	-.040***	.016#	.015	.015	-.003	.278***	-.002	.060***	1			
16. Psychological/emotional functions	.257***	-.348***	.460***	.174***	.316***	.282***	.056***	.069***	.210***	.270***	-.021*	.062***	-.269***	.077***	.017#	1		
17. Activity capacity	.298***	-.372***	.338***	.186***	.235***	.234***	.015	.008	.143***	.157***	-.058***	.079***	-.337***	.055***	.069***	.537***	1	
18. Participation frequency	.075***	-.259***	.327***	.049***	.256***	.163***	.042***	.097***	.184***	.286***	-.008	.030**	-.094***	.073***	.031***	.399***	.308***	1

Note. \*\*\* $p < .001$ , \*\* $p < .01$ , \* $p < .05$ , # $p < .10$

<sup>a</sup> Household types: 1=single and couple elderly households

## **5.3 Structural Equation Modeling for Multidimensional Disability**

To investigate the influence of health conditions and service-related environmental factors on multidimensional disability and the moderating effect of service-related environmental factors in the association between health conditions and the multidimensional disability, structural equation modeling (SEM) was employed. SEM is composed of a measurement model and a structural model. The measurement model is to confirm whether a concept (i.e., latent variable) is properly designed to fit the data (Bae, 2014, p. 8); a structural model is designed to analyze the relationships among the variables of interest (Bae, 2014, p. 8). If the model fit of measurement model is acceptable, a structural model can be analyzed in the next step. As such, SEM was performed by the two-step approach of the measurement and structural models (Anderson & Gerbing, 1988).

### **5.3.1 Measurement Model**

The measurement model was tested before the test of structural model to examine if the latent variables (i.e., psychological/emotional functions, activity capacity for daily movement, and participation frequency) were well estimated by corresponding manifest variables. The three latent variables and nine manifest variables were included in the measurement model (See Figure 8). The correlations among the three dimensions of disability are presented. Psychological/emotional functions were positively correlated with activity capacity ( $r = .848^{***}$ ); activity capacity was positively correlated with participation frequency ( $r = .333^{***}$ );

psychological/emotional functions and participation frequency were also positively correlated ( $r = .61^{***}$ ). The  $\chi^2$  value of the model was  $\chi^2_{(df=25)} = 1333.82$ , which was statistically significant at  $p < .001$  level. Typically, an insignificant  $\chi^2$  is desirable as it suggests no significant difference between the hypothesized model and the observed data (Rice, Ashby, & Slaney, 1998). However, as the  $\chi^2$  statistic is quite sensitive to sample size, and some of the underlying assumptions regarding the statistic may be invalid (Bentler, 1990), it is recommended to use  $\chi^2$  with other fit indices. Thus, in general, several fit indices are used together. In the present study, the fit indices such as IFI, CFI, and RMSEA were employed as well to examine model fit. The incremental indices showed acceptable model fit as IFI = .967 and CFI = .967. The absolute index RMSEA was .071. As it is less than the criteria .08, it indicates acceptable model fit. Model fit indices suggest that the measurement model is appropriate for the next step to the structural model analysis.

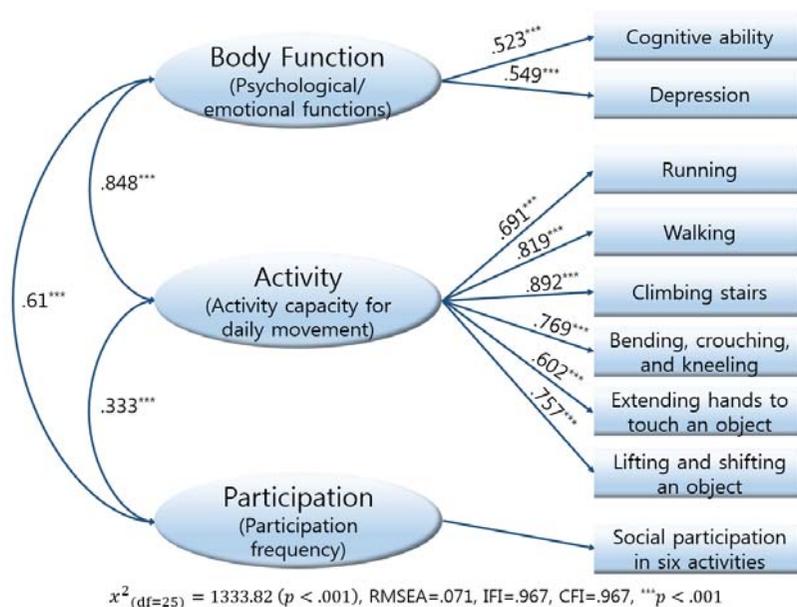


Figure 8. Test of Measurement Model

### 5.3.2 Structural Model

Given that the validity of measurement model was established, the test of structural model was conducted to test Research Hypotheses 1, 2, and 3. The model fit of structural model was displayed in Table 11. The model fit was acceptable,  $\chi^2_{(df=127)} = 4393.965$  ( $p < .001$ ), RMSEA = .057, IFI = .94, and CFI = .94. The undesirable  $\chi^2$  statistic, which was sensitive to sample size, was complemented by other fit indices such as RMSEA, IFI, and CFI. Thus, it can be assumed that the hypothesized model fits the data well.

Table 11. Model Fit of Structural Model

	Chi-square (df)	RMSEA	IFI	CFI
Model fit	4393.965 (127) ( $p < .001$ )	.057	.94	.94

The direct effect of chronic illnesses and service-related environments on the three dimensions of disability, and the moderating effects of the service-related environmental factors were examined simultaneously in one structural model in analysis. The SEM results are presented in Table 12.

Table 12. Path Coefficients of Structural Model

	Psychological/ emotional functions		Activity capacity for daily movement		Participation frequency	
	B	$\beta$	B	$\beta$	B	$\beta$
Chronic illnesses	-.327	-.222***	-.09	-.247***	-.014	-.031***
Accessibility	.246	.059***	.023	.023**	.05	.04***
Infrastructure	-.322	-.04***	.068	.034***	.006	.002
Chronic Illnesses ×Accessibility	.04	.018	.005	.009	.002	.002
Chronic Illnesses ×Infrastructure	-.067	-.015	.026	.024**	.025	.019*
Male	.593	.111***	.227	.171***	-.084	-.052***
Age	-.129	-.303***	-.031	-.291***	-.019	-.148***
Education	.908	.427***	.069	.132***	.135	.21***
Employed	.831	.146***	.137	.098***	.012	.007
Monthly household equivalent income (Ln)	.73	.188***	.07	.072***	.161	.137***
Presence of spouse	.261	.048***	-.034	-.025*	.04	.025*
Household types <sup>a</sup>	1.077	.185***	.075	.052***	.172	.098***
Religion	.499	.09***	.051	.037***	.099	.059***
Number of intimate siblings and relatives	.125	.062***	.011	.021*	.018	.03**
Number of intimate friends and neighbors	.275	.171***	.016	.039***	.09	.185***
Level of financial support from family members	.221	.104***	.009	.017	.02	.031**
Self-reliance ratio of local government	.009	.059***	.002	.05***	-.001	-.016 <sup>#</sup>

Note. All variables were mean-centered except the dependent variables.

$\chi^2_{(df=127)} = 4393.965$  ( $p < .001$ ). \*\*\* $p < .001$ , \*\* $p < .01$ , \* $p < .05$

<sup>a</sup> Household types: 1=single and couple elderly households

For the benefit of visual convenience, the results of each structural model for Research Question 1, 2, and 3 are separately shown in Figure 9, Figure 10, and Figure 11. In these figures of the structural model, only the results of major variables are shown. Significant coefficients are represented by solid lines, while insignificant coefficients are represented by dotted lines. Other controlled variables are presented with blurred lines.

**1) Research Question 1: *Do health conditions influence three dimensions of disability (i.e., body function, activity, and participation) among older adults?***

Figure 9 shows the significant paths for the association between chronic illnesses and the three dimensions of disability. Chronic illnesses and psychological/emotional functions were negatively associated ( $\beta = -.222, p < .001$ ). This indicates that those who had more chronic illnesses are likely to have lower level of cognitive ability and higher level of depression. Chronic illnesses were significantly associated with older adults' activity capacity. Older adults who had more chronic illnesses are more likely to have less activity capacity for their daily movement ( $\beta = -.247, p < .001$ ). The number of chronic illnesses were statistically a significant predictor to participation frequency of older adults. As predicted, older adults having greater numbers of chronic illnesses were less likely to engage in social participation ( $\beta = -.031, p < .001$ ).

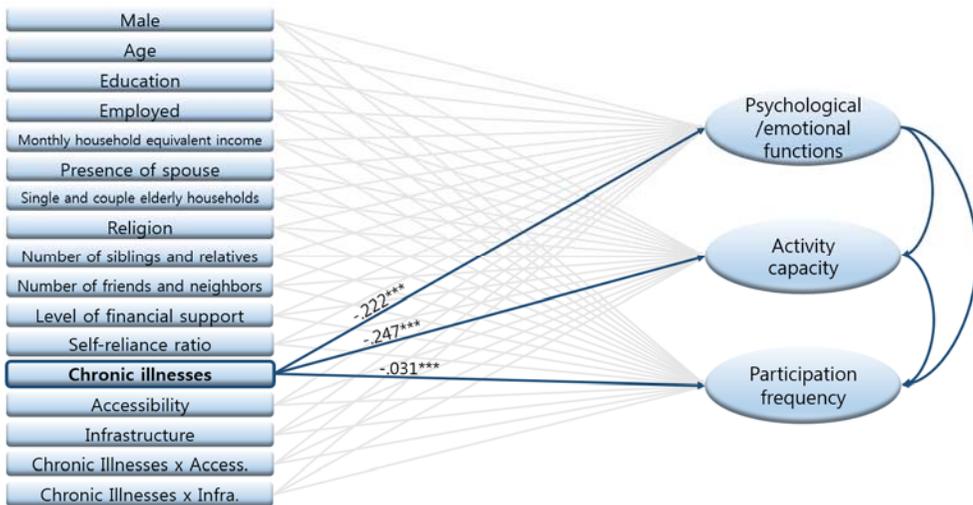


Figure 9. Structural Model for Research Question 1

**2) Research Question 2: Do service-related environmental factors (i.e., accessibility and infrastructure) influence three dimensions of disability (i.e., body function, activity, and participation) among older adults?**

Regarding the service-related environmental factors, while accessibility showed positive associations for all three dimensions of disability, infrastructure showed inconclusive associations with the three dimensions of disability (See Figure 10).

Accessibility was positively associated with older adults' psychological/emotional functions ( $\beta = .059, p < .001$ ), activity capacity for daily movement ( $\beta = .023, p = .009$ ), and participation frequency ( $\beta = .04, p < .001$ ). As the accessibility to the welfare facilities such as senior welfare centers and social welfare service centers were closer to where older adults lived, they had better cognitive ability and lower level of depression. Also, they had higher level of activity capacity

for daily movement and were more likely to participate in various social activities.

Infrastructure, on the other hand, had a positive association with older adults' activity capacity for daily movement ( $\beta = .034, p < .001$ ) as expected, but showed insignificant effect on participation frequency ( $\beta = .002, p = .788$ ). Furthermore, infrastructure was negatively associated with psychological/emotional functions ( $\beta = -.04, p < .001$ ). Older adult living in the area with a higher number of senior welfare centers and social welfare service centers tended to have higher activity capacity for daily movement, but was not related to the level of social participation. Moreover, it appears that living closer to senior welfare centers and social welfare service centers increases the level of psychological/emotional functions of older adults. However, the bivariate analysis result showed that infrastructure and psychological/emotional functions are positively related ( $r = .017, p < .10$ ). Thus, the infrastructure variable may reflect the high needs of older adults with decline in psychological/emotional functions when other variables were adjusted.

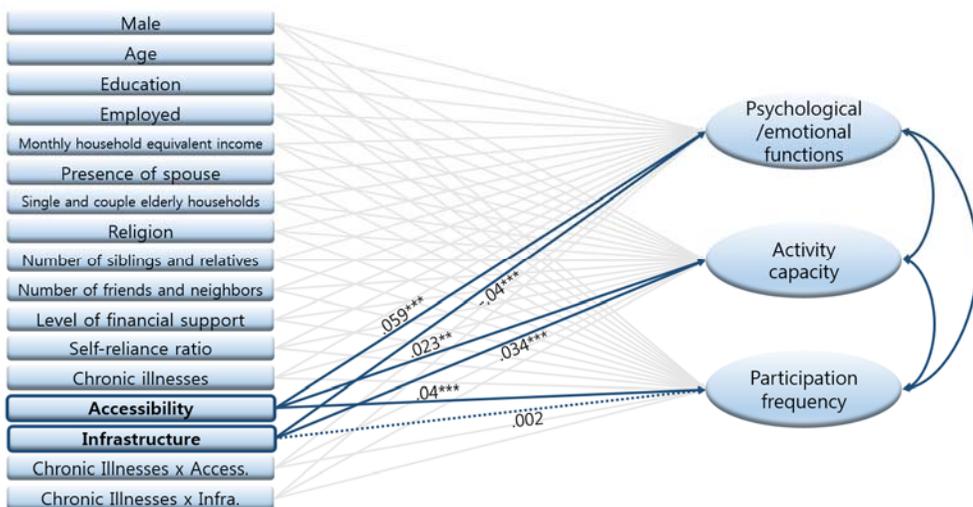


Figure 10. Structural Model for Research Question 2

**3) Research Question 3: *Do service-related environmental factors (i.e., accessibility and infrastructure) moderate the association between health conditions and three dimensions of disability (i.e., body function, activity, and participation) among older adults?***

To investigate the moderation effects of accessibility and infrastructure in the associations between (a) chronic illnesses and psychological/emotional functions, (b) chronic illnesses and activity capacity for daily movement, and (c) chronic illnesses and participation frequency, the cross product terms of Chronic Illnesses  $\times$  Accessibility and Chronic Illnesses  $\times$  Infrastructure were made. Figure 11 shows the significant moderating effect of the infrastructure.

Chronic Illnesses  $\times$  Accessibility was not significantly associated with psychological/emotional functions ( $\beta = .018, p=.125$ ), activity capacity for daily movement ( $\beta = .009, p=.268$ ), and participation frequency ( $\beta = .002, p=.785$ ). The results show that regardless of the accessibility to senior welfare centers and social welfare service centers, the effects of chronic illnesses on the three dimensions of disability among older adults were statistically identical.

As for the infrastructure factor, the Chronic Illnesses  $\times$  Infrastructure was significantly related to activity capacity for daily movement ( $\beta = .024, p=.006$ ) and to participation frequency ( $\beta = .019, p=.034$ ). Yet, the Chronic Illnesses  $\times$  Infrastructure was not significantly associated with the psychological/emotional functions ( $\beta = -.015, p=.191$ ). These results show that infrastructure played moderating roles. Although chronic illnesses negatively affect activity capacity of older adults, better infrastructure buffers this negative association. In addition, higher

infrastructure will lower the negative effect that chronic illnesses have on older adults' level of engagement in social activities. However, the influence of chronic illnesses on cognitive ability and level of depression among older adults does not differ by the level of infrastructure.

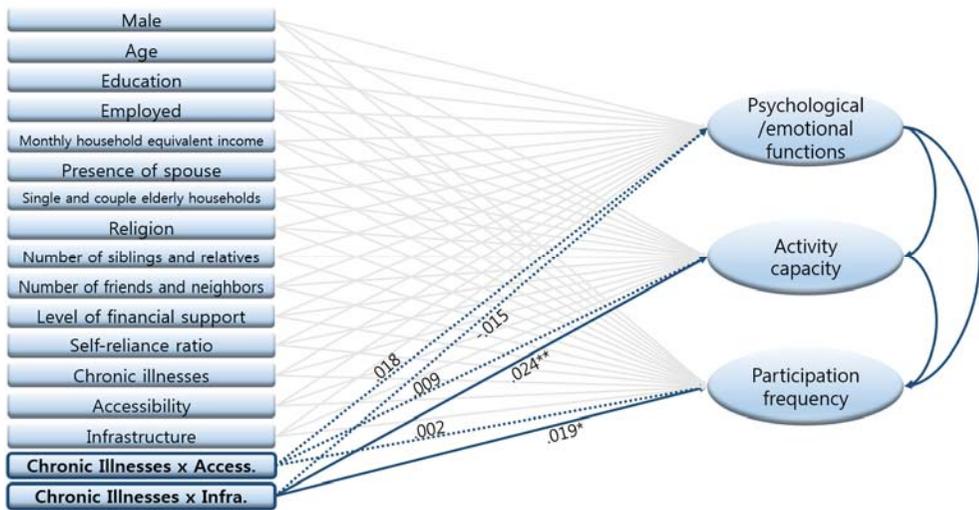


Figure 11. Structural Model for Research Question 3

To sum up, the finding showed that chronic illnesses significantly negatively affected older adults' psychological and emotional functions, activity capacity for daily movement and participation frequency. Of the two service-related environmental factors which were accessibility and infrastructure, shorter duration of time to reach the senior and social welfare service centers increased the level of psychological and emotional functions, activity capacity for daily movement, and participation frequency among older adults. However, the effects of infrastructure were inconsistent on the three dimensions of disability among older adults. Lastly,

the total number of senior and social welfare service centers moderated the negative influence of chronic illnesses on activity capacity and participation frequency, respectively. No moderating effect of infrastructure was detected in relation to psychological and emotional functions of older adults. Accessibility did not show significant moderation in the association between chronic illnesses and all three dimensions of disability among older adults.

# Chapter 6. Discussion

## 6.1 Summary of Findings

The purposes of this study were (a) to examine whether chronic illnesses influenced three dimensions of disability (i.e., psychological and emotional functions, activity capacity for daily movement, and participation frequency) among older adults, (b) to examine whether service-related environmental factors (i.e., accessibility and infrastructure) affected three dimensions of disability, and (c) to examine whether the service-related environmental factors (i.e., accessibility and infrastructure) moderated the association between chronic illness and each dimension of disability.

A total of 10,451 older adults with 65 years and older from the 2014 Survey of Living Conditions and Welfare Needs of Korean Older Persons (henceforth “the 2014 Survey”) were included. The 2014 Survey was used as the main data source, and two national data sources on welfare facilities as of 2014—the Ministry of Health and Welfare Statistical Year Book and the Current State of Elderly Welfare Facilities—released by the Ministry of Health and Welfare (2015a, 2015b) were used together to construct the infrastructure variable. The infrastructure variable was operationalized as the total number of senior welfare centers and social welfare service centers per ten thousand older adults in 16 metropolitan cities and provinces: Seoul, Busan, Daegu, Incheon, Gwangju, Daejeon, Ulsan, Gyeonggi, Gangwon,

Chungbuk, Chungnam, Jeonbuk, Jeonnam, Gyeongbuk, Gyeongnam, and Jeju. Sejong was included in Chungnam as of 2014. To calculate the ratio of the number of senior and social welfare service centers and to older adults, the number of centers was obtained from the national statistics data, and the number of older adults was collected from the resident population registered as of December 31, 2014 (Statistics Korea, 2015). Self-reliance ratio of 16 local governments was obtained from the Local Finance Integrated Open System ‘Local Finance 365’ operated by Ministry of the Interior. The remaining major factors (i.e., chronic illnesses, accessibility, cognitive ability and depression for psychological and emotional functions, activity capacity for daily movement, participation frequency, and the personal and social support and relationship variables) came from the 2014 Survey. The 2014 Survey data and several national statistics data were merged and used as the final data in this study. The research model was established upon the International Classification of Functioning, Disability and Health (ICF) framework, a useful conceptual scheme to explain the relationship between health and disability and the moderating roles of environmental factors in the development of disability. The results of Research Questions 1, 2, and 3 are summarized below.

- **Research Question 1: *Do health conditions influence three dimensions of disability (i.e., body function, activity, and participation) among older adults?***

Older adults’ health conditions significantly influenced all three dimensions of disability. As the number of chronic illnesses diagnosed by a doctor increased, the levels of psychological and emotional functions, activity capacity, and participation frequency tended to decrease. That is, as older adults had a greater number of chronic

illnesses, their level of cognitive ability decreased and depression increased. Also, they experienced more difficulty in their daily movements and engaged less in social activities.

**• Research Question 2: *Do service-related environmental factors (i.e., accessibility and infrastructure) influence three dimensions of disability (i.e., body function, activity, and participation) among older adults?***

The influence of service-related environmental factors on each of the three dimensions of disability was investigated. The service-related environmental factors consisted of accessibility and infrastructure. Accessibility was operationalized as duration of time required for older adults to reach senior welfare centers and social welfare service centers. Infrastructure was operationalized as the total number of senior welfare centers and social welfare service centers per ten thousand older adults in 16 metropolitan cities and provinces.

Of the two factors, accessibility was positively associated with psychological and emotional functions, activity capacity for daily movement, and participation frequency, as predicted. This finding indicated that a shorter duration of time to reach senior and social welfare service centers increased the level of psychological and emotional functions, activity capacity, and participation frequency in social activities among older adults. However, the effect of infrastructure on the three dimensions of disability yielded unexpected results. Infrastructure and older adults' activity capacity were positively associated, as predicted, which means that, in regions with more infrastructure, older adults, on average increased their level of activity capacity for daily movement. However, infrastructure did not have a significant influence on

participation frequency and was negatively associated with psychological and emotional functions among older adults.

**• Research Question 3: *Do service-related environmental factors (i.e., accessibility and infrastructure) moderate the association between health conditions and three dimensions of disability (i.e., body function, activity, and participation) among older adults?***

The moderating effects of the service-related environmental factors in the association between health conditions and the three dimensions of disability were investigated. The interaction terms of Chronic Illnesses  $\times$  Accessibility and Chronic Illnesses  $\times$  Infrastructure were created by multiplying chronic illnesses with accessibility and chronic illnesses with infrastructure. I then investigated their moderating effects in chronic illnesses' associations with psychological and emotional functions, activity capacity for daily movement, and participation frequency.

The findings showed moderating effects of infrastructure for the associations with activity capacity and participation frequency. This indicates that higher infrastructure tended to buffer the negative effects of chronic illnesses on older adults' activity capacity and participation frequency. Thus, older adults living in regions with a greater number of senior welfare centers and social welfare service centers tended to experience less decrease in their activity capacity and social participation influenced by the chronic illnesses they had. However, the infrastructure variable did not moderate the association between chronic illnesses and psychological and emotional functions among older adults. Whether the older adults lived in the regions

with a higher or lower number of senior and social welfare service centers did not mitigate the effect of chronic illness on their cognitive ability and level of depression.

Moderating effects of accessibility were not found in any of the associations between health conditions and the three dimensions of disability. That is, the influence of chronic illness on psychological and emotional functions, activity capacity, and participation frequency did not differ statistically regardless of the level of accessibility to the senior and social welfare service centers.

## **6.2 Discussion**

### **6.2.1 Health Conditions and Multidimensional Disability in Old Age**

The research findings showed that older adults' negative health conditions influenced their multidimensional disability. This result has two important meanings.

First, the number of chronic illnesses was found to be the important predictor of psychological and emotional functions, capacity for performing basic movements in daily life, and engagement in social activities among older adults. In old age, chronic illnesses are a common experience. The statistics also show that more than 89.7% of Korean older adults have at least one chronic illness (Ministry of Health and Welfare & KIHASA, 2014). Chronic illness can be mild compared to severe or fatal diseases but still can increase the death rate in the elderly population (Ministry of Health and Welfare, 2011). Thus, the impact of chronic illness should not be overlooked.

Especially in the elderly group, a voluminous body of literature has revealed

the negative significant association between the chronic illnesses and disability in old age. These previous studies confirmed that the presence, number, or severity of chronic illness led to a decline in their cognitive functioning, emotional health, physical strength, sensory problems, and participation frequency in social activities and an increase in their level of depression, anxiety, loneliness, solitude, bodily pain, difficulty in daily activities, and perceived participation restriction (e.g., Arnadottir et al., 2011; Choi & Yoo, 2011, Han & Kim, 2014; I. S. Jang, 2006; Lee, 2012; Verbrugge & Yang, 2002; Yu et al., 2015). These findings imply that chronic illnesses affect various aspects of older adults, such as physical, psychological, and emotional functions and ability and their actual involvement in their life. Although eliminating the occurrence of the onset of chronic illness in old age is unavoidable, reducing its impact on multiple dimensions of disability is possible. Thus, more research is needed on the ways to prevent outbreaks of chronic illness, to reduce its impact, and to maintain and promote older adults' health status.

Second, understanding the multidimensional characteristics of disability is important for older adults. Based on the literature review, the present study regarded disability in old age as having various aspects (Kim & Kim, 2009; Ko & Kim, 1996, p. 116; M. A. Lee, 2010) and WHO's ICF framework (WHO, 2001). In old age, disability caused by chronic illness does separately occur in one of these dimensions (e.g., physical, psychological, and emotional functions, activity capacity, or social participation). Due to aging and gradual deterioration of health, older adults live in circumstances wherein decline in energy, difficulties in mental health (e.g., solitude or anxiety), and loss of social roles are dynamically interrelated (Kim & Kim, 2009, p. 185). These experiences are depicted in the concept of multidimensional disability.

Thus, the present study attempted to reflect the multidimensionality of disability (i.e., psychological and emotional functions, activity capacity, and participation frequency) and their interrelationships. The findings showed that the three dimensions of disability studied here were positively correlated. Due to the cross-sectional data used in this study, the analysis was limited in testing a more complete conceptualization of disability in the model. Still, the multidimensionality of disability was theoretically reflected by constructing disability with body function, activity, and participation. This consideration of multidimensional disability contributes to a more comprehensive understanding of older adults' overall health.

## **6.2.2 Main Effects of Service-Related Environmental Factors**

### **1) Influence of Accessibility on Multidimensional Disability**

The findings showed that better accessibility positively affected all three disability dimensions among older adults. Previous studies have conceptualized accessibility using transport systems, information, geographic distance, and travel time; the present study conceptualized accessibility as the time it took the older adults to walk to the senior and social welfare service centers from their residence. Due to a decline in physical functions and retirement from work, older adults' activity areas narrowed, and consequently, they became more dependent on the neighborhood environment (H. S. Lee, 2011, p. 64). Because the neighborhood is the older adults' main activity area, living close to welfare facilities should contribute to improving their outcomes on multiple dimensions of disability. Additionally, the

distance between older adults' residence and community service centers is a significant factor for frequency of using the center and quality of life (Jirovec, 1984). Therefore, better accessibility should increase the use of service centers, which should increase physical activity and improve general health (H. S. Lee, 2011), contribute to reducing the feeling of solitude (Seo, 1994), and heighten their participation in their community. In another study on the relationship between perceptions of neighborhood user-friendliness and social participation (Richard et al., 2009), better accessibility to services showed a positive increase in older adults' participation. These findings are inconsistent with the present study's results.

Older adults have been found to have a great need for senior welfare centers (H. S. Lee, 2011), and such centers have been identified as a frequent visiting place for older adults (Kang & Lee, 1997; Lee & Lee, 2000). However, previous studies (e.g., H. S. Lee, 2011) revealed that these senior welfare centers and community centers are often located beyond walking distance for many older adults (H. S. Lee, 2011). The findings of this study empirically examined the positive effect of accessibility on older adults' multidimensional disability; thus, senior and social welfare service centers should be located closer to their user populations to have more impact on the three dimensions of disability outcomes.

## **2) Influence of Infrastructure on Multidimensional Disability**

The main effects of infrastructure on the three dimensions of disability were inconsistent in this study. First, an unexpected finding was that infrastructure was negatively associated with psychological and emotional functions among older

adults, which is inconsistent with findings from previous studies. Most previous studies saw a positive influence of infrastructure on older adults' psychological and emotional functions. They indicated that living in a poor neighborhood or in a region with low social and financial independence decreased health and depression and that using social welfare centers' programs and having social relationships with others improved the level of cognitive ability and depression level (Kim & Cho, 2008; Kim & Yoo, 2013; Yang et al., 2013a). Also, it has been found that older adults living in a region with a high elderly welfare budget demonstrated a lower likelihood of having depressive symptoms (Ko & Lee, 2012). Overall, the previous studies indicated a positive influence of infrastructure on psychological and emotional functions among older adults.

In the present study, this association was also significantly positive when other variables were not controlled. That is, a higher number of senior and social welfare service centers per ten thousand older adults increased the level of cognitive ability and decreased the level of depression among older adults in the region, indicating a consistent finding with the previous studies. However, when other factors were considered together, the association between infrastructure and psychological and emotional functions reversed. This reversal could be due to factors that share similar characteristics with infrastructure, or it could reflect the needs of older adults; the lack of clarity means that we should interpret the results with caution. In other words, in regions where older adults' need for welfare services was higher, more senior and social welfare service centers were established, but, due to an inconclusive association between infrastructure and psychological and emotional functions, more nuanced empirical analyses will be needed in future research.

Second, the infrastructure positively affected activity capacity for daily movement among older adults. This finding is inconsistent with Joung and Lee's (2015) study. In Joung and Lee's study, older adults' satisfaction with their physical environment, such as medical services, neighborhood environment, and transport system, increased their daily activity capacity. Although their study did not directly focus on welfare infrastructure, such as the numbers of senior and social welfare service centers, as in this study, quality of neighborhood, regional independence, and extent of infrastructure are interrelated. In addition, older adults' health is greatly influenced by their physical environment, as they have usually been exposed to their region of residence for a long time (Joung & Lee, 2015, p. 76). From these previous findings, we can infer that, in the present study, sufficient infrastructure contributed to older adults' activity capacity.

Third, the effect of infrastructure on participation frequency among older adults was found to be insignificant: They were positively associated but not statistically significant. Yet, when other factors were not considered, infrastructure and participation frequency showed a significant and positive association. Thus, the finding can be understood to mean that higher infrastructure is generally beneficial to increasing participation frequency among older adults. As senior and social welfare service centers provide older adults with opportunities to use various services and to improve social relationships and their health (Jang, 2003, p. 112), these centers should contribute to leading a healthy and meaningful life and escaping a feeling of loss or solitude (Hancock, 1990, p. 243). Thus, it is conceivable that infrastructure will be advantageous to older adults' social participation, but the findings revealed no significant influence of infrastructure. One possible

interpretation of this nonfinding might be that, even if senior and social welfare service centers provide programs and services for older adults, those services might only be accessible to those who live close enough and are healthy enough to visit the centers (Jang, 2003, p. 110). The lack of accessibility might be one of reasons for the nonsignificant influence of infrastructure in the present study. Another possible interpretation could be that the centers focus more on entertainment or hobbies than on professional physical and mental health services (Jang, 2003, p. 110). However, with cross-sectional data, it is inappropriate to make a firm conclusion, so future research is required to continue to investigate the association between infrastructure and participation frequency among older adults.

In summary, infrastructure can be understood in terms of availability, which refers to the adequacy of the supply of facilities for the users' volume and types of needs (Penchansky & Thomas, 1981, p. 128). Thus, it is expected that sufficient infrastructure would increase the level of psychological and emotional functions, activity capacity, and participation frequency among older adults because a better "fit" would be achieved between providers' characteristics and clients' expectations (Penchansky & Thomas, 1981, p. 139). However, the present analyses uncovered several unexpected findings. Further investigation is needed on the relationship between infrastructure and psychological and emotional functions and the relationship between infrastructure and participation frequency to find better explanations for the current findings.

### **6.2.3 Moderating Effects of Service-Related Environmental Factors**

Of the service-related environmental factors, moderating effects of infrastructure were found in chronic illnesses' associations with activity capacity for daily movement and participation frequency. No moderating effect of infrastructure was found in the association between chronic illness and psychological and emotional functions. Accessibility showed no significant moderation in any association. These findings are discussed below.

#### **1) Moderating Effect of Infrastructure in the Association between Health Conditions and Activity**

In the elderly group, the influence of chronic illness on activity capacity for daily movement differed by the level of infrastructure. In other words, those living in a region with a higher number of senior and social welfare service centers were likely to experience less negative effects of chronic illness on their capacity for basic activities, such as running, walking, climbing stairs, bending their body, and lifting or moving an objects. The moderating effect of infrastructure is presented in Figure 12.

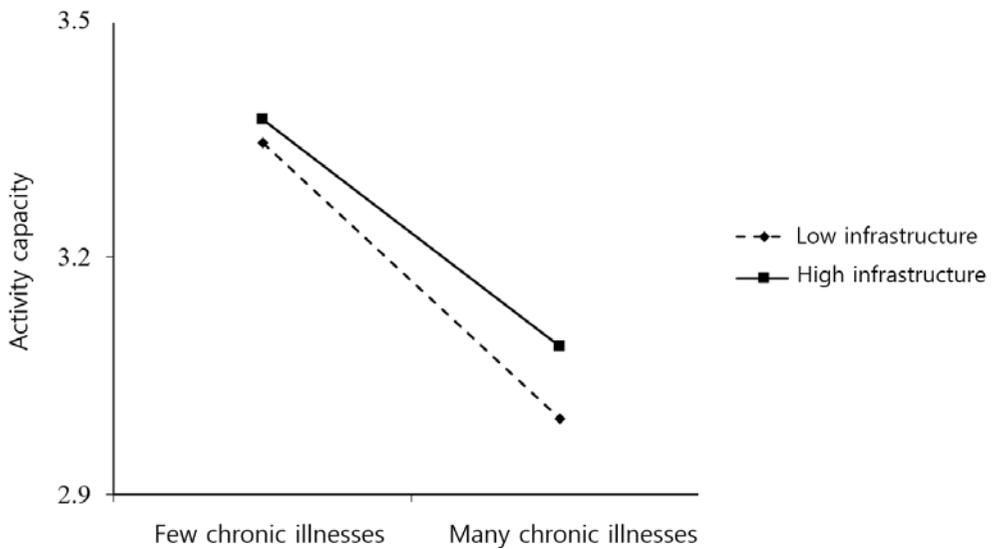


Figure 12. Moderating Effect of Infrastructure in the Chronic Illnesses–  
Activity Capacity Association

The total number of senior welfare centers and social welfare service centers per ten thousand older adults was analyzed as a supportive resource. Although the senior welfare centers are specialized for older adults and the social welfare service centers are open to every community resident, they both provide health-related programs and services with professional knowledge and skills (Park, 2010, p. 457). In particular, the senior welfare centers focus on older people’s health in their prevention, intervention, and promotion efforts (Ministry of Health and Welfare, 2016a, p. 90). These centers provide regular health checkups, counseling, and self-care programs for older adults to prevent the onset of illness, to help them maintain their current health status, or to intervene early when needed. For instance, when older adults experience activity and functioning limitations due to brain injury, dementia, or other chronic illnesses, the centers provide physical and exercise

therapy or refer them to hospitals if needed. In addition, as stipulated in the fifth clause of Article 34 in the Social Welfare Services Act, social welfare service centers provide services primarily to the more vulnerable groups, such as older adults, people with disabilities, or others in need (National Law Information Center, 2016c). Although specific services and programs can differ across regions because they are established according to the demands of the community residents, social welfare service centers generally provide regular health checkups or health-promotion programs for older adults. Thus, older adults who live in regions with higher infrastructure will have more opportunities to have contact with the senior and social welfare service centers. In turn, using these services and having a relationship with others should directly and indirectly decrease the negative effect of chronic illness on their activity capacity.

As chronic illnesses in old age are not a target for complete treatment but for support of resources and adaptation, the sufficient infrastructure should help reduce the negative impact of chronic illness. Although people often face new illnesses in old age (Kim, 2014, p. 163), once older adults have a chronic illness, it is difficult to cure and continuously exerts a negative effect on their activity ability. Thus, chronic illness can be a major stressor for older adults. However, as Pearlin, Mullan, Semple, & Skaff (1990) stress process model illustrated, not every person experiences identical pressure from the same stressor, and the moderating factors tend to make the difference in a person's ability to cope adaptively. Thus, the present findings suggest that higher infrastructure should buffer the negative influence of chronic illness on older adults' activity capacity for daily movement.

## 2) Moderating Effect of Infrastructure in the Association between Health Conditions and Participation

The findings revealed that the number of senior welfare centers and social welfare service centers moderated the relationship between chronic illness and social participation among older adults. In other words, as the number of chronic illnesses increased, the older adults living in the regions with higher infrastructure experienced a less negative effect of chronic illness on participation frequency compared to the older adults living in regions with lower infrastructure. The moderating effect of infrastructure is presented in Figure 13.

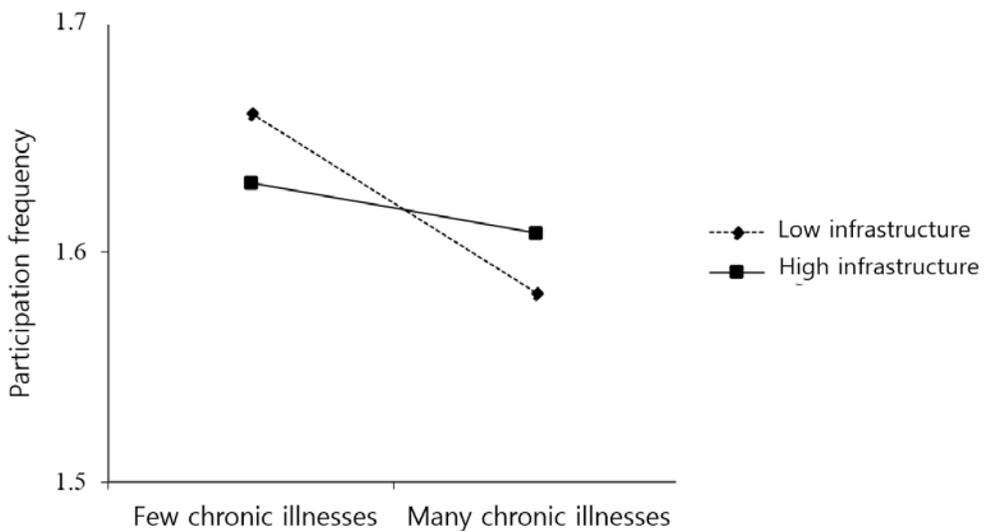


Figure 13. Moderating Effect of Infrastructure in the Chronic Illnesses–  
Participation Frequency Association

In old age, especially after their retirement, older adults should make an extra effort to find and meet other people if they wish to build new social relationships. However, it is not as easy for them to establish new social networks and emotional bonding as it is for younger adults (Park & Kang, 2008, p. 717) because older adults are less exposed to opportunities to meet people, and they tend to engage less in social activities. Moreover, their deteriorated health conditions and functional decline might hinder their social participation (Adams, Sanders, & Auth, 2004). However, social participation in old age enhances happiness (Menec, 2003) and life satisfaction (Levasseur, Richard, Gauvin, & Raymond, 2010), maintains successful aging (Rowe & Kahn, 1997), and prolongs life expectancy (Berkman, 1995). Active participation in activities even contributes to society in that older adults can provide their wisdom and knowledge through social activity (Hur, 2014, p. 236). To support active and healthy life in old age, the Korean government has implemented the National Support Project for Senior Job Placement and Social Activity since 2004 (Ministry of Health and Welfare, 2016b). Chronic illness in old age is degenerative, meaning that it develops naturally as people age; thus, having at least one or two chronic illnesses is common in old age (Ministry of Health and Welfare & KIHASA, 2014). The negative effect of chronic illnesses on participation among older adults was examined empirically in the present study and is supported by several previous studies (e.g., Arnadottir et al., 2011; Fairhall et al., 2011). Thus, it is more important to identify protective factors that buffer the negative impact of chronic illness on social participation.

For older adults with low mobility, their “neighborhood” consists not only of the surrounding physical area but also of the emotional and social areas in which

they feel sense of belonging and attachment to their community (Yi, 2008; as cited in H. S. Lee, 2011, p. 64). The neighborhood is a space where older adults conduct their everyday life; community facilities are generally placed close by to provide services and hold social activities (Ahn, 2001). Among many community facilities, welfare centers are either free or require a nominal fee and, thus, are affordable and open equally to every elderly resident. Both senior and social welfare service centers provide programs and services related to health, such as social activities (e.g., sports dance, table tennis, and billiards) and health management initiatives (e.g., physical therapy, acupuncture, and strength training; Kim, Park, et al., 2010). Using these health-promotion or health-maintenance programs should help reduce the level of or the pain from their chronic illness or illnesses. Also, older adults' use of services or programs increases their frequency of using their physical and cognitive functioning and provides opportunities to interact with others; all of these outcomes could help lessen the negative association between chronic illnesses and social-participation frequency. A similar interpretation was given in a previous study: For older adults with a disability, simply visiting a welfare center stimulated their desire to participate in programs and helped them overcome their negative emotions (Yang, Park, & Park, 2013).

Senior and social welfare service centers function similarly to most available community resources for older adults, compared to other community facilities for profit. Additionally, they have various programs and services that can prevent, maintain, and improve the health status of older adults and facilitate positive relationships with other neighbors. These characteristics of the senior and social welfare service centers should help explain the buffering effects in the association

between chronic illnesses and participation frequency among older adults.

### **3) No Moderating Effect of Infrastructure in the Association between Health Conditions and Body Function**

The findings showed that infrastructure did not moderate the association between chronic illness and psychological and emotional functions (i.e., cognitive ability and depression) among older adults. This result indicates that, regardless of the number of senior welfare centers and social welfare service centers, the negative impact of chronic illnesses was identically influential in psychological and emotional functions among older adults.

One of the possible interpretations of the nonsignificant moderating effect could be how the psychological and emotional functions were operationalized in this study. Cognitive ability was measured by the MMSE-DS (Korean version of Mini-Mental State Examination for Dementia Screening; Kim, Jhoo, et al., 2010), which consists of items such as time and place orientation, memory registration, and attention and calculation. These items indicate a more determined status of cognitive ability among older adults. Depression was measured by the SGDS (Short Form of Geriatric Depression Scale; Sheikh & Yesavage, 1986), which uses items that ask about depressed feeling, a sense of worthlessness, and energy level, among other indicators. Given that depression is a mood, it can change at any time, but it is known that depression occurs commonly in old age (Koenig & Blazer, 1996). Thus, cognitive decline and level of depression might vary less for older adults affected by these issues.

Advancing age is a risk factor for cognitive decline (Park, 2011, p. 185; Zelinski & Gilewski, 2003). Although some previous studies have mentioned that appropriate stimulus and participation in repetitive activities and exercise can improve cognitive function (Choi et al., 2014; Ji, Choi, Cho, & Ju, 2004), because cognitive decline is highly likely lead to onset of dementia (H. J. Lee, 2013, p. 345), restoring cognitive function to difficulty-free status is not easy. Thus, cognitive decline in old age is usually perceived as an important social issue (Choi, 2006, p. 119).

Older adults' depression is associated with social, economic, and functional decline and has a tendency to be chronic (Jeon & Kahng, 2009; Kim, 2001). Depression refers to a wide range of feelings, from simple sadness and depressive mood to continuous worthlessness (Beck, 1967). However, because chronic illnesses, subjective health status, physical health (Hwang, 2008; Kang & Chung, 2008; Kang & Kim, 2000), and economic difficulty are risk factors of depression in old age, older adults are more likely to suffer from depression, and the condition is more serious than it is for other age groups (Choi, 2006, p. 119). One third of older adults in Korea report having depressive symptoms, which suggests that depression is highly prevalent in old age (Ministry of Health and Welfare & KIHASA, 2014). Unfortunately, older adults' depression is not easily detected because depression at this life stage is frequently regarded as a natural aging phenomenon, and older adults are often reluctant to seek treatment (Choi, 2006, p. 119; Lee & Ko, 2009). Unfortunately, neglecting treatment makes it more difficult to improve one's depressed condition (Switzer et al., 2006).

In this respect, older adults' cognitive ability in general and the level of depression in this study in particular are relatively stable; for this reason, the

interaction between chronic illness and the level or use of infrastructure might not have interacted to increase the level of psychological and emotional functions.

With great caution, this nonsignificant moderation effect by infrastructure can be discussed in terms of the likelihood of fit between the content of social programs and services and the cognitive ability and depression level of older adults. Some possible reasons could be the stable characteristics of cognitive ability and depression level, a gap between older adults' needs and available programs and services, and a greater need for public health assistance. The first reason is discussed above. The second explanation can be investigated further by a need survey for older adults. As for the third possible reason, in effect, older adults' cognitive ability and depression level are one of national agendas in the National Health Plan 2020 (hereinafter "HP2020"; Ministry of Health and Welfare, 2011). In the HP2020, how elderly people's cognitive and mental health can be addressed preventatively, maintained as is, and improved are the main themes for the older-adult cohorts in the country. Korea's health promotion plan is designed from a public health and medical point of view, and thus, the main organizations in charge of implementing the policy are public health centers, regionally based hospitals, and community-based mental health centers. This may be a possible reason that the moderating effect of infrastructure in the association between chronic illnesses and psychological and emotional functions was not found in this study. However, these assumptions should be made with caution because the empirical findings do not support a conclusion one way or the other. In addition, from a practical point of view, because the older-adult population will continue to increase, the current medical infrastructure will need to expand. A high demand for senior and social welfare service centers should also be

expected. Because these centers function as a professional service provider, especially for the older adults having social and economic difficulties or health-related problems, their roles should not be minimized. If older adults' cognitive ability and depression can be assessed accurately, the senior and social welfare service centers will be able to positively affect the level of their psychological and emotional functions (Kim, Kim, & Kim, 2005).

Although a moderating effect of infrastructure was not found in this study, it is essential that future research investigate this variable while considering the possible explanations discussed above. Older adults' cognitive ability is an influential predictor of dementia (Jun, 2015; Lee & Kahng, 2011, p. 180), and depression is a commonly studied factor due to its continuous increase in old age. Thus, it is necessary to continue examining infrastructure's moderating role in the association between chronic illnesses and psychological and emotional functions.

#### **4) No Moderating Effect of Accessibility in the Association between Health Conditions and all Three Dimensions of Disability**

In this study, accessibility was conceptualized as duration of walking time to arrive at the welfare service centers. Accessibility did not significantly moderate any of the associations between health conditions and the three aspects of disability. This nonfinding indicates that the negative influence of chronic illnesses on psychological and emotional functions, activity capacity for daily movement, and participation frequency did not vary by the time spent to reach the senior and social welfare service centers. Therefore, in this study, the senior and social welfare service centers did not

seem to act as a buffer in the studied relationships.

Older adults may have other ways of arriving at senior and social welfare service centers than by walking, and their use of such modes of transportation could have nullified the moderating effects of accessibility. It is not easy to define an appropriate walking distance for older adults, but according to prior studies, older adults perceive approximately 7 to 10 minutes on foot as a desirable walking distance for the day (H. S. Lee, 2011, p. 63; Lee, Lee, & You, 2015, pp. 12-13). In H. S. Lee's study (2011, pp. 69-70), the older-adult users of senior welfare centers reported that it took approximately 13.37 minutes to walk to the nearest senior welfare center, and most participants reported this distance as too far. These studies indicate that, if the travel distance is more than 10 minutes, it is highly likely that older adults will find it difficult to visit the centers on foot.

Of the total older adults in the present study, 60.4% reported that it took over 30 minutes on foot to get to the senior and social welfare service centers. About 30% responded that they needed between 10 and 30 minutes to walk to the centers. For 8.8% of them, it took between 5 and 10 minutes, and for just 1.1% of the participants, it took less than 5 minutes to arrive by foot. These figures reveal that only 9.9% of the study sample resided within the 7- to 10-minute limit (for one walk) identified in previous research (H. S. Lee, 2011, p. 63; Lee et al., 2015, pp. 12-13). When the older participants' average age (74.01 years old) and their health status are considered, it is not easy for them to use the centers if they have to walk. Thus, it is conceivable that the older adults living more than 10 minutes away might have found transportation to the center, such as by car or public transportation. That is, because using vehicles extends older adults' acceptable travel distance, the travel time itself

might not be a critical moderating factor for the association between chronic illness and the three dimensions of disability.

Although no moderating effect of accessibility in the association between chronic illnesses and three dimensions of disability was found, duration of arrival does seem to be a critical factor how accessible older adults perceive their local service centers to be and which influences older adults' judgement to use them. With the limitations existed in measuring accessibility, the conclusion of the present study should be with great caution and better measure of accessibility are needed in future research.

### **6.3 Implications**

The findings revealed that older adults who had greater numbers of chronic illnesses experienced lower levels of psychological and emotional functions, activity capacity for daily movement, and participation in social activities. Next, more favorable accessibility to senior and social welfare service centers increased the level of psychological and emotional functions, activity capacity for daily movement, and participation in social activities among older adults. However, although higher infrastructure was positively associated with the activity capacity of older adults, it was not significantly associated with participation frequency. Also, older adults living in higher infrastructure tended to have lower levels of psychological and emotional functions. Finally, of the two service-related environmental factors (i.e., accessibility and infrastructure), significant moderating effects were found for infrastructure. Specifically, infrastructure moderated chronic illnesses' effects on

activity capacity and participation frequency among older adults. Based on these findings, theoretical, policy, and practical implications are discussed.

### **6.3.1 Theoretical Implications**

The present study contributes to modifying the paradigm of health and disability at older ages by applying the ICF conceptual framework to older adults. By acknowledging that every human being can experience a decrement in health and, thereby, experience a disability, the ICF mainstreams the experience of disability and recognizes it as a universal human experience (WHO, 2002, p. 3). This view justifies using the ICF to explain late-life-onset disabilities. The present study reveals health and environmental factors as predictors of multidimensional disability and environmental factors as having moderating effects in the relationship between health and multidimensional disability. These findings will help illustrate disability profiles and the mechanisms of disability onset in older age.

This study applied the ICF framework of health and disability to Korean older adults. Because the ICF was developed from a disability model called the International Classification of Impairment, Disability and Handicaps (ICIDH) (WHO, 1980), many previous studies have used the ICF framework to study disabilities (Campbell & Crews, 2001; Jung, 2002; Shin & Park, 2010). Although the main target of the ICIDH has been individuals with disabilities, the ICF expands its target group to every human being (WHO, 2002, p. 3). This expansion of perspective provides a theoretical groundwork for applying the ICF framework to older adults, which is important because health and disability are especially pertinent

issues for this population. Beyond the direct association between health conditions and disability, the ICF includes environmental factors that buffer the negative effect of health conditions on disability.

In addition, by constructing disability with three dimensions, the present study attempted to reflect the multifaceted characteristics of disability emphasized in the ICF. This attempt develops the field's understanding of disability in old age because previous studies on older adults have only partially measured the disability construct (e.g., Fairhall et al., 2001; Yu et al., 2015). Although the cross-sectional data used in the present study have some drawbacks, I used a test of measurement model and bivariate analysis to examine the possibility of mutual influences among the three disability dimensions. Furthermore, the findings on the moderating effect of infrastructure and the multidimensionality of disability have important theoretical implications in that they show that the ICF is a useful model for explaining older adults' disability in a Korean context.

Scholars have given rich explanations of disability in older age. In particular, disability in old age can be classified as late-life-onset disabilities and early-onset disabilities; the former refers to a disability that begins during old age, usually due to a geriatric disorder, and the latter refers to people with a childhood-onset disability who have become old (Putnam, 2007; Roh, 2007; Verbrugge & Yang, 2002). The timing of the onset of a disability is important. People whose disability begins in childhood live with that condition throughout their lives, whereas people with a late-onset disability experience the change suddenly (in old age) or gradually (from adulthood into old age). Thus, these populations can have quite different experiences with and feelings toward disability (Verbrugge & Yang, 2002, p. 263).

In Korea, mainly due to the Welfare of Disabled Persons Act's definition of registered disabilities (National Law Information Center, 2015), disabilities in old age are generally perceived as late-life-onset disabilities (e.g., Jang, 2014; Paik & Roh, 2009; 2012). The policy defines a *registered disability* as a physical or psychological impairment, which is a restrictive definition that only explains part of the phenomenon. However, because of extended life expectancy, more attention to disability in later life is required. When the focal group is changed to older adults, the perspective on disability should be changed as well. To this end, this study focused on late-life-onset disabilities, which was conceived as a dynamic interaction between health conditions and contextual factors (WHO, 2001, p. 8). The findings of this study expands the field's knowledge of disability at older ages theoretically and empirically by examining the relevant factors on disability.

Another contribution of this study is that it investigated infrastructure as an important moderator in the association between health and disability among older adults. This analysis is useful because it indicates how disability at older ages can be reduced or delayed. Disability is not purely the result of some physical or mental impairment but rather of the fit of such impairments with the social, attitudinal, architectural, medical, economic, and political environments (Zola, 2005, p. 1). Thus, older adults will experience various dimensions of disability if their environments function as barriers and are not supportive of their health conditions. In the present study, significant moderating effects were found in infrastructure (i.e., the total number of senior and social welfare service centers per ten thousand older adults). For older adults living in a region with higher senior and social welfare service centers, the negative influence of their chronic illnesses on their activity capacity

was less than for those living in a region with low infrastructure. A moderating effect of infrastructure was also found in the association between the chronic illnesses and their social participation. These results add to the theoretical knowledge on the significant role of environmental factors, especially the roles of senior welfare centers and social welfare service centers. Older adults have a greater possibility of suffering from chronic illness, but environmental factors can help alleviate their negative health conditions for multiple dimensions of disability.

In sum, disability at older ages should be construed in a broad sense and should include multiple dimensions, such as impairments, activity limitation, and participation restriction. More environmental factors that are immediate and far from older adults should be examined to better understand if they moderate the relationship between chronic illnesses and disability for this age group.

### **6.3.2 Implications for Social Welfare Policies**

The research findings and the perspective of the ICF framework on health and disability at older ages implies that multifaceted approaches are required in social welfare policies and systems to address health and disability issues among older adults.

First, preventing chronic illnesses and promoting health among older adults should be in the focus of social welfare policy. In the present study, chronic illnesses were found to significantly predict all three dimensions of disability (i.e., psychological and emotional impairments, activity limitation, and participation restriction). Chronic illnesses can generate slowly and, thus, some illnesses might

seem moderate and manageable, but illnesses such as cancer, high blood pressure, and arthritis are likely to continuously worsen, heavily burden the individual and family, and significantly reduce expected lifespan (Ministry of Health and Welfare, 2011, p. 78). Recently, the aging population, changes in lifestyles, and environmental aggravation have increased the incidence rate of chronic illnesses (Ministry of Health and Welfare, 2011, p. 72). It is urgent to find ways to prevent or delay the onset of chronic illnesses and to promote health among older people.

In Korea, the National Health Plan 2020 (henceforth “HP2020”) (Ministry of Health and Welfare, 2011, p. 1) was established based on the National Health Promotion Law in 1995 (National Law Information Center, 2016a). HP2020 acts as a national health promotion plan that aims to enhance the health of individuals through health education, disease prevention, nutrition improvement, and encouragement of healthy lifestyles. HP2020 primarily focuses on establishing an effective health management system among older adults with chronic illnesses to prepare them for the present and the future (Ministry of Health and Welfare, 2011, p. 77). In particular, older adults are encouraged to receive regular health checkups, to manage stress, and to exercise their body and mind.

Other than professional health care centers (e.g., hospitals or public health centers), community centers (e.g., senior and social welfare service centers) perform important functions, including health prevention, maintenance, and promotion. Because these centers are located in the community, they play a significant role in implementing health prevention and promotion programs for older adults. The systems for financial support for the community centers are required and evaluation and monitoring of the community centers should be implemented to maintain and

improve the quality of health promotion programs. In addition, older adults' health conditions are not able to be managed by one sector such as hospitals or public health centers; thus, social welfare and health systems should be connected with the medical sector so that older adults' health status can be tracked, analyzed, and addressed early by social welfare and health care services.

Second, older adults' disabilities should be reconsidered in policy. This study treated disability as a multidimensional, relational concept. Korea's disability evaluation system defines disability as a physical or psychological impairment, which limits the construct to body functioning. Only older adults that fit into the government's registered disability categories are eligible for disability services in Korea. For example, services for people with a disability and services for older adults are provided in two different sectors. If a person wants a disability service, he or she must be officially evaluated as having a registered disability. In the older-adult welfare sector, the word *disability* is not often used. Instead, the terms *activities of daily living* (ADLs) and *instrumental activities of daily living* are used in long-term care service for older adults to represent older adults' level of disability in their daily lives. Just as with disability services, to receive a long-term care service, an older adult must be found eligible (in this case, as evaluated via ADLs and IADLs). Likewise, older adults do not have access to government-provided assistive devices, descriptive video,<sup>12</sup> and other products and services if they are not enrolled as a

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<sup>12</sup> Descriptive video is the art of enhancing audio-visual content by inserting verbal descriptions where circumstances permit it, for example, between dialogues. These inserted descriptions translate relevant visual information so that an individual who is blind or has low vision can assess, enjoy, and understand audio-visual entertainment as a sighted person (Chapdelaine, 2013).

person with a registered disability. Regarding the participation aspect of disability, job placement and social activity support services are available for older adults and people with disabilities, but these services also have their own policies,<sup>13</sup> programs, and eligibility criteria.

It is conceivable that the restrictive understanding of disability in old age has greatly impacted the fragmentary services and systems in Korea. This disadvantageous situation will negatively affect all three disability dimensions among older adults. Thus, it is important for policy makers to broaden their views of disability in old age. Integrating services for people with disabilities and for older adults is complex, and a complete discussion of this issue is beyond the scope of this study. However, the current services for older adults are disconnected and narrow in terms of service type. If policy makers use a multidimensional definition of disability in old age, they could design and construct more comprehensive health-and disability-related services and systems.

It is true that disability services are not linked with aging in Korea (Paik & Roh, 2009, p. 99). However, policy makers should make efforts to better understand the associations between disability, aging, and health. At the very least, people who have a late-life-onset disability should be able to receive welfare services. In 2015, the Act on the Right to Health and Medical Accessibility for People with Disabilities (National Law Information Center, 2015) was established to assure people's right to

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<sup>13</sup> The services for people with a disability are based on the Welfare of Disabled Persons Act (National Law Information Center, 2015), whereas the services for older adults are based on the Elderly Welfare Act (National Law Information Center, 2016b) and the Act for Low Fertility and Population Aging (National Law Information Center, 2014).

health and access to medical services and to establish a health management system for people with disabilities. This policy on disability reflects the multidimensional aspect of disability. Legislation for the aging population needs to adopt this multidimensional conceptualization to better meet the various needs of older adults.

Third, systematic planning is needed to ensure an equal distribution of infrastructure. The study found out that the senior and social welfare service centers not only directly affected the participants' activity capacity for daily movement but also acted as a resource by reducing the negative effects of chronic illnesses on older adults' activity capacity and social participation. The senior and social welfare service centers provide professional services such as exercise programs, counseling, basic medical treatment, cultural programs, and education and employment programs. Additionally, older adults can establish social networks by using these centers. The services and social support both act to reduce the negative effects of disability on a person's daily life. However, despite these important roles, the senior and social welfare service centers for older community residents in Korea were mandated from the central government, but, due to poor planning, they were not distributed in a regionally balanced way (Kim, 2013, p. 190). In 2016, the Ministry of Health and Welfare (2016a, p. 87) announced that at least one senior welfare center should be established in every city and town based on the number of older adults and the regional area (*Si, Gun and Gu*, in Korean). Also, for those living far from the regional senior welfare center, the government plans to establish satellite offices or branch service centers that are more accessible (Ministry of Health and Welfare, 2016a, p. 89). Older adults are potentially a high-demand population for the welfare facilities in each region, and the baby boomer generation (in Korea, those

born between 1955 and 1963) is about to join the older population. Thus, it seems reasonable to devise a scheme to arrange welfare facilities by the number of older adults in the area, in accordance with the needs of the region, and at an appropriate distance for the majority of the user base (Kang & Yoon, 2007, p. 374). The establishment rate of senior welfare facilities is acutely influenced by the level of financial self-sufficiency of the local governments and the direction of the regional development plan; therefore, policy for senior and social welfare facilities requires multidimensional approaches by each region (Kim, 2013, p. 189).

Fourth, local officials should ensure that people have access to senior and social welfare service centers. The duration of time required to arrive at the senior and social welfare services centers was found to be an important predictor of all three dimensions of disability (i.e., psychological and emotional functions, activity capacity, and participation frequency). The shorter the duration of time, the better older adults fared on the three dimensions of disability. Due to their health status, older adults tend to be less active and to travel shorter distances than do younger individuals (Lee et al., 2015, pp. 2, 5).<sup>14</sup> Thus, it is far more important to establish senior and social welfare service centers within walking distance for older adults.

In sum, government efforts are required to lessen the impact of chronic illness on disability onset among older adults. Creating coalitions between aging and disability policies (Campbell, 1996) and expanding the total number of senior and social welfare services in all regions of the country are recommended.

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<sup>14</sup> For reference, the average area of neighborhood perceived by older adults aged 61 and over was 23.7  $m^2$  (unit = ten thousand), and the average area perceived by people under 20 years old was 75  $m^2$  (unit = ten thousand) (Kim, 2006).

### **6.3.3 Implications for Social Work Practice**

The present findings show that, for social work practice, a comprehensive approach is necessary in dealing with health and disability issues among older adults. This study addressed the gap in empirical testing of the multidimensional approach, and the findings suggest where to intervene, how to intervene, and the usefulness of the ICF framework in the real world to enhance the health status of older adults and to minimize their negative experience with disability.

For older adults, intervention in their health conditions is an important area of focus for social workers. In practice, health and disability issues among the older-adult population should be considered in the spectrum of the medical model to the social model of disability. In theory, individualistic and environmental approaches can be explained as contradictory; however, in practice, every biopsychosocial aspect is an important practical area that should be assessed and considered comprehensively within an integrated service approach (Heikkinen, 2003, p. 12; Kim, 2016, p. 10).

Australia's case provides a clue as to how the social and medical models can be harmonized in intervention services. Wellness approaches are increasingly preferred throughout the health and disability service sectors in Australia (Breen, Green, Roarty, & Saggars, 2008, p. 173). These approaches are based on the social model of disability and emerged as a response to the people's increasing dissatisfaction with the existing medical model. The key characteristics of wellness approaches include a focus on holistic functioning and a holistic definition of health; shared control between user and practitioner; individualized support, therapy, and intervention

services; use of multidisciplinary teams consisting of practitioners from various health and allied health disciplines; provision of support from a community-based rather than hospital or medical setting; and advocacy or the politicization of health (Breen et al., 2008, p. 175). These approaches emphasize the influence of health conditions on the partnership between a user and a practitioner, individualization in intervention, the role of community, and the advocacy and empowerment of users. It seems very likely that wellness approaches would have characteristics similar to those of the ICF in the sense that, although wellness approaches draw upon the social model of disability, they do not minimize the impact of impairment or illness.

Second, disability at older ages needs to be assessed from the multidimensional point of view. Due to the classifications of registered disabilities in the Welfare of Disabled Persons Act (National Law Information Center, 2015) and ADLs and IADLs in the Long-Term Care Insurance system, older adults are only considered to have a disability within a narrow definition of physical and psychological conditions. However, older adults can experience all or parts of multiple dimensions of a disability and might want services for one specific dimension even though they have difficulties in other domains. Thus, just as WHO (2001) illustrated disability from a biological, individual, and social perspective, a coherent view of different perspectives of disability should be adopted in social work practice. The ICF framework not only explains the concepts of the components but also provides assessment scales (called ICF core sets) and manuals for use; thus, the framework will help practitioners understand the expanded concept of disability and how they can apply it to their older-adult users.

Third, the finding of the significant moderating effect of infrastructure informs

intervention services. In particular, the findings showed that the total numbers of senior welfare and social welfare centers were the key protective factors in reducing and alleviating disability in older age. Expanding this service infrastructure and distributing the centers equally in each region will be the focus of social welfare policy; in the practice setting, increasing the utilization of senior and social welfare service centers among older adults in communities will be the main concern.

The senior welfare and social welfare service centers generally provide programs and services related to older adults' health, such as physical therapy, acupuncture, exercise class, health-related counseling and education, and even disease-specific personalized programs. These programs will help older adults cope with their chronic illnesses, which, consequently, should have less impact on their activity capacity. In addition, using these programs, meeting people, going out and walking even a short distance, or using their bodies will directly and indirectly affect their chronic illnesses positively. Moreover, increased use of the centers should lead to a decline in the negative impact of their chronic illnesses on their activity capacity and social participation. Therefore, to give older adults greater opportunity to use the service centers, the centers should manage the older adults in community systematically. Specifically, the centers identify the characteristics and residences of the older adults in their community and find various ways to invite them into the centers, such as by developing health programs that are targeted to the local older-adult population's needs; conducting outreach to locate older adults who might not be aware of the service centers; informing the community of the centers' location and services; and providing convenient transportation services, such as a pick-up service.

In sum, practitioners should reconsider their perspective on health and disability among older adults. They should provide programs and services to meet the needs of older adults based on integrated medical and social models of disability. In addition, appropriate strategies should be continuously developed to improve and increase older adults' utilization of welfare facilities.

## **Chapter 7. Limitations and Directions for Future Research**

Despite the theoretical contributions and policy and practice implications of the present study, consideration should be given to several potential limitations with regard to the research data and measurement of focal variables.

Initially, a longitudinal study will help investigate the possibility of interrelations among three dimensions of disability (i.e., body function, activity, and participation) in old age. The multidimensional concept of disability and interrelations among these multiple dimensions of disability are of significance in understanding disability in old age. However, due to the cross-sectional data used in the present study, the interrelations among the three dimensions of disability were not fully examined. Longitudinal data will allow the test of mutual influences among the three dimensions of disability, which will provide more accurate information on the patterns of their relationships.

Next, local level data will provide more accurate information on the influences of senior and social welfare service centers in regions where older adults live. The present study used merged data of the 2014 Survey of Living Conditions and Welfare Needs of Korean Older Persons (hereinafter “2014 Survey”) (Ministry of Health and Welfare & KIHASA, 2014) and the national statistics data: Ministry of Health and Welfare Statistical Year Book 2015 (Ministry of Health and Welfare, 2015a) and the Current State of Elderly Welfare Facilities in 2015 (Ministry of Health and Welfare, 2015b), which contained data for 2014. Although the national statistics data provided

local level information on the senior and social welfare service centers, the 2014 Survey data only provided metropolitan level information in order to protect the confidentiality of the participants. Thus, further investigation into lower-level regions was not possible in the present study. Most previous studies analyzed welfare facilities at the metropolitan level (Kang & Yun, 2007; Kim, 2004; Kim, 2013), but a few studies analyzed them at local level (Jung, Oh, & Lee, 2003). The reason may also be due to the same limitation this study encountered. Nonetheless, efforts to gather local level data should be continued to accurately measure local variations of elderly welfare facilities and their moderating effects.

Various environmental factors can broaden and enrich the knowledge of moderating effects of environments in the association between health and disability among the older population. Although the present study focused on the service-related environmental factors such as accessibility and infrastructure, many other factors can be taken into consideration such as utilization of service programs and health care systems, use of assistive devices, attitude, and culture. In addition, this study operationalized accessibility as duration of time required to reach senior and social welfare service centers and infrastructure as the total number of these centers per ten thousand older adults. Yet, accessibility and infrastructure can be operationalized in many other ways. For instance, accessibility can be defined as access to information or any building, and infrastructure can include the amount of budget allocated or social safety net established in a region. Sufficient information on environmental factors will foster more in-depth and practical implications in prevention or alleviation of disability in old age. In addition, more accurate and rich information on effective moderators in the association between health and disability

among older adults can be established for future policies and systems in health and disability field.

Additionally, elaboration in measurement of accessibility will increase the possibility of more accurate information on older adults' accessibility to senior and social welfare service centers. The moderating effect of accessibility was found to be insignificant in this study. Because of the lack of previous studies on the moderating effect of accessibility, several possible reasons can be considered. One reason could be the possibility of using transportation. Accessibility was measured by older adults' walking distance; however, the respondents might use vehicles for transportation. Then, this may reduce the validity of response ranges and result in low quality of measurement. As travel time is a strong predictor of satisfaction with accessibility (Penchansky & Thomas, 1981, p. 138), if older adults' accessibility was measured by travel time by vehicles such as their own cars, transportation or pick-up shuttle bus from the centers, this measure may be more beneficial in capturing their accessibility in a more realistic way. Another reason can be that as the scope of "over 30 minutes on foot" is broad, it can include a wide range of time. In the 2014 Survey, accessibility was measured on four Likert scale from "over 30minutes on foot (1)" to "less than 5 minutes on foot (4)". If the response range is more finely split, the significant moderating effect of accessibility might be found. Another possible reason is that because the level of accessibility was self-reported by the elderly participants in the 2014 Survey, it may include measurement bias. These limitations can be addressed in future research.

Last, inclusion of physical functions will compose body function more comprehensively. According to the ICF, body functions are physiological and

psychological functions of body systems (WHO, 2001, p. 47). However, in this study, due to lack of available physiological variables in the 2014 Survey (Ministry of Health and Welfare & KIHASA, 2014), body function was operationalized as psychological and emotional functions. Yet, physiological functions are significantly related with older adults' biological aging and are beneficial in explaining how their body functions and body structures change (Choi & Chang, 2010, p. 61). Therefore, the important physical functions such as vision, hearing, grip strength, BMI, intra-abdominal fat, cholesterol/HDL, lung function, systolic/diastolic blood pressure, blood oxygen saturation, quadriceps strength, motor function and body structure such as atherosclerosis, pulse wave velocity, carotid intima media thickness, bone mineral density, joint deformity, joint space narrowing, and stiffness should be considered in future aging and disability research (Arnadottir et al., 2011; Bang et al., 2011; den Ouden et al., 2013; Fairhall et al., 2011; Fauth et al., 2007; 2008; Femia et al., 2001; Ko, Oh, Baek, & Lee, 2012; Lee, 2010).

The limitations mentioned in this chapter will indicate suggestions for future research. As investigating the association between chronic illnesses and multidimensional disability among older adults and the moderation effects of accessibility toward and infrastructure of senior and social welfare service centers is a critical issue to be addressed, it is recommended that continuous research is valuable and should be a priority. Regardless of these several limitations, the present study, as the initial research that examined the impact of health conditions on the multidimensional disability among Korean older adults and the buffering effects of service-related environmental factors, will contribute to understanding and approaching the health and disability issues in old age.

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## Appendix. MMSE-DS Criteria

The below box is criteria for MMSE-DS, the Korean version of Mini-Mental State Examination for Dementia Screening (Kim et al., 2010). Older adults with MMSE scores below this cut-off level are evaluated to have cognition decline with suspicion of dementia. This group is therefore a target for diagnosis for dementia confirmation.

Education (years)	0-3		4-6		7-12		13+	
Gender Age	Female	Male	Female	Male	Female	Male	Female	Male
60-69	19	20	23	24	25	25	26	26
70-74	18	21	21	23	25	25	26	26
75-79	17	20	21	22	24	25	26	25
80+	16	18	20	22	24	24	27	25

Source. Ministry of Health and Welfare & KIHASA (2014, p. 353)

## 국문초록

# 건강이 노인의 다차원적 장애에 미치는 영향

– 국제기능장애건강분류틀(ICF)을 적용하여 –

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조상은

본 연구는 건강 및 서비스 관련 환경요인이 다차원적 장애에 미치는 영향과 건강과 다차원적 장애의 관계에 대한 서비스 관련 환경요인의 조절효과를 규명하여 노년기 건강과 다차원적 장애에 대해 심층적으로 탐구하는 것을 목적으로 한다.

생활수준의 향상과 의료기술의 발전은 노인인구 증가, 기대수명 연장이라는 긍정적인 발전을 이룬 반면, 연령의 증가에 비례해 만성질환과 장애출현율도 함께 높아지고 있어 사회적 관심이 요구된다. 현재 국내 65세 이상 노인의 경우, 89.7%가 최소 1개 이상의 만성질환을 가지고 있고 2개 이상의 만성질환을 가진 노인도 70.5%에 달해 높은 수준의 유병률이 보고되고 있다. 노년기 장애는 노화와 장애의 복합적인 상호작용으로 인해 비장애 노인집단이나 다른 연령대의 장애인집단에 비해 신체기능의 약화, 심리·정서적 기능감소, 일상생활과 사회참여에서의 제약으로 인한 부정적 영향이 가중되어 나타날 수 있다. 또한 노인성 질환 등으로 인한 노년기에 처음 경험하는 장애로 인해 노인의 삶과 정체성은 이전과는 다른 모습일 수 있다.

만성질환은 장애의 여러 측면에 부정적인 영향을 미치는 것으로 알려져 있다. 신체적 손상과 통증, 신체구조 변형 등의 신체적 기능과 우울, 독립성 및 자아통제감 상실, 낙인감, 고립, 죽음에 대한 두려움 등의 심리·정서적 기능의 약화를 야기하고, 일상생활에서의 수행능력을 감소시키며 사회적·경제적 활동에 대한 참여를 제한하기도 하여 노인의 삶 전반에 부정적인 영향을 미친다. 여러 선행연구들을 통해 만성질환과 장애의 긴밀한 상관관계가 보고되고 있지만, 만성질환의 출현에도 불구하고 기능적 측면에서 크게 제한을 받지 않는 노인들의 사례 또한 보고되면서 만성질환과 장애의 인과관계에 대한 새로운 접근 가능성을 시사하고 있다. 이는 무엇보다 만성질환의 장애로의 귀결을 예방, 방지하거나 또는 지연시킬 수 있는 다른 요인들의 가능성을 암시하는 것으로 매우 흥미롭다.

다양한 환경요인 중에서 사회서비스는 노인의 건강과 상호작용하여 장애에 영향을 미치는 중요한 요인으로 알려져 있으며 이용자의 수요에 부합하는 프로그램은 노인의 건강에 긍정적으로 작용하고 장애로 인한 부정적 영향을 완화하는데 도움을 줄 수 있다. 특히 노인복지관과 사회복지관은 전문적이고 효과적인 서비스와 프로그램을 제공함으로써 노인의 사회적 관계를 향상시키고 건강을 증진시키며 상실과 고립을 감소시켜 활기차고 의미 있는 삶을 영위하는 데 기여한다. 뿐만 아니라 이들 복지관은 지역사회 내 노인의 거주지역 인근에 설치되어 있기 때문에 이동성이 낮은 노인들이 이용하기에 적합하다.

이 같은 이론적 검토를 바탕으로 본 연구에서는 만성질환과 서비스 관련 환경요인이 다차원적 장애에 미치는 영향과 건강과 다차원적 장애의 관계에 대한 서비스 관련 환경요인의 조절효과를 실증적으로 탐구할 필요성을 확인하였다. 문헌검토를 통해 위의 내용들이 선행연구에서 경험적으로 충분히 규명되지 못했다고 판단한 바, 본 연구에서는 첫째, 만성질환이 노인의 다차원적 장애에 영향을 미치는지 살펴보고 둘째, 서비스 관련 환경요인인 노인복지관과 사회복지관에 대한 접근성과 지역인프라가 다차원적 장애에 영향을 미치는지 확인하며 셋째, 만성질환과 다차원적

장애의 관계를 서비스 관련 환경요인이 조절하는지 규명하고자 하였다.

65세 이상 노인 10,451명을 대상으로 2014년도 노인실태조사 자료를 분석에 사용하였다. 연구모델에 포함된 변수들 중 지역인프라와 재정자립도 변수는 16개 시도의 지역특성을 반영하는 변수로서, 지역인프라는 국가통계자료인 보건복지통계연보와 노인시설현황자료를 통해 구축하였고, 재정자립도는 행정자치부에서 운영하는 지방재정통합공개시스템인 지방재정365에 공개된 자료를 활용하였다. 이 외 다른 변수들은 2014년도 노인실태조사에 포함되어 있다. 국제기능장애건강분류틀(International Classification of Functioning, Disability and Health, 이하 'ICF')을 개념적 모델로 하여 구조방정식을 통해 본 연구모델을 분석하였다.

분석을 위해 다차원적 장애는 심리·정서적 기능(인지기능과 우울수준으로 측정), 일상활동 수행능력, 사회활동 참여빈도로 구성되었고, 건강 조건은 의사가 진단한 만성질환수로 측정되었으며 서비스 관련 환경요인은 접근성과 지역인프라로 구성되었다. 접근성은 노인이 거주지에서 도보로 노인복지관과 사회복지관에 도달하는 시간으로 측정되었고 지역인프라는 노인이 거주하는 16개 시도 (서울, 부산, 대구, 인천, 광주, 대전, 울산, 경기, 강원, 충북, 충남(세종 포함), 전북, 전남, 경북, 경남, 제주)의 노인 만 명당 노인복지관과 사회복지관 총수로 측정되었다.

주요 연구결과를 제시하면 다음과 같다. 첫째, 만성질환수가 많은 노인일수록 다차원적 장애 수준은 높은 것으로 나타났다. 구체적으로 살펴보면, 진단받은 만성질환수가 많을수록 노인의 심리·정서적 기능, 일상활동 수행능력, 사회활동 참여빈도는 모두 낮아졌다. 둘째, 노인복지관 또는 사회복지관의 지리적 근접성 (거주지에서 도보 도달시간)이 좋을수록 노인의 심리·정서적 기능, 일상활동 수행능력, 참여빈도에 긍정적인 영향을 미치는 것으로 나타났다. 한편, 지역인프라가 높은 지역에 거주하는 노인일수록 일상활동 수행능력은 증가한 반면 참여빈도에는 유의미한 영향을 미치지 않았고 심리·정서적 기능은 더 낮은 것으로 나타났다. 셋째, 서비스 관련 환경요인 중에서 지역인프라는 만성질환이 노인의 일상활동

수행능력과 참여빈도에 미치는 부정적인 영향을 완화시키는 것으로 나타났다. 하지만 만성질환과 심리·정서적 기능 사이에서 지역인프라는 유의미한 조절효과를 보이지 않았다. 또한, 노인의 만성질환과 다차원적 장애의 관계에 대한 접근성의 조절효과는 유의미하지 않은 것으로 나타났다.

위의 연구결과를 바탕으로 이론적·정책적·실천적 함의를 제시하였다. 건강과 장애를 설명하는 개념적 모델인 ICF들은 생리심리사회적 접근과 장애의 의료모델과 사회모델의 통합에 기반하여 개발되었기 때문에 노년기 장애에 대한 보다 종합적인 시각을 제공하는데 기여할 것이다. ICF들은 장애를 다차원적 개념으로 이해하고 노인의 건강 조건과 그들의 서비스 관련 환경요인 사이의 역동적인 관계 속에서 다차원적 장애가 어떻게 형성되는지 설명한다. 본 연구에서는 노년기 건강과 장애에 대한 기존의 패러다임에 의문을 제기하고 노년기 장애의 다차원적 측면들을 이해함으로써 ICF가 노인의 건강과 다차원적 장애의 관계, 노년기의 장애발생 메커니즘을 설명하는데 유용한 이론적 틀이라는 것이 실증적으로 검증되었다.

본 연구에서 만성질환이 노인의 다차원적 장애에 미치는 부정적인 영향은 기존 연구들과 맥을 같이 한다. 따라서 노인의 만성질환을 예방하거나 혹은 발생 시기를 늦추고 궁극적으로는 노인의 건강을 증진시킬 수 있도록 실천·정책적 차원에서 효과적인 전략들이 개발되어야 할 것이다. 지역인프라 수준이 높을수록 만성질환이 노인의 일상활동 수행능력과 사회활동 참여빈도에 미치는 부정적인 영향이 완화되는 것으로 나타나 지역인프라의 중요성이 확인되었다. 따라서 지역별 균형 잡힌 인프라 구축을 위한 정부차원에서의 체계적인 계획이 요구된다. 노인의 만성질환과 다차원적 장애에 대한 지역인프라의 유의미한 조절효과는 중요한 실천적 함의를 제공한다. 노인복지관과 사회복지관은 중요한 보호요인으로서 건강관련 프로그램 개발, 노인복지관과 사회복지관의 위치와 서비스에 대한 정보 제공, 이동 서비스 제공 등 다양한 방법을 통해 지역사회 노인의 복지관 이용을 증가하는데 노력해야 한다. 마지막으로, ICF들은 건강과 장애에 대한 개념적 설명 외에도 실천매뉴얼을 통해 ICF들이 다양한 영역에서 활용될 수 있도록

정보를 제공하고 있다. 본 연구에서도 실증적으로 검증된 바와 같이 ICF들이 노인의 건강과 장애에 대한 사정, 관련정보 수집, 정책수립에 도움이 될 수 있도록 정책입안자와 실천가들의 지속적인 관심과 연구가 요구된다.

주요어: 다차원적 장애, 건강, 만성질환, 접근성, 지역인프라, 국제기능장애  
건강분류틀(ICF), 노인, 구조방정식 (Structural equation modeling)

학 번: 2010-30905

# 摘要

## 健康对老年人多层次残疾的影响

- 基于《国际功能、残疾和健康分类(ICF)》模式 -

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本论文的研究目的为通过探讨健康与社会服务相关环境因素对多层次残疾的影响以及社会服务相关环境因素的调节作用，对老年期健康与多层次残疾进行深入研究。

随着人们生活水平的提高与医疗技术的进步，老年人口逐年增加，人类寿命逐渐延长。同时慢性疾病和残疾的发病率也逐年上升，成为重大的社会问题。目前韩国65岁以上的老年人中慢性病患病率达到了89.7%，其中患有两种以上疾病的老年人比率达70.5%，从数据中可以了解到老年人的慢性疾病发病率相当得高。老年期的残疾兼有老化与残疾的双重特点，与非残疾老年人群体和其他年龄层残疾群体相比，身体功能减弱，心理、情绪功能减弱，日常生活与社会参与受到制约等出现了各种负面的影响。并且，老年人因患上老年疾病初次感受到残疾时，老年人的生活质量和自我认同感会发生很大的变化。

慢性疾病对残疾多方面起到负面影响。例如，身体损伤和疼痛、身体结构变形等身体功能弱化与忧郁、丧失独立性与自我控制能力、孤独、死亡恐

惧等心理情绪功能弱化，日常生活能力减退，参与社会、经济活动得到限制等给老年人的所有生活带来了负面的影响。在许多文献研究中慢性疾病与残疾具有密切的相关关系，但发现患有慢性疾病的老年人中存在一些不受上述各种负面影响的案例。因此，慢性疾病和残疾之间的因果关系给我们提供了新的调查可行性。这暗示了我们有其他可避免或预防慢性疾病的因素存在。

各种环境因素中社会服务与老年人健康互相作用对残疾起到重要的作用。适合使用者需求的社会服务节目对老年人健康起到积极作用，有助于缓解残疾带来的负面影响。特别是老年人福利院和社会福利院通过提供专门、有效的服务和节目，提高老年人社会关系及增强健康，减少孤独和丧失感，使得他们寻求活力和有意义的生活。而且福利院一般位于地区社会内的老年人居住地，有利于移动不便的老年人利用。

本论文通过理论研究了解到老年期残疾的多层次性，以理论为基础对慢性疾病与社会服务相关环境因素对多层次残疾的影响以及社会服务相关环境因素的调节效应进行了实证分析。在文献研究中上述内容没能得到充分的经验性调查，因此本研究设立如下三个目标。第一，慢性疾病是否影响多层次残疾。第二，社会服务相关环境因素（即，接近性与地区基础设施）是否影响多层次残疾。第三，社会服务相关环境因素能否有效调节慢性疾病与多层次残疾的关系。

本研究以65岁以上老年人10,451名为对象，使用可代表韩国国内老年人群体的2014年老年人实况调查资料进行了分析。研究模型所包含的影响要素中地区基础设施与财政自立度反映了16个地区的特性。地区基础设施使用了两种国家统计资料即，保健福祉统计年报和老年人设施现况资料，财政自立度使用了行政自治部管理的中央财政综合公开系统，即地方财政365公开的资料。其他影响要素使用了2014年度老年人实况调查资料。研究模型使用了《国际功能、残疾和健康分类（ICF）》模式，通过结构方程模型（Structural equation modeling）进行了分析。

为进一步了解分析，多层次残疾分为心理、情绪性功能（认知功能与忧虑为测定标准）、日常活动能力、社会活动参与频率。健康条件变量使用了

医生诊断的慢性疾病总数，社会服务相关环境因素分为接近性与地区基础设施。接近性变量使用了老年人步行从居住地出发到达老年人福利院和社会福利院的时间。地区基础设施变量使用了老年人居住的16个地区（首尔特别市、釜山广域市、大邱广域市、仁川广域市、光州广域市、大田广域市、蔚山广域市、京畿道、江原道、忠清北道、忠清南道、全罗北道，全罗南道、庆尚北道、庆尚南道、济州特别自治道）每一万名老年人中老年人福利院和社会福利院总数。

本论文主要研究结果如下：

- 第一，老年人患有慢性疾病数越多，其多层次残疾水准越高。具体地说，老年人患有慢性疾病数越多，心理、情绪功能、日常活动能力、社会活动参与频率越低。
- 第二，离地区老年人福利院与社会福利院越近，对老年人心理、情绪功能、日常活动能力、社会活动参与频率具有正的影响。居住地区基础设施越好，老年人的日常活动能力越高，但社会活动参与频率没有显著影响，对心理、情绪功能起到负的作用。
- 第三，社会服务相关环境因素中，地区基础设施降低了慢性疾病对老年人日常活动能力的负面影响。地区基础设施在慢性疾病与社会活动参与频率之间也起到显著的调节效应。然而，地区基础设施对老年人心理、情绪功能没有起到显著的调节作用。慢性疾病与多层次残疾关系上接近性没有起到显著的调节效应。

以上述研究结果为基础，提出如下理论、政策、实践意义。ICF模式是解释健康与残疾的概念模型，基于生理-心理-社会模型和医疗与社会模型综合开发而成，所以能够对老年期残疾提供更全面、更客观的评价。ICF模式从多层次理解残疾解释了老年人健康条件与社会服务相关环境因素的密切关系如

何形成多层次残疾。本研究针对老年人健康与残疾的现有模式提出质疑，同时阐述了老年人残疾的多层次性。通过实证分析证明出ICF理论模式对解释老年人健康与多层次残疾的关系、老年人残疾形成机制很有意义。

本研究中慢性疾病对老年人多层次残疾的负面影响结果与相关文献的研究结果一致。因此，为了增强老年人的健康，预防或者推迟老年人慢性疾病发生，从政策和实践中开发有效实施的策略。研究表明地区基础设施水准越高，慢性疾病对老年人日常活动能力与社会活动参与频率等引起的负面影响越小，可以了解到地区基础设施的重要性。因此需要政府制定各地区均衡基础设施建设的体系规划。地区基础设施对老年人慢性疾病与多层次残疾的显著性调节效应，具有重要的实践意义。老年人福利院和社会福利院作为重要的保护因素，应开发医疗康复项目、提供福利院位置及各种服务信息、交通服务信息等各种方式，让更多的老年人便于利用福利院。最后，ICF模式不仅是理论模型，而且ICF模式的使用菜单给使用者们提供了各种领域中的应用。本研究中也得到了证实，希望ICF模式能够适用于制定政策和实践中有效地评估老年人健康与残疾、收集基本信息、制定政策等。

关键词：多层次残疾，健康，慢性疾病，接近性，地区基础设施，国际功能、  
残疾和健康分类（ICF）模式，老年人，结构方程模型（Structural  
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