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Factors Affecting the Mental Health of the Urban Elderly and Psychological Therapeutic Utilization of an Urban Forest

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Abstract

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In Korea, most of the population resides in cities owing to the increase in urbanization. Urban older adult population formed 76.6% of the total urban population in 2014, and it has been steadily increasing. People living in the urban environment are more vulnerable to mental health problems such as stress and depression, caused by lack of contact with green spaces, and social isolation, caused by fewer opportunities for communication. Older adults are vulnerable to mental health problems such as stress and depression due to a decrease in their social and economic status as well as an increase in their physical illnesses. Mental health is related to physical and social health, and consequently affects the burden of health care and the overall survival rate. Therefore, it is important to study the mental health problems of older adults in urban areas as social problems, and not merely as personal problems, to strengthen preventive measures and to identify the factors that

affect mental health. In addition, it is necessary to identify the factors that affect mental health in older adults in relation to social, demographic, physiological, and psychological aspects of their lives.

Further, urban parks and green areas are known to help improve mental health by promoting social contact and interaction among people and by reducing psychological stress. In recent years, national and local governments in Korea have recognized the importance of the health benefits of forest therapy (forest bathing), and the implementation of forest therapy programs using urban as well as other forests is increasing. However, most of them target the general public, and the urban forest therapy program targeting specific vulnerable groups such as low-income groups or older adults living alone is at the pilot stage. In addition, there is relatively insufficient study focusing on how urban forests affect mental health positively. The psychological healing effect of urban forests varies according to people's age and life cycle stage and is reported to be the strongest in older adults as well as middle-aged people. Therefore, it is necessary to implement forest therapy programs utilizing urban forests separately to target older adults or middle-aged people. This is empirical case studies of an urban forest therapy program for mental health of older adults and middle-aged people.

We found socio-demographic factors affecting mental health of older adults in Chapter 1. The predictive indicators of subjective stress level were female gender, younger age, belonging to a third-generation household, low income, comorbidity, being a smoker, and participation in manual labor. The predictive indicators of depressive experience were female gender, living alone, low income, comorbidity,

not working, being a smoker, being a non-drinker, and non-participation in periodic social activities. Additionally, the lower the urban green ratio in the administrative district, the higher the subjective stress levels and depression. In older adults, the presence or absence of periodic physical activity was not correlated with mental health, but the presence of social activity was significantly correlated with mental health.

Based on the results of this study, we analyzed the effects of social capital on depression in Chapter 2. It was found that trust factor in social capital reduced depression through social capital satisfaction and self-esteem. In other words, we found that qualitative social capital is more effective in dealing with depression than quantitative social capital. It is necessary to identify and manage vulnerable groups through demographic and social characteristics and suggest such policies for improving trust factor in social capital that are effective in improving and promoting the mental health of older adults.

In Chapter 3, we implemented a forest therapy program targeting older adults living alone on low income and receiving medical aid, using the urban forest near their living area as healing resources. As a result, the relationship between self, others (neighbors), and nature is formed through the process of awareness and flow in nature, and the sense of isolation is reduced, and self-coping, healthy lifestyle habits, were instilled. This implies that the utilization of urban forests contributed to the formation of social relations, and the formation of social capital results in not only mental health but also physical health improvement.

In Chapter 4, we conducted the urban forest therapy program for middle-aged

women preparing for the old age. We found that negative emotions are replaced by positive emotions through the recognition of inherent negative emotions in nature, recovering self-esteem through internal immersion process, and acquiring coping ability based on nature's providence.

It is necessary to be careful while generalizing these results to other groups because each result is for a specific group. However, the results of this study will be helpful in establishing the policy direction of green welfare for the future through the understanding of mental health issues of older adults and middle-aged people in an aging society and in-depth analysis of the effects of therapy programs using urban forests.

◼ *Keywords: Depression, Mental well-being, Stress, Urban forest therapy (forest bathing)*

◼ *Student number: 2016-37318*

Publications

Please note that Chapters 1-4 of this dissertation proposal were written as stand-alone manuscripts (see below), and therefore there is some repetition in the methods and results.

CHAPTER 1

Lee, H.J. and D.K. Lee., 2019. Do Sociodemographic Factors and Urban Green Space Affect Mental Health Outcomes Among the Urban Elderly Population? International Journal of Environmental Research and Public Health, 16(5), 789.

CHAPTER 2

Lee, H.J. et al., 2019. Relationships between Social Capital, Social Capital Satisfaction, Self-esteem, and Depression among Elderly Urban Residents: Analysis of Secondary Survey Data. International Journal of Environmental Research and Public Health, 16(8), 1445.

CHAPTER 3

Lee, H.J. and S.A. Son., 2019. Qualitative Assessment of Experience on Urban Forest Therapy Program for Preventing Dementia of the Elderly Living Alone in Low-Income Class. Journal of People, Plants, and Environment, 21(6), 565-574.

CHAPTER 4

Lee, H.J. et al., 2019. Healing experiences of middle-aged women through an urban forest therapy program. Urban Forestry & Urban Greening, 38, 383-391.

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1. INTRODUCTION

In Korea, the older adult population was 14% of the total population in 2017. As the population ages, the various needs and social problems of older adults become a priority, and social interest in the life of older adults becomes more important. In Korea, the majority of population resides in cities owing to the increase in urbanization, and urban older adults accounted for 76.6% of the total population in 2014. In the urban environment, the residents are more vulnerable to mental health problems such as stress and depression, caused by lack of contact with green spaces, and social isolation, caused by fewer opportunities for communication. Older adults are vulnerable to mental health problems such as stress and depression due to a decrease in social and economic status as well as an increase in physical illnesses. Mental health is related to physical and social health and consequently affects the burden of health care and the overall survival rate. Therefore, the mental health problems of older adults in urban areas should be recognized as social problems, and not merely as individual problems, and it is necessary to strengthen prevention and pay attention to them.

Urban parks and green areas are known to help improve mental health by promoting social contact and interaction among people and by reducing psychological stress. In recent years, national and local governments in Korea have recognized the importance of the health effects of forest therapy (forest bathing), and the implementation of forest therapy programs using urban as well as other forests is increasing. However, most of them target the general public, and the urban forest

healing program targeting specific vulnerable groups such as low-income groups or older adults living alone is at the pilot stage. In addition, there is relatively insufficient study focusing on how urban forests affect mental health positively. The psychological healing effect of urban forests varies according to age and life cycle stage of people and is reported to be the strongest in older adults as well as middle-aged people. Therefore, it is necessary to implement forest therapy programs utilizing urban forests separately to target older adults and middle-aged people. This is empirical case studies of an urban forest therapy program for mental health of older adults and middle-aged people.

This study consists of four chapters analyzing the relationship between demographic, societal, environmental, and psychological factors affecting mental health in urban older adults and exploring two empirical studies focusing on older adults and middle-aged women. The four sections have different themes and are applied to different participants. In Chapter 1, we assessed socio-demographic indicators and urban green area ratios related to depression and stress level for urban older adult residents in seven metropolitan cities in Korea. This study was conducted to identify older adults who are vulnerable to mental health problems based on their demographic and social characteristics, and to emphasize that the proportion of green areas can play an important role in the improvement of mental health of urban older adults. In Chapter 2, there is a clarification of the relationship between social capital and psychological factors of depression in urban older adults. This study focused on the relationship model of psychological factors of depression such as social capital,

social capital satisfaction, and self-esteem in urban older adults. Chapters 3 and 4 include empirical studies that use urban forests as psychological healing resources by using urban forests in therapy programs. In Chapter 3, categorize the themes related to the psychological and cognitive changes in the participants (older adults living alone in a low-income group) after experiencing the program by visiting an urban forest periodically. In Chapter 4, we extensively explored the process of psychological change that occurs in middle-aged women living in urban areas after they experience periodic therapy programs in an urban forest.

The purpose of this study is not to establish a methodology for assessing mental health problems and psychological healing function of urban forests. Instead, this study aims to find predictive indicators affecting the mental health of urban older adults and demonstrate a positive psychological change process by utilizing the urban green space and urban forests, to fill the knowledge gap concerning the urban green space and its mental health outputs by fully understanding the underlying processes. This is meaningful for welfare and city planning policy makers in understanding the issues of vulnerable groups such as low-income groups, older adults living alone, and middle-aged people, and in utilizing the green welfare policy using the urban green resources.

2. CHAPTER 1: Do Sociodemographic Factors and Urban Green Space Affect Mental Health Outcomes Among the Urban Elderly Population?

2.1. Introduction

Increased life expectancy and falling fertility rates are accelerating the aging of populations, and the worldwide population aged over 65 is expected to increase from 524 million in 2010 to nearly 1.5 billion, representing 16% of the world's population, in 2050 [1]. In Germany, the population aged 65 years or older is expected to increase from 20.7% in 2009 to 29% in 2030 and to 31% in 2050 [1]. However, the fastest increase in the aging population has occurred in East Asia [1]. Korea began to be considered an aging society in 2000, when 7.2% of its total population was aged over 65 years of age; in 2017, this percentage had reached 14.0% (7,257,288 people as at the end of October 2017) and is expected to increase to 24.5% in 2030 and to 28.7% in 2035 [2]. This shifting age structure requires more targeted forms of health and social care and changes in national infrastructures, particularly in relation to healthcare systems [3].

With the development of urbanization in Korea, 91.8% of the population lived in cities in 2017 [4], the percentage of the elderly population living in urban areas rose from 56.4% in 1994 to 76.6% in 2014 [2]. Urban environments often lack access to green spaces due to the proliferation and density of buildings, and urban residents have been found to be more vulnerable to mental health issues such as stress and

depression [5,6], due to deterioration in their social and economic status, as well as due to physical illness [1]. Mental health issues among elderly people can also exacerbate dementia [7,8] and increase the suicide rate [9], resulting in an increase in the social and economic costs to society [1,10]. Given that mental health issues occurring among elderly urban residents have implications for society extending beyond the individual level, it is even more necessary to focus on prevention and effective solutions.

Urban green spaces have been shown to provide various health benefits. Recent studies have reported a relationship between mental health and parks and green spaces at the neighborhood level [9,11–15]. Mental health issues may arise because of genetic factors or the psychological state of the individual [16] but can be exacerbated by social and economic inequalities and the state of the surrounding environment [17,18]. Parks and green space can help improve mental health through encouraging physical activity [12,19,20], social interaction, and contact with nature while reducing psychological stress [9,21–23]. In addition, it has been reported that people living in environments with greenery, which provides physical, social, and economic benefits to residents, enjoy better mental health than those who do not have access to green space [24].

Previous studies on this topic have mostly used demographic data from people of all ages; thus, little research on the characteristics of elderly households is available. Furthermore, research that is available is limited to national units or specific geographical areas that do not consider environmental characteristics such

as urban and rural areas. However, it is important to identify the characteristics of elderly urban households (e.g., single-member household, elderly single-generational household and multi-generational family household) and factors (e.g., health status and health behaviors) affecting mental health to implement effective policies related to elderly urban residents in aging societies. This study thus addresses various gaps in the literature through examining the mental health of the urban elderly and the effects of demographic characteristics and access to urban green space.

The purpose of this study was to investigate the demographic and social characteristics of the elderly who are vulnerable to mental health problems, such as depression and stress, in seven metropolitan areas in Korea. We also investigated the prevalence of mental health problems related to urban green spaces based on the findings of previous studies that urban parks and green spaces are associated with mental health benefits. Furthermore, this study is intended to assist in mental health policy making and to promote mental health among the growing urban elderly population, and offer practical suggestions concerning welfare policy in relation to green space.

2.2. Materials and Methods

2.2.1. Study Population

We used 2015 Community Health Survey (CHS) data from the Korea Centers for Disease Control and Prevention (KCDC) [25]. The purpose of this survey is to

assess the health status, health behavior, and health determinants of Koreans and produce community-based health statistics. The CHS is a survey conducted by trained researchers who visit households sampled nationwide using a multi-stage stratified cluster sampling procedure. The CHS's target population comprises adults over 19 years of age living in their communities. It is a cross-sectional survey, where participants are sampled each year. CHS data is available to researchers upon request through the KCDC's online site. Raw data has been provided annually, both at the national and regional levels (one national dataset, and 17 city and province datasets), since 2008. The data are available in text formats. Collected data include sociodemographic information, health behaviors (e.g., smoking, alcohol consumption, physical activity), health status, and subjective health indicators [9,26].

We selected seven major Korean metropolitan cities to study the urban elderly population. Detailed geographic information derived from these locations is shown in Figure 1. Among the 11,720 participants aged 65 years and older included from the target areas, questionnaires with missing values among the survey variables were excluded from the analysis. In total, 11,408 people were finally included in the study. This study was approved for exemption by the Institutional Review Board of our university (IRB No. E1902/002-002).

2.2.2. Control Variables

Sociodemographic variables were selected based on previous studies [9,11,14,26], including sex, age, educational level, labor market participation, being

a basic livelihood social security recipient, monthly household income, household type, comorbidity, physical activity, cigarette smoking, alcohol consumption, and participation in social activity. The participants were divided according to age groups, as follows: those aged 65–69 years old, those aged 70–79 years old, and those aged 80 years old or older. Educational levels were classified as having completed primary school, middle school or high school, college or university, or having graduated with a Master or higher degree. Participation in the labor market was defined using two answer options (yes, no) to the question "Have you worked in the past week for income purposes?" Participants on temporary vacation were considered labor market participants. Comorbidity was categorized as a disease condition if a participant had been diagnosed by a doctor and was receiving treatment at the time of the survey for two or more diseases. Household type was classified into single-member households, elderly single-generational households (i.e., married couples), and multi-generational family households with children and grandchildren. Physical activity was defined as the number of days in which more than ten minutes of occupational activity or physical activity, such as moderate physical activities (e.g., slow swimming, doubles tennis, volleyball, badminton or table tennis) or athletic activities (e.g., running [jogging], climbing, cycling, rapid swimming or jumping rope) was undertaken during the preceding week. For cigarette smoking, we categorized the participants into current smokers, former smokers and those who had never smoked. In terms of alcohol consumption, participants were classified as alcohol consumers if they had consumed alcohol within the preceding year and non-

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alcohol consumers otherwise. Participation in social activity was categorized as regular participation in social activity (yes, no) at least once a month.

2.2.3. Response Variables

The response variables for mental health included subjective stress levels and symptoms of depression. A person's stress level was classified as high when their answer was "I feel stressed very often or a lot" to the question "How often do you feel stress every day?" However, the answer "I feel stressed a little or rarely" was classified as low. A person was classified as having exhibited symptoms of depression using two response options (yes, no) to the question "Have you ever felt sad or desperate for more than two weeks in the last year?" If the participants answered "yes," they were classified as having had symptoms of depression.

2.2.4. Explanatory Variables

We used the proportion of urban green area per administrative area derived from CHS data to assess the degree of exposure to green space. Urban green areas include parks and green space (roadsides, road and riverside greenery, small parks, children's parks, neighborhood parks, theme parks, amusement parks, and green spaces excluding cemeteries), which require little money or time to visit and which are easy to access and use in daily life. Therefore, we selected an existing variable of the ratio of urban green area per administrative area, including park area, to determine the likely amount of exposure to the green environment. We divided them into quartiles

with natural breaks to compare the odds ratios of stress levels and symptoms of depression related to the proportion of green areas in various cities (Figure 1). The first quartile refers to the lowest proportion of green area and the fourth quartile refers to the highest proportion of green area per administrative area. In addition, interaction terms between the proportion of green areas and physical and social activities were generated and used as explanatory variables to identify the potential effects of subjective behaviors.
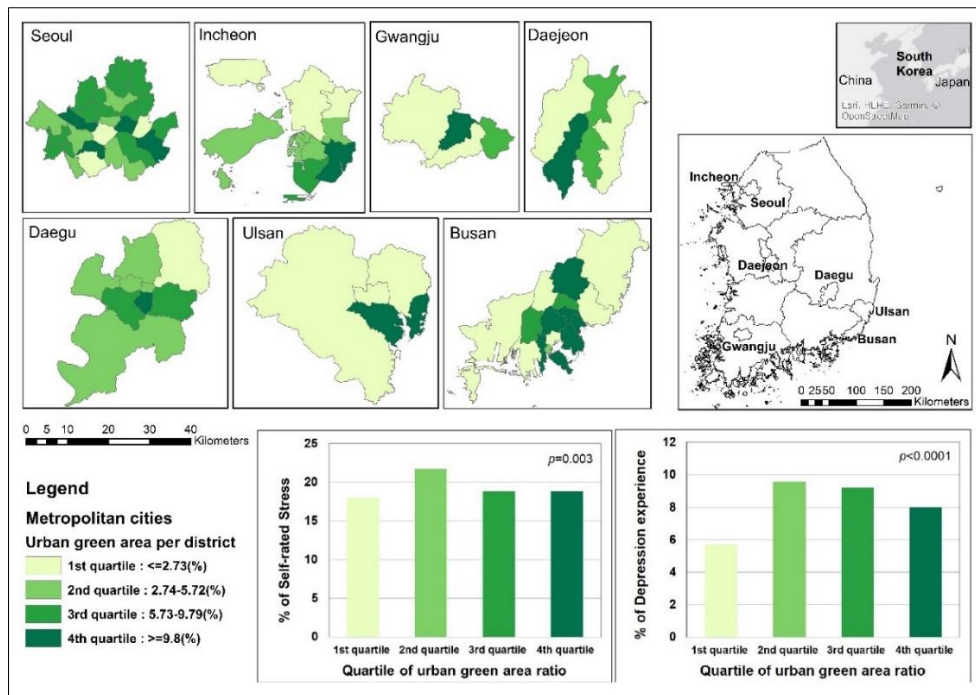
Figure 1. Prevalence of self-rated experiences of stress and/or depression among Koreans aged 65 and over within quartile divisions of urban green areas in seven Korean cities.

2.2.5. Statistical Analysis

We conducted a frequency analysis and a chi-square test using PASW Statistics 18.0 (SPSS Inc, Chicago, IL, USA) to analyze the demographic and sociological characteristics of the study sample. We conducted a binary logistic regression analysis, with reported symptoms of depression and stress levels as response variables for mental health indicators. We calculated odds ratios according to differences in relation to sociodemographic characteristics and urban green area.

2.3. Results

2.3.1. Study Sample Characteristics

Table 1 shows the sociodemographic characteristics of the study sample by sex. A total of 11,408 people (4922 [43.1%] men and 6486 [56.9%] women) participated in this study, with those aged 65–69 comprising 3865 people (33.9%), those aged 70–79 comprising 5789 (50.7%) people, and those aged 80 or over comprising 1754 (15.4%) people. For household type, 2891 (58.7%) men and 2167 (33.4%) women reported living in elderly single-generational households, and 1608 men (32.7%) and 2587 (39.9%) women reported living in multi-generational family households. Single-member households were more common among women (1732 [26.7%]) than men (423 ([8.6%]). Furthermore, men were more educated than women (x^2 = 1736.241, p < 0.0001). More women (518 [8.0%]) than men (252 [5.1%]) were social security recipients. Most women (557 [82.6%]) did not participate in the labor market, while a substantial number (143 [35.4%]) of men did. The most commonly

reported disease was hypertension (total 558 [50.5%]), and the rate of arthritis was much higher for women (1661 [25.6%]) than for men (338 [6.9%]). Many more men (947 [19.2%]) than women (142 [2.2%]) were cigarette smokers. More men (3245 [65.9%]) than women (2216 [34.2%]) were consumers of alcohol. Most participants did not engage in physical activity (8335 [73.1%]). However, men had a higher rate of physical activity ($x^2 = 85.0$, $p < 0.0001$) and regular social activity ($x^2 = 74.636$, $p < 0.0001$) than women. Finally, 19.3% (2203) of all respondents reported high levels of stress, and 8.0% reported having experienced symptoms of depression.

Table 1. Descriptive characteristics of the study sample: 2015 Korean community health survey (n=11,408).

Variable	Category	All		Sex				$x^2(p)$
				Male		Female		
		n	%	n	%	n	%	
Total		11,408	100	4,922	43.1	6,486	56.9	
Age group (years)	65-69	3,865	33.9	1,758	35.7	2,107	32.5	50.857 (0.000)
	70-79	5,789	50.7	2,540	51.6	3,249	50.1	
	80+	1,754	15.4	624	12.7	1,130	17.4	
Household type	Solitary	2,155	18.9	423	8.6	1,732	26.7	930.290 (0.000)
	1 generation	5,058	44.3	2,891	58.7	2,167	33.4	
	2, 3 generations	4,195	36.8	1,608	32.7	2,587	39.9	
Education level	Primary school or less	5,635	49.4	1,377	28.0	4,258	65.6	1736.141 (0.000)
	Middle school or high school	4,467	39.2	2,565	52.1	1,902	29.3	
	College or university	1,088	9.5	787	16.0	301	4.6	

	Master's degree or higher	218	1.9	193	3.9	25	0.4	
Financial aid	No	10,638	93.3	4,670	94.9	5,968	92.0	36.534 (0.000)
	Yes	770	6.7	252	5.1	518	8.0	
Monthly household income in thousands of Korean Won (KRW)	<1,000 (< 887 USD)	4,758	41.7	1,746	35.5	3,012	46.4	146.626 (0.000)
	1,000-3,000 (887-2,663 USD)	4,266	37.4	2,093	42.5	2,173	33.5	
	3,000+ (2,663 USD+)	2,384	20.9	1,083	22.0	1,301	20.1	
Labor market participation	No	8,536	74.8	3,179	64.6	5,357	82.6	481.626 (0.000)
	Yes	2,872	25.2	1,743	35.4	1,129	17.4	
Comorbidity prevalence	Hypertension	5,758	50.5	2,334	47.4	3,424	52.8	32.292 (0.000)
	Diabetes	2,398	21	1,060	21.5	1,338	20.6	1.386 (0.239)
	Dyslipidemia	2,195	19.2	694	14.1	1,501	23.1	147.245 (0.000)
	Arthritis	1,999	17.5	338	6.9	1,661	25.6	680.139 (0.000)
Cigarette Smoker	Current	1,089	9.5	947	19.2	142	2.2	6142.901 (0.000)
	Former	2,985	26.2	2,795	56.8	190	2.9	
	Never smoked	7,334	64.3	1,180	24.0	6,154	94.9	
Alcohol consumer	No	5,947	52.1	1,677	34.1	4,270	65.8	1131.331 (0.000)
	Yes	5,461	47.9	3,245	65.9	2,216	34.2	
Moderate physical activity (day/week)	0	8,335	73.1	3,410	69.3	4,925	75.9	85.0 (0.000)
	1-3	1,407	12.3	628	12.8	779	12.0	
	4+	1,666	14.6	884	18.0	782	12.1	
Regular social activity (monthly)	No	5,130	45	1,986	40.3	3,144	48.5	74.636 (0.000)
	Yes	6,278	55	2,936	59.7	3,342	51.5	

Self-rated stress level	Slightly or rarely	9,205	80.7	4,186	85.0	5,019	77.4	105.506 (0.000)
	Very much or a lot	2,203	19.3	736	15.0	1,467	22.6	
Symptoms of depression		916	8.0	271	5.5	645	9.9	74.656 (0.000)

2.3.2. Association of Sociodemographic Characteristics with Stress Levels and Symptoms of Depression

Table 2 shows the sociodemographic characteristics of the sampled population in relation to stress levels and symptoms of depression. The indicators for having a high risk of stress were: being female, being between the ages of 65 and 69, living in a multi-generational family household, having had a lower level of education, receiving social security payments, having a lower income, comorbidity, participating in the labor market, being a cigarette smoker, engaging in less than three days of physical activity per week, and not participating in regular social activity. The indicators for having symptoms of depression were very similar to the high stress level indicators but had slightly different characteristics. Multi-generational family households reported higher symptoms of depression than single-generational households. All variables except education level and alcohol consumption were statistically significant ($p < 0.05$) for participants who reported high stress levels and symptoms of depression.

Table 2. Odds ratios (95% Confidence Interval (CI)) of self-rated stress levels and symptoms of depression in relation to sociodemographic characteristics: 2015 Korean community health survey (n=11,408).

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Variable	Category	Odds Ratio (95% CI)	
		Self-rated stress level	Symptoms of depression
Sex	Female	1.564 (1.330-1.839) **	1.577 (1.242-2.003) **
	Male	Reference	Reference
Age group (years)	65-69	1.556 (1.323-1.832) **	1.232 (0.989-1.534)
	70-79	1.419 (1.225-1.642) **	1.068 (0.880-1.296)
	80+	Reference	Reference
Household type	Solitary	0.632 (0.543-0.736) **	1.075 (0.878-1.316)
	1 generation	0.778 (0.690-0.876) **	0.722 (0.603-0.865) **
	2, 3 generations	Reference	Reference
Education level	Primary school or less	1.089 (0.706-1.681)	0.766 (0.404-1.454)
	Middle school or high school	0.944 (0.614-1.451)	0.790 (0.419-1.492)
	College or university	1.022 (0.650-1.607)	0.819 (0.418-1.605)
	Master's degree or higher	Reference	Reference
Financial aid	No	0.529 (0.446-0.626) **	0.534 (0.433-0.659) **
	Yes	Reference	Reference
Monthly household income in thousands of Korean Won (KRW)	<1,000 (< 887 USD)	1.707 (1.451-2.008) **	2.086 (1.617-2.690) **
	1,000-3,000 (887-2,663 USD)	1.337 (1.155-1.548) **	1.552 (1.225-1.965) **
	3,000+ (2,663 USD+)	Reference	Reference
Comorbidity prevalence	No	0.743 (0.672-0.822) **	0.835 (0.723-0.965) **
	Yes	Reference	Reference
Labor market participation	No	0.874 (0.777-0.982) *	1.384 (1.144-1.675) **
	Yes	Reference	Reference
Cigarette Smoker	Current	1.578 (1.304-1.910) **	1.520 (1.153-2.003) *
	Former	0.951 (0.804-1.125)	1.064(1.064-0.831)
	Never smoked	Reference	Reference

Alcohol consumer	No	1.092 (0.984-1.211)	1.226 (1.052-1.429) *
	Yes	Reference	Reference
Moderate physical activity (day/week)	0	1.058 (0.915-1.223)	1.237 (0.983-1.557)
	1-3	1.055 (0.872-1.278)	1.309 (0.976-1.755)
	4+	Reference	Reference
Regular social activity (monthly)	No	1.551 (1.401-1.717) **	1.455 (1.255-1.688) **
	Yes	Reference	Reference

*< .05, **< .001

2.3.3. Association of the Urban Green Area Ratio with Stress Levels and Symptoms of Depression

Table 3 shows the OR (95% CI) of stress levels and symptoms of depression among the sample population in quartiles according to the urban green area ratio. The fourth quartile was the respective reference category for the response variables. In Models 1 and 2, where the potential variables were adjusted relative to the unadjusted model, the OR for both stress levels and symptoms of depression tended to increase as the ratio of the green area decreased; from the fourth quartile with the highest green area ratio to the first quartile with the lowest green area ratio. After complete adjustment (Model 2a), prevalence of stress levels increased by 2.2% (OR: 1.022, CI: 0.892–1.171) for participants in the third quartile and by 18.3% (OR: 1.183, CI: 1.034–1.353) for participants in the second quartile compared to those in the fourth quartile, the highest green area ratio.

Table 3. Odds ratios (95% CI) of self-rated stress levels and symptoms of depression in quartiles of urban green area ratio.

	Unadjusted model	Adjusted		
		Model 1	Model 2 (a)	Model 2 (b)
Self-rated stress levels (n = 11,408)				
1st quartile (≤ 2.73%)	0.944 ** (0.825–1.081)	0.945 * (0.823–1.085)	0.931 ** (0.811–1.070)	1.163 (0.750–1.804)
2nd quartile (2.74-5.72%)	1.192 ** (1.046–1.359)	1.188 * (1.039–1.358)	1.183 ** (1.034–1.353)	1.451 (0.946–2.227)
3rd quartile (5.73-9.79%)	0.998 ** (0.874–1.140)	1.026 * (0.896–1.175)	1.022 ** (0.892–1.171)	1.492 (0.987–2.256)
4th quartile (≥ 9.8%)	Reference	Reference	Reference	Reference
p - value for trend	< 0.005	< 0.01	< 0.005	0.191
Symptoms of depression (n = 11,408)				
1st quartile (≤ 2.73%)	0.730 ** (0.590–0.902)	0.740 *** (0.597–0.918)	0.727 *** (0.586–0.902)	0.742 (0.369–1.491)
2nd quartile (2.74-5.72%)	1.276 ** (1.057–1.542)	1.279*** (1.055–1.550)	1.280 *** (1.047–1.540)	0.820 (0.425–1.583)
3rd quartile (5.73-9.79%)	1.218** (1.009–1.471)	1.274*** (1.052–1.543)	1.269*** (1.056–1.541)	1.131 (0.615–2.081)
4th quartile (≥ 9.8%)	Reference	Reference	Reference	Reference
p-value for trend	< 0.005	< 0.0001	< 0.0001	0.561

Model 1: adjusted for demographic factors (i.e., sex, age, household type, education, monthly income, financial aid, labor market participation, and comorbidity prevalence)

Model 2 (a): adjusted for model 1 + individual behavioral factors (i.e., cigarette smoking, alcohol consumption, moderate physical activity, and regular social activity)

Model 2 (b): adjusted for model 2 (a) + interaction of the urban green area ratio with physical activity and regular social activity, * $p < 0.01$, ** $p < 0.005$, *** $p < 0.001$.

In the case of symptoms of depression, there was a 26.9% (OR: 1.269, CI: 1.056–1.541) increase of participants in the third quartile and a 28.0% (OR: 1.280, CI: 1.047–1.540) increase of participants in the second quartile compared to the fourth quartile. However, both stress levels and symptoms of depression scarcely appeared in the first quartile, the lowest green area ratio. Apart from the first quartile, there was a clear tendency for stress levels and symptoms of depression to increase as the urban green area ratio decreased ($p < 0.005$).

2.4. Discussion

In this study, we first examined the relationship between stress levels and symptoms of depression and the sociodemographic characteristics of elderly urban residents. Elderly women were more likely to experience higher levels of stress and symptoms of depression than elderly men. Some studies suggest that the lower economic status of elderly women compared to elderly men might negatively affect their mental health [23,27]. Most elderly Korean women have been housewives, with no independent income. It has been reported that fewer opportunities for labor market participation can limit the possibility of forming social relationships, which can lead to depression [27]. Those elderly people who do participate in the labor market experienced more stress but were less likely to experience symptoms of depression. These results suggest that encouraging labor market participation as opportunities (e.g., volunteer, join social groups, etc.) for forming social networks

among the elderly could be a promising way to reduce the occurrence of depression among this population. However, the stress caused by labor market participation would need to be mitigated through improvements in the working environment for elderly working people. Interestingly, multi-generational family households were found to be more stressful and more linked to symptoms of depression for elderly persons than single-generational households. Within multi-generational families, there is a greater likelihood of differences in political views or economic power among family members, and these differences might cause inter-generational conflict [28,29]. This finding suggests that comprehensive household welfare policies and services are needed to help families live together in multi-generational homes, and to provide support to families where needed to counter the stresses that can occur in such living arrangements.

Current cigarette smokers were more likely to experience higher levels of stress and symptoms of depression. Because this study used a cross-sectional design, these results cannot be interpreted as causal relationships. However, current cigarette smokers may be more likely to experience mental health challenges, as there is a strong association between mental health and personal health behavior, such as smoking [9,26,30,31]. On the other hand, non-consumers of alcohol in our study reported higher rates of stress and symptoms of depression compared to previous studies suggesting that drinking alcohol is associated with poorer mental health outcomes [26,32–34]. In Korea, drinking alcohol among elderly people, but not heavy drinking of alcohol, has often been culturally regarded as a social lubricant for

communication and alcoholic drinks are served at various social and family functions [35,36]. In this study, it was found that moderate drinking among elderly people had a positive effect on stress relief and in reducing the symptoms of depression. However, the criterion for alcohol consumption in this study did not concern how much was consumed but whether alcohol had been consumed in the preceding year. Although no relationship was found between stress levels and symptoms of depression in relation to physical activity, regular social activity was shown to be positively linked to reducing stress and symptoms of depression [9,26,27,37,38]. Previous studies have reported that social engagement at the neighborhood level could reduce the likelihood of depression caused by air pollution [39] and urbanization [40]. These results suggest the necessity of supporting and increasing opportunities to participate in social activity for the elderly. Overall, the results of this study provide further evidence concerning the importance of identifying relevant sociodemographic characteristics that are likely to affect mental health among elderly urban residents.

In recent years, welfare policies for elderly people have been focused on promoting elderly-friendly environments involving increased opportunities for contact with nature [1,41,42]. Many studies have suggested that there is a positive association between providing green environments in urban areas and mental health benefits [5,43–45]. The physical environment affects mental health [44], and environmental improvement at the neighborhood level can contribute to the social integration of elderly people [45–47]. Previous studies have assessed the effects on

mental health of the density or presence of green space at the neighborhood level, through using the Normalized Difference Vegetation Index (NDVI), a method of measuring the composition of residential greenness [48–50]. However, this study was unable to apply these methods to determine relevant environmental indicators because of limited data sources. Therefore, the ratio of urban green area including parks and all open space green areas was used as a quantitative exposure index to determine the extent of the green environment within the urban areas covered in this study.

In this study, no significant relationship was found with stress levels and symptoms of depression in the quartile with the smallest urban green area ratio. Nevertheless, we found that the higher the rate of greenery in a city, the less stress and fewer symptoms of depression reported among its elderly residents. This result supports previous cross-sectional design studies reporting that exposure to the green environment in urban areas has positive relation to mental health among elderly people [51,52]. In addition, because of the interaction effects of the green areas and physical and social activities which may be associated with mental health outcomes were not significant, this study could still identify clear mental health benefits according to the extent of exposure to greener environments in cities.

2.4.1. Policy Implications

We assessed factors affecting the mental health of elderly urban residents in relation to stress levels and symptoms of depression, focusing on the effects of

specific sociodemographic factors and varying exposure to green areas. Our results provide substantial empirical data on these aspects within Korea, with policy implications given the uneven extent of certain mental health issues among elderly people. The mental health issues identified in this study could be more effectively targeted with better information concerning the relevant individual characteristics involved and through extending the green environment. Therefore, welfare policies should be implemented for vulnerable groups in terms of mental health, based on relevant data and a commitment to establishing or extending green space to ensure a wider exposure. However, it is not easy to increase the amount of greenery within urban areas in a short period. As an alternative, we propose the development of nature-based activities that utilize urban parks or gardens in order to expose elderly people to green environments in their daily lives. For example, forest bathing (therapy) program is one of the nature-based activities that promote physical and mental health using various elements of forest environment such as landscape, sound, phytoncide and anion [53]. The mental health of elderly people is more related to social activity than physical activity, based on the results of this study. Forest bathing programs provide elderly people with an opportunity to casually form social groups in nature [53] and help them facilitate connectedness with self, neighbors and nature [54]. In addition, resting and engaging in nature reduce fatigue and stress [55] and social contact within nature in parks or gardens boosts health and well-being [56,57]. As levels of association increase within a group, people have been reported to become more open with one another [58]. As a result, positive psychological changes

can begin to occur through mutual understanding and interests when social interactions are formed in a green environment [37]. Therefore, for green welfare policies that focus on vulnerable individuals, utilizing urban green spaces is likely to assist in reducing depression and stress for elderly people who lack the opportunities for physical activity and social interaction [59], and also help to reduce the financial burden of healthcare on governments. However, it should be noted that such a suggestion is beyond the scope of this study.

2.4.2. Limitations

This study has some limitations. First, many studies on the relationship between exposure to greenery and health have assessed the level of greenery using NDVI through setting neighborhood units linked to participants' addresses. In this study, we obtained a green exposure level for the participants using the administrative level of a district ("Gu" in Korean), but addresses could not be obtained. Therefore, it was not possible to precisely define green exposure in terms of individual neighborhood units. In addition, the random effects that could occur at various green levels were not controlled because we reflected the green areas of the administrative districts to the participants. However, the reliability of this study was enhanced through the large sample size used and the quality of the official administrative data collected and released annually. Second, the quality of the green spaces involved was not investigated. However, considering the seasonal characteristics of plants in Korea, and that the CHS is usually carried out from August to October, outcomes in relation

to the mental health issues focused on in this study were deemed unlikely to be affected by the seasons and state of the greenery, because the quality of greenery undergoes little change during the survey period. Third, the sample was limited to the residents of seven metropolitan cities. Although populations in all cities were not included, the reliability of the sample was increased through selecting the cities with the largest populations. Fourth, the amount of time participants spent in their residential areas was not considered. If the participants had spent more time in other areas, this could have led to misclassification, due to diverse exposure levels to a green environment with differing durations of exposure. Fifth, one question was used to assess depression among the response variables for mental health outcomes, and only two response options (yes, no) were used. In addition, it is possible that more biased response results were obtained because of the subjective nature of the responses, rather than what might have been obtained using medical diagnoses.

2.5. Conclusions

This study investigated certain sociodemographic characteristics of elderly urban residents, such as their socioeconomic status and health behavior, and the effect of exposure to urban green area on mental health in relation to stress and symptoms of depression. We have identified the characteristics of urban elderly people who are vulnerable to mental health issues and found that the proportion of green areas within a community is an important component in improving their mental health outcomes. Therefore, to ensure ongoing improvements in mental

health and maintain the mental health of elderly urban residents, it is critically important to give more attention to identifying vulnerable elderly groups and to either construct new urban green spaces or develop suitable nature-based activities that utilize existing resources.

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3. CHAPTER 2: Relationships between Social Capital, Social Capital Satisfaction, Self-Esteem, and Depression among Elderly Urban Residents: Analysis of Secondary Survey Data

3.1. Introduction

The urban environment promotes social disruption and renders its residents more vulnerable to mental health problems, such as anxiety and depression [1]. In 2017, 91.8% of the Korean population lived in cities due to rapid urbanization [2]. Further, the elderly urban population also rapidly increased from 56.4% in 1994 to 76.6% in 2014 [3]. The elderly are particularly susceptible to depression owing to both endogenous factors, such as physiological changes (e.g., reduced levels of Serotonin) [4] as well as exogenous factors such as reduced social networks resulting from downward mobility in socioeconomic status [5].

Depression in the elderly can adversely affect their likelihood of developing dementia [6,7] and committing suicide [8], thereby leading to increased social and economic costs [9]. The WHO reported that mental health is related to physical and social health and consequently burdens the health care system and impacts overall survival [10]. Therefore, the problem of depression among elderly urban residents is recognized as a social problem rather than as an individual-level problem; it is necessary to strengthen strategies that are aimed at preventing depression among the elderly. In recent years, pharmacological [11] and non-pharmacological [12]

strategies have been made available worldwide to attenuate depression-related disorders and psychological impairment. Given the advantages of pharmacological evidence, both recent standard serotonin-reuptake inhibitors (SSRIs) and serotonin-norepinephrine reuptake inhibitors (SNRIs) [11] to date have demonstrated their efficacy and potential to prevent negative outcomes associated with this invalidating illness. Therefore, the correct and rapid recognition or treatment of this disabling condition is an absolute imperative for the global community. However, depression is frequently associated with cognitive dysfunction. When it comes to non-pharmacological options, the existence of a trend toward improvements in the neurocognitive profile with repetitive transcranial magnetic stimulation (rTMS) has been demonstrated [12]. Therefore, new available treatment strategies may be considered promising for cognitive enhancement in major depression in order to avoid or attenuate the likelihood of developing disabling conditions such as dementia.

On the other hand, several factors have been found to play a role in depression among the elderly, including physiological factors [4,13,14], health status [15–17], socioeconomic characteristics [8,15,18,19], and health behaviors (e.g., leisure activities, physical activity) [20–23]. These factors can be addressed by adequate economic welfare support policies. However, many reports suggest that various aspects of the social environment, such as social capital and psychological factors, are associated with depression in the elderly [24]. In a meta-analytic study, Kim and Son (2005) showed that depression in the elderly evidenced the highest mean correlation coefficient with psychological variables and the lowest mean correlation

coefficient with demographic variables [24,25]. Specifically, correlation coefficients that emerged between depression and psychological variables (i.e., self-esteem, life satisfaction) yielded an average that was above 0.30. In other words, depression in the elderly showed a higher correlation with psychological variables than with demographic variables; it evidenced the strongest correlations with life satisfaction and self-esteem [25].

The findings of previous studies suggest that elderly people with high social capital, life satisfaction, and self-esteem tend to obtain low scores on measuring depression, making necessary policy efforts that are aimed at extending the social capital of the elderly. Social capital is defined as an individual's social network that is built on mutual trust, agreed-upon standards, sharing, etc. [26–29]. It acts as a protective factor and plays an important role in improving mental health status and reducing the prevalence of mental health disorders [30,31]. Accordingly, previous studies have found that social capital and support significantly improve mental health [16,23,24,32–35]. Individual's cognitive social capital is known to be a psychological factor of depression [30]; social support perceived by such social capital alleviates the loneliness and stress of the elderly [35]. It has also been reported that social capital facilitates subjective mental well-being and reduces psychological problems such as depressive symptomatology or anxiety [36,37]. At the same time, social capital is one predictor of individual life satisfaction [38]. Life satisfaction reflects the consequences of social conditions, norms, and interactions among social members. Therefore, positive perceptions of social capital and networks can be

expressed as subjective satisfaction with the social environment and is a part of measurements of life satisfaction [39]. Life satisfaction is defined as the subjective and overall assessment of an individual's life [40]. The variables that affect satisfaction with social environment include not only demographic characteristics but also social contact and relationships with others, such as friends or neighbors [41]. Life satisfaction is also expressed as quality of life or well-being and includes personal perceptions of socio-emotional functioning, social capital, well-being, and health status. Therefore, satisfaction with an individual's cognitive social capital is included in life satisfaction [26].

Little research examined the psychological aspects of social capital that affect depression. Therefore, it is necessary to understand the mediating effects of psychological factors in the relationship between social capital and depression in order to help elderly urban residents who are vulnerable to mental health problems build effective social capital.

The primary aim of this study was to identify the differential sociodemographic characteristics of elderly urban residents who are vulnerable to low social capital satisfaction, poor self-esteem, and depression. A second objective was to examine the relationships between depression and psychological factors such as social capital, satisfaction with social capital, and self-esteem, among elderly urban residents. Finally, we aimed to use the findings to provide evidence-based recommendations that are aimed at alleviating depression among elderly urban residents.

In this study, the hypotheses for the research model were set as follows: (1) Social capital, social capital satisfaction, and self-esteem are directly related to depression; (2) social capital is directly related to social capital satisfaction and self-esteem; (3) social capital satisfaction and self-esteem can mediate the relationship between social capital and depression; and (4) self-esteem can mediate the relationship between social capital satisfaction and depression.

3.2. Materials and Methods

3.2.1. Data Collection and Research Participants

This cross-sectional study used data that were collected as part of the 12th edition of the Korea Welfare Panel Study (KOWEPS) in 2017 by the Ministry of Health and Welfare and the Korea Institute for Health and Social Affairs (KIHASA) and Seoul National University (SNU). The data contains information about the living conditions and welfare needs of each population group differing in age and income level for each year since 2006 [42]. This survey did not use personally identifiable information, and all participants signed an informed consent form before the survey [42,43]. In a survey, trained researchers directly visited each household that was selected from a nationwide stratified double sampling in order to collect data by means of interviews [42]. The raw data can be downloaded from the Welfare Panel's website [43].

A total of 701 individuals (295 (42.1%) men and 406 (57.9%) women) who lived in urban environments and responded to all the survey questions were included in the present study. This sample consisted of 206 individuals (29.4%) between the ages of 66 and 70 years, 198 individuals (28.2%) between the ages of 71 and 75 years, 198 individuals (28.2%) between the ages of 76 and 80, and 99 individuals (14.1%) aged 81 years or older. With regard to educational level, 494 (70.4%) respondents endorsed the option, "Below primary school." For household type, 453 individuals (64.6%) reported living in "elderly single-generational households," 245 individuals (35.0%) reported living in "single-member households," and 3 individuals (0.4%) reported living in "multi-generational households." More than half of the participants perceived their subjective health to be poor (412 people (58.8%)). Further, 509 respondents (72.6%) were classified as "low income status," based on the below 60% of median income. This study was approved for exempt status by the Institutional Review Board of our university (IRB No. E1903/003-009).

3.2.2. Instruments

3.2.2.1. Depression

The brief 11-item Korean version of the Center for Epidemiologic Studies Depression Scale (11 CES-D) [44,45], translated by Jeon and Rhee [46], was used to measure depression in the KOWEPS [42]. After eliminating items that reduce reliability on account of low correlation coefficient between observed variables

(Table A1) [47], the selected variables were entered into our research model (Table 1). The total depression score was obtained by the sum of all the items with reverse coding of relevant items. Responses were recorded on a four-point scale ranging from "extremely rare," which is score of 1, to "most of the time," which is score of 4. Scores on the test range from 7 through 28; high composite scores indicated a high degree of depressive symptomatology [42]. Reliability of the scale was estimated using Cronbach's alpha, which was found to be 0.88 in this study.

3.2.2.2. Social Capital

Questions assessing social capital related to family, friends and neighbor as sub scales in the KOWEPS [42]. However, in the present study, only the relationships with friends and neighbors were assessed using six items given the research purpose of considering the social environment. In this study, six items pertaining to the social capital of the elderly were divided in terms of their social networks (i.e., network capital) and their subjective perceptions of trust in their relationship with others (i.e., cognitive trust).

Network capital was assessed using the following three items: "There are special people (friends or neighbors) who can help in an emergency." "There are special people (friends or neighbors) who make me comfortable." and "There are friends or neighbors around to share joy and sorrow." Responses can be recorded on a five-point Likert scale ranging from "strongly disagree," which is score of 1, to "strongly agree," which is score of 5; high composite scores indicate a strong sense

of cognitive network capital. Cronbach's alpha for this subscale was found to be 0.92 in the present study.

The measurement of cognitive trust was also confined to friends and neighbors. Cognitive trust was assessed using the following three items: "My friends or people around me try to help me." "I can depend on friends or people around when I'm in trouble." and "I can talk to friends or people around me about my problem." Responses to each item can be recorded on a five-point Likert scale ranging from "strongly disagree," which is score of 1, to "strongly agree," which is score of 5; high composite scores indicate a strong sense of cognitive trust. The internal consistency of the three items, estimated using Cronbach's alpha, was found to be 0.92 in the present study.

3.2.2.3. Social Capital Satisfaction

In the KOWEPS data, the satisfaction scale assesses satisfaction with life domains such as health, family income, residential environment, occupation, family relationship, social relationship, and leisure [42]. In this study, three domains related to the social environment (social relationship, leisure, and overall) [48] were selected for our research model (Table 1). Each item can be rated on a five-point Likert scale ranging from "strongly disagree," which is score of 1, to "strongly agree," which is score of 5; high composite scores indicate high social capital satisfaction. Cronbach's alpha for this scale was found to be 0.83 in the present study.

3.2.2.4. Self-Esteem

The Korean version of the Rosenberg Self-esteem Scale (RSES) [49] was used to measure self-esteem in the KOWEPS [42]. After eliminating items that reduce reliability on account of low correlation coefficient between observed variables (Table A2) [47], the selected items were entered into our research model (Table 1). The scale scores are the sum of all the items. Items are rated on a four-point scale ranging from "strongly disagree," which is score of 1, to "strongly agree," which is score of 4; high composite scores indicate high self-esteem. The internal consistency of this scale, estimated using Cronbach's alpha, was found to be 0.77 in the present study.

Table 1. Measurements of the variables in this study.

Latent Variable	Definition	Observed Variables	Categories
Depression	Depressive symptomatology felt in daily life during the past week	Poor appetite Doing well Depressed Burden Lonely Happiness Sadness	(1) Extremely rarely (2) Rarely (3) Sometimes (4) Most of the time
Network	Subjective recognition of the quantitative social network	Who can help in an emergency Who can make one comfortable Who can share in joy and sorrow	

		Can get help	
Trust	Confidence in social relationships	Can depend on others when in trouble	(1) Strongly disagree
			(2) Disagree
		Can talk about problems	(3) Neither
Satisfaction	The extent to which an individual feels satisfaction	Satisfaction with social relationships	(4) Agree
		Satisfaction with leisure	(5) Strongly agree
		Satisfaction as a whole	
Self-esteem	The extent to which an individual's respects and approves of himself/herself	Positive attitude toward oneself	(1) Strongly disagree
			(2) Disagree
		Satisfaction with oneself	(3) Agree
			(4) Strongly agree

3.2.3. Statistical Analysis

Descriptive statistics were used to examine the sociodemographic characteristics of the participants. The chi-square test was used to investigate sociodemographic differences in social capital satisfaction, self-esteem, and depression. Analyses were conducted using version 18 of the PASW Statistics (SPSS Inc, Chicago, IL, USA).

Structural equation modeling (SEM) was used to examine the relationship between social capital and depression, social capital satisfaction, and self-esteem among elderly urban residents. Two steps were undertaken to test the validity of our model. First, we conducted a confirmatory factor analysis to assess whether the observed variables are valid indicators of the latent variables. Second, the goodness-

of-fit of the model and the mediating effects of variables were tested using structural models [50]. To explore the association effects of psychological variables (i.e., social capital, social capital satisfaction, self-esteem) and depression, we conducted an analysis of the mediating effect of the SEM using the bootstrap verifying method [51].

The SEM model included both exogenous variables (i.e., social capital, measured in terms of network and trust) and endogenous variables (i.e., social capital satisfaction, self-esteem, and depression). Version 22 of AMOS (IBM, New York, NY, USA) for Windows was used to execute SEM and calculate the maximum likelihood estimates of the model parameters and the model fit indices. Goodness-of-fit of the measurement and structural models was examined using the following absolute fit indices [52,53]: Minimum value of the discrepancy function (CMIN: $\chi 2$), CMIN/df (Normed $\chi 2$) less than 2 or 3, Goodness-of-fit index (GFI) greater than 0.90, Root Mean Square Residual (RMR) less than 0.05, and Root Means Square Error of Approximation (RMSEA) less than 0.08. Additionally, the following relative fit indices [52,53]: Normed Fit Index (NFI), Tucker Lewis Index (TLI), and Comparative Fit Index (CFI) greater than 0.90 were also used.

3.3. Results

3.3.1. Sociodemographic Differences in Social Capital Satisfaction, Self-Esteem, and Depression

Table 2 shows sociodemographic differences in the dependent variables. Specifically, social capital satisfaction, self-esteem, and depression were significantly different across groups varying in household type, health status, and income status. However, no difference was found in self-esteem scores across groups differing in household type. Those individuals belonging to multi-generation households reported lower social capital satisfaction and self-esteem and greater depressive symptomatology than those individuals belonging to other household types. Participants with poor health also reported lower social capital satisfaction and self-esteem and greater depressive symptomatology than their healthier counterparts. Similar results were observed when groups differing in income status were compared on social capital satisfaction, self-esteem, and depression.

Table 2. Sociodemographic differences in social capital satisfaction, self-esteem, and depression (N = 701).

Sociodemographic Group	N	%	Satisfaction	Self-Esteem	Depression
			M ± SD	M ± SD	M ± SD
Sex					
Men	295	42.1	9.98 ± 1.87	4.90 ± 1.24	15.82 ± 5.98
Women	406	57.9	9.98 ± 1.92	4.78 ± 1.24	18.59 ± 6.79
$\chi 2$ (p)			0.13 (0.99)	7.61 (0.27)	31.35 (0.051)
Age group					
65–70	206	29.4	9.93 ± 1.83	4.74 ± 1.21	10.76 ± 3.84
71–75	198	28.2	10.22 ± 1.85	4.96 ± 1.29	11.59 ± 4.77
76–80	198	28.2	9.92 ± 1.97	4.78 ± 1.27	11.46 ± 4.28

>80	99	14.1	9.72 ± 1.95	4.83 ± 1.13	12.61 ± 4.39
$\chi 2$ (*p*)			45.47 (0.13)	11.15 (0.89)	64.68 (0.32)
Educational level					
<Primary school	494	70.5	9.92 ± 1.91	4.78 ± 1.24	11.69 ± 4.32
Middle or high school	181	25.8	10.03 ± 1.91	4.91 ± 1.25	11.08 ± 4.50
>College	26	3.7	10.73 ± 1.40	5.23 ± 1.18	9.58 ± 3.00
$\chi 2$ (*p*)			20.46 (0.67)	17.00 (0.15)	28.12 (0.92)
Household type					
Solitary	245	35	9.76 ± 1.92	4.71 ± 1.18	12.58 ± 4.62
Elderly spouse	453	64.6	10.12 ± 1.85	4.89 ± 1.27	10.81 ± 4.00
Multi-generation	3	0.4	7.33 ± 3.21	4.33 ± 1.53	17.00 ± 9.85
$\chi 2$ (*p*)			100.78 (0.00 **)	9.38 (0.67)	176.13 (0.00 **)
Health status					
Good	289	41.2	10.45 ± 1.65	5.16 ± 1.24	10.32 ± 3.71
Bad	412	58.8	9.65 ± 1.99	4.60 ± 1.19	12.25 ± 4.59
$\chi 2$ (*p*)			42.38 (0.00 **)	41.00 (0.00 **)	51.34 (0.00 **)
Income status					
Low-income class	509	72.6	9.78 ± 1.95	4.72 ± 1.24	11.88 ± 4.59
Middle class	192	27.4	10.50 ± 1.63	5.11 ± 1.21	10.32 ± 3.38
$\chi 2$ (*p*)			27.15 (0.01 *)	20.68 (0.00 **)	39.59 (0.01 *)

* $p < 0.05$; ** $p < 0.001$.

3.3.2. Measurement Model

The validity of the proposed model was examined using confirmatory factor analysis and structural model analysis. The convergent and discrimination validity of the scales used in the study were also examined [54]. As shown in Table 3, factor loadings (λ) indicating convergent validity ranged from 0.65 to 0.91; these values are above the acceptable threshold (i.e., 0.50). In addition, construct reliability (CR) values ranged from 0.80 to 0.93; these values are also above the acceptable threshold (i.e., 0.70). Similarly, average variance extracted (AVE) values, which ranged between 0.61 and 0.82, are also above the acceptable threshold (i.e., 0.50) [53].

Correlation analysis was used to examine the discriminant validity of the latent variables (Table 3) measured by the scales used in this study. The R square (i.e., R^2) value between two latent variables must be smaller than the AVE values of the two latent variables for a scale to be considered valid [53]. Table 4 shows that all the determination coefficients were less than the respective AVE values; therefore, the current measurement model can be described as demonstrating sufficient discriminant validity.

Table 3. Results of the confirmatory factor analysis conducted with scales measuring social capital, social capital satisfaction, self-esteem, and depression.

Latent Variable		Item	Convergent Validity			
			λ	OE.	CR	AVE
Social Capital	Network	NET1	0.80	0.38		
		NET2	0.89	0.22	0.90	0.75
		NET3	0.91	0.17		
	Trust	TRU1	0.90	0.18	0.93	0.82

	TRU2	0.90	0.18		
	TRU3	0.91	0.17		
Satisfaction	SAT1	0.78	0.21		
	SAT2	0.76	0.27	0.90	0.75
	SAT3	0.82	0.16		
Self-esteem	SEL1	0.65	0.24		
	SEL2	0.76	0.26	0.80	0.67
Depression	DEP1	0.70	0.36		
	DEP2	0.68	0.39		
	DEP3	0.79	0.20		
	DEP4	0.73	0.38	0.92	0.61
	DEP5	0.72	0.27		
	DEP6	0.66	0.48		
	DEP7	0.71	0.20		

OE = observational error; CR = construct reliability; AVE = average variance extracted.

Table 4. Intercorrelations among the latent variables.

Variable		Social Capital		Satisfaction	Self-Esteem	Depression
		Network	Trust			
Social capital	Network	**0.75**				
	Trust	0.59	**0.82**			
Social capital satisfaction		0.17	0.15	**0.75**		
Self-esteem		0.08	0.07	0.39	**0.67**	
Depression		0.05	0.05	0.29	0.26	**0.61**

Values presented in the table indicate R Square (R^2) values. Diagonal text in boldface represents average variance extracted (AVE) values.

3.3.3. Structural Model

Fit indices for the model presented in Figure 1 were found to be acceptable for all four variables, namely, social capital (i.e., network, trust), social capital satisfaction, self-esteem, and depression: $\chi^2/df = 2.83$, GFI = 0.95, CFI = 0.98, TLI = 0.97, RMR = 0.02, RMSEA = 0.05. Standardized coefficients for the direct paths from trust to social capital satisfaction ($\beta = 0.71$, $p = 0.04$), from social capital satisfaction to self-esteem ($\beta = 0.62$, $p = 0.00$), from social capital satisfaction to depression ($\beta = -0.36$, $p = 0.00$), and from self-esteem to depression ($\beta = -0.29$, $p = 0.00$) were significant. On the other hand, the standardized coefficients for all the direct paths from network to social capital satisfaction ($\beta = -0.35$, $p = 0.36$), self-esteem ($\beta = -0.34$, $p = 0.37$), and depression ($\beta = -0.04$, $p = 0.90$) were not statistically significant.
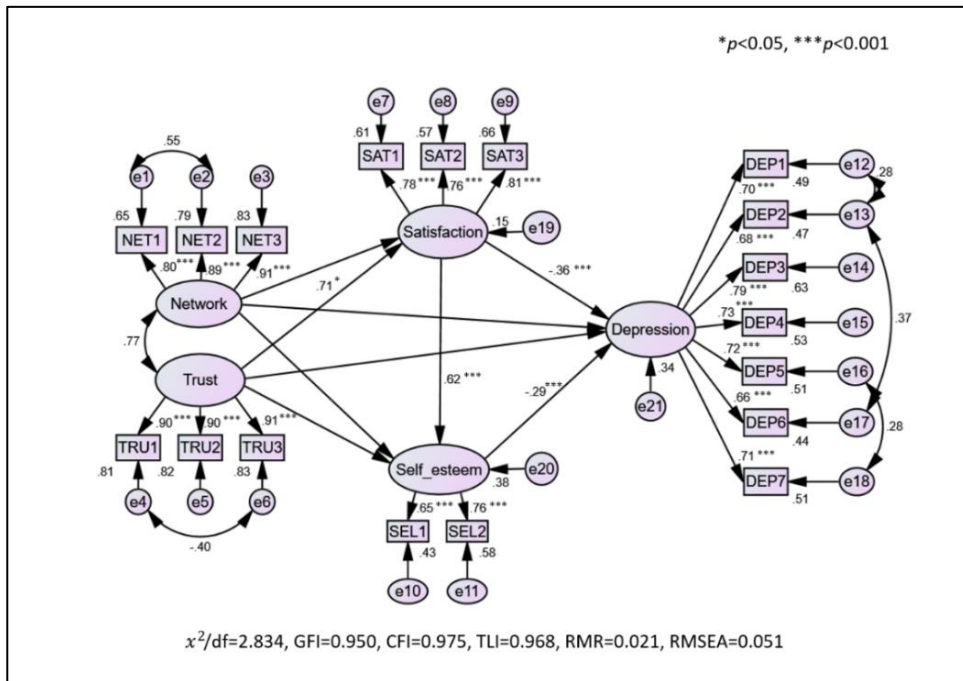
Figure 1. Model displaying factors associated with depression among elderly urban residents in Seoul, Korea (N = 701). NET1: There are special people (friends or neighbors) who can help in an emergency, NET2: there are special people (friends or neighbors) who make me comfortable, NET3: there are friends or neighbors around to share joy and sorrow, TRU1: my friends or people around me try to help me, TRU2: I can depend on friends or people around when I'm in trouble, TRU3: I can talk to friends or people around me about my problem, SAT1: satisfaction with social relationships, SAT2: Satisfaction with leisure, SAT3: overall satisfaction, SEL1: positive attitude, SEL2: satisfaction with oneself, DEP1: poor appetite, DEP2: doing well, DEP3: depressed, DEP4: burden, DEP5: loneliness, DEP6: happiness, DEP7: sadness. *Note.* **Values represent standardized factor loadings.**

3.3.4. Mediation Analysis

Table 5 shows the results of the analysis that examined the mediating effect of social capital satisfaction and self-esteem on the relationship between social capital (i.e., network, trust) and depression; this analysis was conducted by adopting the

bootstrap estimation procedure in AMOS (bootstrap sample of 500, 95% confidence intervals). Since the indirect effect estimates may not conform to a normal distribution, a bootstrapping method was used to calculate the most accurate confidence intervals for indirect effects [55]. The results of the analysis showed that social capital satisfaction fully mediated the relationship between social capital (i.e., trust) and depression (standardized indirect effect = −0.49, p = 0.00). Self-esteem partially mediated the relationship between social capital satisfaction and depression (standardized indirect effect = −0.18, p = 0.00).

Table 5. Standardized coefficients for the relationships between social capital (trust, network), social capital satisfaction, self-esteem, and depression.

Variable	Total (Direct, Indirect)			
	Trust	**Network**	**Satisfaction**	**Self-Esteem**
Social capital satisfaction	0.71 *	−0.31		
	(0.71 *, 0.00)	(−0.31, 0.00)		
Self-esteem	0.80	−0.53	0.62 **	
	(0.36, 0.44)	(−-0.34, −0.19)	(0.62 **, 0.00)	
Depression	−0.44	0.22	−0.54 **	−0.29 **
	(0.04, −0.49 *)	(−0.04, 0.27)	(−0.36 **, −0.18 **)	(−0.29 **, 0.00)

* $p < 0.05$; ** $p < 0.01$.

3.4. Discussion

Multi-generational households were found to report the lowest scores on social capital satisfaction, self-esteem, and the highest scores on depression, among the various household types. This result is consistent with our previous findings that families living in multi-generational households report higher levels of stress and depression than those living in other types of households [18]. A possible explanation for this finding could be that generational differences in political orientations or economic power cause conflicts among family members [56,57]. This result suggests that a comprehensive household welfare service is needed to resolve intra-household conflicts. Intergenerational problems and conflicts may not be solved over short periods. However, many institutions in developed countries have created generational integration programs to strengthen ties between the elderly and younger generations [58]. However, since changes in attitudes tend to be limited to specific situations in which the contact occurred, having various contact experiences is important in resolving conflicts among generations [59]. Kaplan suggested that various generational groups should participate together in school-based educational activities that include senior volunteers [60]. Intergenerational education and programs may solve intergenerational conflicts in the family in an aging society [61]. At the same time, generation-independent education and support, which does not transfer elderly care to the family's duties, as well as policies to expand social capital for the elderly, are needed to alleviate family conflict caused by aging [62,63]. In addition, integrated recreation not only positively influences children's attitudes

toward the elderly, but also positively affects the subjective well-being of the elderly [64].

The results of our study also support past findings that elderly individuals who have poor health and low income tend to obtain higher scores on tests of depressive symptomatology, than those with good health and income that is representative of the middle-class income class [8,15,18,65]. These findings suggest that physical health and economic factors are related to depression in the elderly.

Our results also support past findings that psychological variables, such as low social capital satisfaction and poor self-esteem, negatively affect depression [66–68]. With regards to the psychological variables that were included in our model, we found that one of the strongest predictors of depression is social capital. Although the effect of network on depression was not significant, the effect of trust on depression was indirectly significant. Further, social capital satisfaction and self-esteem significantly mediated the relationship between social capital and depression. These findings suggest that social capital does not directly affect depression; instead, its effect on depression is mediated by social capital satisfaction and self-esteem. Although many studies have examined depression in the elderly from a sociodemographic perspective, this study is unique because it also examined the role that psychological variables play in depression among the elderly. These psychological variables were selected based on the findings of our previous study [5], which revealed that social, not physical, activities are related to depression in the elderly. This study is also unique because it examined the mediating role that

these psychological variables play in the relationship between social capital and depression. The mediating effects of social capital satisfaction and self-esteem can promote understanding the effect of social capital on the depressive symptoms of elderly urban residents. Satisfaction and self-esteem are not easily changed with short-term interventions because of their cognitive characteristics. However, the social trust associated with the network positively affects satisfaction and self-esteem and may improve depression. In other words, strengthening social capital can help identify psychological mechanisms that can improve depression. Further, these findings suggest that depression in the elderly can be alleviated by improving their social capital resources. Depression among other members of the community can also be reduced by increasing their social capital resources (Jones, 2014).

Trust is a basic concept that reflects whether people are connected to others [69]; it is variously shaped by four specific factors (family, friends, neighbors, and strangers) [70]. Social trust toward social partners is positively related to subjective happiness [71]. Similar to the findings in our study, social trust in previous studies is correlated with social networks with friends or neighbors, as well as with participation in social activities [72,73]. For example, participants in social education programs, such as vocational, cultural art, and liberal arts programs, reported higher social trust levels than did non-participants [74]. Social trust is also associated with various sociodemographic variables, such as marital status, educational level, residential satisfaction, subjective health status, vocational education, and participation in civic education [30,75]. Therefore, sociodemographic characteristics

and social participation in the community may provide information that can help identify elderly people who are vulnerable to mental health challenges. Additionally, providing opportunities for social activities with neighbors will also help promote positive mental health among elderly urban residents who lack social capital.

The study findings underscore the importance of the psychological perspective in the provision of welfare services that are aimed at preventing depression in the elderly. In particular, it is necessary to develop a program that strengthens the trust within social capital of those individuals who are vulnerable to mental health problems, such as anxiety and depression. On the basis of our findings, we recommend periodic and long-term welfare policies for supporting trust-based relationships by engaging in open communication with neighbors. For example, our previous study that conducted a three-hour weekly nature-based activity in urban forest near the participants' residence for 10 weeks with neighbors for the low-income single elderly group reported that the relationships and trust with neighbors improved [5]. Specially, low-income elderly persons who lack opportunities for social participation and economic capital formed new relationships with neighbors, and their stress and depression reduced after they experienced periodic and long-term programs for leisure activities and health promotion [76]. In order to prevent and reduce the depression of elderly urban residents, it is necessary to support the social environment. Consequently, welfare policies for enhancing trust-based relationships with neighbors will help alleviate depression among elderly urban residents by improving their social capital satisfaction and self-esteem.

This study has several limitations. First, although the KOWEPS consists of a wide dataset, only a limited set of responses that were consistent with the research objectives of this study were included in the analysis. Second, sociodemographic variables were not included in the structural model because this study focused on psychological variables. Therefore, future studies are necessary that can expand this model by controlling for relevant sociodemographic variables. In addition, because this study adopted a cross-sectional design, the causality of the relationships between social capital and depression cannot be determined. We suggest an extended analysis on the basis of our study by adopting longitudinal designs.

3.5. Conclusions

The purpose of this study was to examine the role of sociodemographic characteristics and psychological variables in depression among elderly urban residents. We found that two psychological variables, namely, social capital satisfaction and self-esteem, significantly mediated the relationship between social capital and depression. Therefore, in order to improve efforts to prevent depression among elderly urban residents, it is necessary to identify vulnerable groups of elderly individuals and provide them welfare programs that are aimed at improving their trust in social capital.

3.6. Appendix A

Table A1. Correlation coefficients from Pearson correlation analysis between observed variables in depression.

	DEP2	DEP3	DEP4	DEP5	DEP6	DEP7	DEP8	DEP9	DEP10	DEP11
DEP1	−0.629 **	0.551 **	0.537 **	0.486 **	0.484 **	−0.479 **	0.376 **	0.334 **	0.295 **	0.296 **

$** < 0.01.$

Table A2. Correlation coefficients from Pearson correlation analysis between observed variables in self-esteem.

	SEL2	SEL3	SEL4	SEL5	SEL6	SEL7	SEL8	SEL9	SEL10
SEL1	0.496 **	0.341 **	0.382 **	0.310 **	0.374 **	0.312 **	0.219 **	0.388 **	0.168 **

$** < 0.01.$

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4. CHAPTER 3: Qualitative Assessment of Experience on Urban Forest Therapy Program for Preventing Dementia of the Elderly Living Alone in Low-Income Class

4.1. Introduction

The number of people with dementia is soaring due to the rapid aging of societies across the world, which is leading to a huge increase in social costs (Wimo et al., 2017). The World Health Organization (WHO) has predicted that the number of dementia patients around the world will more than triple to 152 million in 2025 due to the aging of society. The organization recognized dementia as a serious social problem and announced the Global Action Plan on the Public Health Response to Dementia in May 2017. In South Korea, the prevalence rate of dementia (23.7%, from 610,000 patients in 2014 to 1.01 million patients in 2024) is expected to increase more rapidly than the rate of the growth of the elderly population (15.8%, from 6.39 million in 2014 to 1.01 million in 2024) (MHW, 2015).

Since a drug for dementia has not been yet developed, once the disease develops, the slow process of deterioration over a long period of time is accompanied by many burdens and much suffering. In particular, in the case of the elderly living alone on low income, they could be more vulnerable to the onset of dementia due to the lack of personal and social support and networks (Ennis et al., 2014). In South Korea, the number of elderly people living alone is increasing along with the increase of the elderly population. The number of elderly living alone was 1.44 million in 2016 and

it is expected to be 3.43 million in 2035 (KOSIS, 2016). Therefore, it is the best approach to reduce the risk factors associated with the onset of dementia or delay the onset of the disease through healthy lifestyles (Barnard et al., 2014). In addition, it should be recognized that dementia is no longer a personal problem, but a social problem. Accordingly, there is an urgent need to develop prevention and management programs for high risk groups by strengthening preventive intervention.

Forest therapy or forest healing is one of the nature-based therapy methods that can improve physical and mental health by using various environmental factors such as landscapes, sounds, phytoncides, negative ions, and lights (Yu et al., 2017). The risk factors of dementia include psychological and physiological factors (Deckers et al., 2015), and the forest therapy program is effective in reducing anxiety, depression, and stress which are known as psychological dementia risk factors (Yu et al., 2017; Vujcic et al., 2017). Furthermore, it was reported that the therapy improved the autonomic nervous system responses and cognitive functions of elderly patients with dementia (Bratman, 2015; Kim, 2017), and also assisted in improving chronic diseases such as stabilizing heart rate variability (HRV) and pulse rate (Yu et al., 2017), decreasing blood concentration of stress hormones (Jia et al., 2016), lowering blood pressure of patients with high blood pressure (Mao et al., 2012; Song et al., 2017), and lowering blood glucose levels of patients with diabetes (Song et al. 2017). In this regard, it is expected that intervention utilizing the forest therapy program could be effective in preventing dementia and bring about other positive effects such as reducing social costs.

However, even though it is a fact that the elderly aged over 75 are classified as a high risk group who are particularly vulnerable to dementia (MHW, 2015), there are few studies on nature-based programs for the elderly living alone on low income. In order to expand the forest therapy program as part of a green welfare scheme to deal with the aging of society, it is necessary to understand to how vulnerable social groups are aware of the urban forest and therapy program, and what are the obstacle factors and diffusion factors in promoting them.

This study aimed to examine how the elderly living alone on low income recognized the urban forest therapy program in their daily life and what changes they experienced through this program. The study also sought green welfare measures for the elderly living alone on low income from the findings

4.2. Research Methods

4.2.1. Research design

To comprehensively understand regarding awareness of the urban forest therapy program to prevent dementia targeted at the elderly living alone who are medical aid beneficiaries and the changes brought about by such a program, this study conducted a qualitative research that analyzed data by using a thematic analysis method which is a data analysis method that explores contexts and situations. Qualitative research is an alternative approach to positivist quantitative research, and is also a

phenomenological type and method that approaches the phenomenon 'as it is' or 'from its original standpoint'as much as possible (Tong et al., 2007). Since important information such as the values of the research participants or their past experiences cannot be obtained through observation or scale, the analysis method collects data through interviews, and categorizes and classifies transcribed data after recording the interviews with the interviewees'consent, and identifies important themes or meanings through this process (Tong et al., 2007). Theme analysis (Braun and Clarke, 2006) derives patterns or themes related to the experienced meaning of participants. This method is effective in constructing the meanings and experiences of individuals derived from social and environmental contexts (Braun and Clarke, 2006), and it is especially important to understand the experiences of vulnerable groups with low social status or who lack social support in social and cultural contexts (Mama et al., 2016). Therefore, the theme analysis method is an appropriate research method for exploring participants' experiences and the meanings they place on things. The interview format followed a format to gain a detailed understanding of participants' experiences, recognition, beliefs, values, and behaviors (Ponterotto, 2002), and it aimed to comprehend relatively unknown concepts including the personal meaning of the urban forest for the elderly living alone.

4.2.2. Forest therapy program

The urban therapy program for preventing dementia was conducted from September 10 to October 17, 2018 except for holidays, from 10 a.m. to 1 p.m. once a week, with five sessions in total. The places were nature study trails and therapeutic forest trails located in the urban forest of N-gu in Seoul. The main activities of the program were divided as follows:'Dementia prevention exercise and forest walking'in order to manage risk factors for depression and dementia (Lee, 2009; Kim and Ahn, 2015), 'Five senses meditation'in order to induce cognitive stimulation and relieve emotions by reducing unnecessary distractions and concentrating on their own body and five senses (Yoo, 2010; Lee and Shin, 2015), and 'Traditional therapeutic play'to work effectively on relieving emotions and increasing physical residual function capacity (Seo, 2007) by re-experiencing the emotions and memories of their childhood through traditional play activities using natural objects (Table 1). The progression per session consisted of introduction (20~30 minutes, dementia prevention exercise and forest walking, five senses meditation, etc.), development (120 minutes. therapeutic play activities, lunch), and closing (20~30 minutes, feedback, assigning task) respectively.

Table 1. Activity details of forest therapy program for preventing dementia

Contents	Activities
Warming up	Body tapping, eyeball turning, hand clapping, etc.
Forest walking	Walking slowly with listening to the sound of the forest, looking at the trees and Feeling the wind
Five senses meditation	Focusing on listening to, looking at and feeling the nature, deep

	breathing
Traditional therapeutic play	Stone hitting game, stacking up wood stick game, giving hand massage with aromatic oil each other, etc.
Feedback & Assignment	Talking and sharing about health promotion, checking health care daily log, etc.

4.2.3. Research participants and ethical considerations

Participants for this study were the elderly living alone in single households who were medical aid recipients over 65 years old, who didn't have problems related to physical activities and who participated in the 'Urban forest therapy program for preventing dementia' conducted in an urban forest in Seoul. They were recruited from residents of A-dong and B-dong in N-gu that are areas not originally related to the program and consisted of people who were willing to participate voluntarily after receiving an adequate explanation regarding the purpose and methodology of the study. The total number of participants were 21 people, the group being composed of 8 men (average age: 73.7 ± 4.3) and 13 women (average age: 74.6 ± 7.0). Except for two participants, all of them had mild chronic diseases such as backache, high blood pressure, and diabetes. Before collecting the data, the researchers clearly identified themselves, explained the purpose and process of the study, and also explained that the anonymity of the participants would be guaranteed and the collected data would be used for research only. In addition, participants signed the study agreement after receiving an explanation that the data would be discarded at

the end of the study and that they had the right to refuse continuing with their participation during the study.

4.2.4. Data collection and analysis method

Data collection was conducted at the end of the therapy program, October 16 (13 participants from A-dong) and October 17, 2018 (8 participants from B-dong) in the urban forest by interviewing the focus groups. The focus-group interview is a group interview wherein purposive participants to a specific topic get together and have a focused discussion in a narrative way (Rabiee, 2004). It is a useful method to collect the participants'thoughts and feelings on a new theme because the method has a synergy effect of interaction which makes them realize unrecognized things after listening to the remarks of others (Morse, 1994). Furthermore, the advantage of this method is that it is easier to obtain information from a group interview where there is a sense of kinship rather than a face-to-face interview with a researcher when there is a difference in social status between participants and researchers (Gubrium et al., 2012). The researchers provided the participants with the research method and content again just before the interview, and they explained the interviews would be recorded. The researchers also informed them that the research content would be used for research only and the content would be discarded at the end of the study.

The interviews were conducted for one and a half hour, respectively. A semi-structured type format was used based on questions, and the main questions selected

as a result of discussion among researchers were as follows: (1) What is the meaning or significance of participating in the urban forest therapy program? (2) How did you come to be aware of urban forests and the therapy program? and (3) How does the urban forest affect an individual's health and well-being either positively or negatively?

All the interviews were transcribed by the researchers and the manuscript was entered into NVivo version 12, qualitative analysis software, after assigning a number (e.g. P1) to each participant. In the input data, meaningful words, sentences, and paragraphs were open-coded first, and then were grouped and classified in similar sentences and paragraphs. The classified sentences and paragraphs were categorized and given labels based on their category (Hsieh and Shannon, 2005). The researchers concluded the final result through discussion for adding and revising categories by continuing to compare different situations while reaffirming the analysis process of extracting concepts and labelling the categories.

4.2.5. Reliability and validity

The study was conducted based on the evaluation standard of qualitative research (Guba and Lincoln, 1989) in order to secure reliability and validity. To secure the facticity of the data, the research assistant summarized the discussion after the interview with the focus group and received participants'consent, and this confirmed that the contents of the interviews were faithfully and accurately recorded

and summarized. The applicability of the study was secured by sending our finally analyzed study result to a forest therapy expert and a program operator and asking them to check the study content.

4.3. Results and Discussion

Participants agreed that experiencing the program was good and they positively responded to the forest welfare services. In addition, they attached special significance to the therapy program as it enabled them to have a chance to learn about healthy lifestyles by experiencing dementia prevention exercises and activities, and because it also can pave the way for them visit forests with neighbors with whom better relations are established. On the other hand, they mentioned in the discussion that the number of the elderly who wanted to participate in the program had increased, but that there were many obstacles to participating in the program such as a lack of publicity about the program. They also suggested measures for activating the program.

4.3.1. Awareness of urban forest and forest therapy program

The elderly living alone who experience isolation and loneliness recognized and appreciated that all the themes associated with the urban forest and the therapy program participation afforded them opportunities to establish relations and have a

sense of belonging. The characteristics of the urban forest and the therapy program experiences can be categorized into three themes based on the agreement and decision of the researchers: 'Connectedness with self through immersion and fulfillment', 'Connectedness with self and neighbors', and 'Connectedness with self and nature'. They were based on the representative quotations presented below:

4.3.1.1. Connectedness with self through immersion and fulfillment

The participants regarded the urban forest as a safe space for leisure activities and demonstrated an awareness that the forest could serve as a motivation to naturally they can be immersed in themselves. For example, when discussing the importance of the urban forest in daily life, they stated the following:

"This is a good place to spend time. I have different thoughts whenever I come here, and I can escape such thoughts here."

"I took a walk here by taking a bus alone when I didn't have a program. I didn't think I would come to a mountain before, but now I'm pleased to have a place to go in my town."

Many participants recognized the urban forest as a place where they can recharge their energy and improve their physical and mental health and discussed how people can spend their time alone in the forest and immerse themselves in their favorite activities to feel joy.

"I like quiet things, so when I listen to the birds, I feel gratitude to all the things and feel alive."

"I see camellia trees in the mountain. I had not seen them for 40 years, and I remember that my mother made some oil from paulownia trees when I was young, and I also remember pastimes."

4.3.1.2. Connectedness with self and neighbors

This theme expresses the concept that participants feel that they are intimately connected to their local community and physical neighborhood through participation in the urban forest therapy program. Many participants who felt isolated found that it was important to develop social relationships.

"The forest seems to bring neighbors close to each other. It's nice to come alone here, but you will get to know your neighbors when you come with people who have not seen your face before."

"When I come to the mountains alone without anyone to talk to, I have bad breath. It was so fun to play with my neighbors."

The urban forest is seen as a place where people can focus their interests and immerse themselves in enriching experiences. Some participants discussed how they came to share similar interests and connect with neighbors who liked to participate in the same type of activities through the urban forest. The following statement

shows how urban forests provide motivation for people in the community to participate in the activity where no opportunities to participate had previously existed.

"With people who love to walk around. I go with my (neighbor) sister to the mountain. I cannot go to areas faraway, so I go to a mountain that is close to my town."

"In the house, I do not have a chance to talk and I just watch TV, but I often talk about eating and living when I am in the mountain. Those who like such things come here."

4.3.1.3. Connectedness with self and nature

The last theme identified through awareness about the urban forest and therapy program was that participants felt that the urban forest was a place to connect them with nature. Many participants expressed emotional feelings about fact that the urban forest provides 'fresh air and contact with nature' to us. It was also recognized as an oasis of peace to escape from the noisy 'concrete jungle.'

"When I close my eyes in the forest and try to listen to sounds, I can hear a lot of things I cannot hear in the city. The sound of the wind and the sound of birds."

"As the teacher (guide for the program) says, I feel comfortable and calm compared to the other places when I listen to the sound of the forest and see the shades of green here."

In the same context as above, they discussed how nature can improve mood and enhance happiness while discussing their reasons for visiting the urban forest and participating in the therapy program. These results suggest that the characteristics of nature, which affects people's health and well-being, are among the most important factors in promoting relations with the urban forest.

"(In the program) I decided on my tree. One day when I came alone I felt the tree was talking to me. At that time, I felt comforted by the tree and I haven't felt that way from anybody or anything before, so I cried after I came back home that day."

"I see a lot of trees and squirrels here and they make me remember my old days and make me feel good. Playing some childhood games such as tossing pine cones or tree sticks makes me feel like I am revisiting my past days. Now I have some fun memories."

4.3.2. Positive and negative awareness of change

Participants were affected by the awareness of the urban forest and the forest therapy program and realized the change in their daily lives. The theme of positive change was associated with 'Improvement of mental and emotional condition', 'Improvement in feelings of isolation and loneliness', and 'Improvement of health-related lifestyle', and the theme of the negative change was associated with 'Short-

period program', 'Inconvenience of access', which were all classified into the theme that relations couldn't be maintained in terms of relationship formation.

4.3.2.1. Improvement of mental and emotional condition

This theme reflects the general belief that the urban forest provides participants with opportunities for self-reflection, serving as a place for resolving daily conflicts and feelings of resentment. The majority of the participants stated that their participation in the therapy program activities in the urban forest calms the mind and makes them feel better.

"We can all get stressed. Now I'm not stubborn and trying to win, but I'm in a bad mood. If I abandon such feelings here, I get less angry."

"I sweat by exercising my body. I have fun playing childhood games, so I feel really good and I feel like I'm having a picnic."

4.3.2.2. Improvement in feelings of isolation and loneliness

Participants recognized that the activity time with their neighbors helped them reduce feelings of isolation and loneliness. Furthermore, they experienced a relaxation of the mind and body in nature through meditation, exercise and therapeutic play that enhance the five senses in nature. They also recognized that

their feelings of isolation and loneliness improved as the sense of feeling distant or remote dissipated and the sense of intimacy formed while being together with their neighbors.

"The people who met here are all from the same town, so it would be nice to meet them on the street."

"I liked playing games here together neighbors. I was alone all day at home. I did not get bored here because I played here all day, and I liked talking to them while having some meals together."

4.3.2.3. Improvement of health-related lifestyle

Participants realized that the burden of taking all their meals alone and the decreased motivation resulted in dietary nutritional deficiencies, and thus the frequency and intensity of their physical activities also decreased as their physical energy decreased. However, they recognized that their physical and mental health were improved under the encouragement to acquire and practice regular and healthy lifestyle habits through the urban forest visits and the dementia prevention program activities.

"I've always done things learned here. Even when I do the dishes, I do stealthy footsteps exercise (dementia prevention exercise for the elderly). Walking on the

road with soil and stones here stimulates my feet and it makes me pay attention not to fall."

"At first it was hard to climb stairs. Now, everything is changed. I live alone, so I have few meals and I didn't have enough energy. However, I eat full meals here because I do some exercise."

"I don't skip meals and check what I eat everyday while reading the book (for healthy lifestyle practice) that you gave us."

"I had a digestion problem. Even though I just visit the mountain once in a week, I can experience a huge effect. The nurse (who visits my home) asked me why I did not have medicine for digestion. I'm okay now without the medicine."

4.3.2.4. Regret regarding the short-period program and inconvenience of access

Participants who learned the healthy exercise methods and the healthy lifestyle practices for the prevention of dementia expressed regret about the fact that the program ended after only five sessions although they wanted to participate more because they enjoyed the program, and they expressed their desire that the program would be continuously developed.

"It's good to do it in the nearby area and exercise is fun when we do it together"

"When I was in my 20s, 30s, and 40s, I felt I was healthy and I didn't need to go to the mountains. I want to go to the mountains because my body condition has deteriorated after passing middle age. This program led me here. I hope there is a program that can continues in this neighborhood."

On the other hand, there were participants who expressed their willingness to continue visiting the urban forest during their leisure time and engage in physical activities after the program was over. They learned how to spend time in the forest after participating in periodic forest experiences led by an instructor but stated that the biggest obstacle to revisiting was transportation.

"The elderly who are not healthy cannot come here alone, so we need more of these programs."

The above results are summarized as follows. Figure 1 explored the potential psychological and social pathways in which the therapy program for preventing dementia using urban forests could provide opportunities for the elderly living alone on low income to form social networks and improve health and welfare in order to prevent dementia. The results also suggested a human-centered green welfare system that could form the basis for future research on preventive measures against dementia. However, it is considered that the detailed exploration of concepts and causal relations is beyond the scope of this study. Given that relationships are important to human beings as they provide beneficial effects on health and well-being (Swierad and Huang, 2018), the main implication of the results is that the expansion of green

welfare, which incorporates psychological factors, is important. Specifically, the results revealed the awareness of participants regarding various relationships, and also confirmed that the relationship formation through 1) connectedness with self, 2) connectedness with neighbors, and 3) connectedness with nature, had effects on reduction in psychological and physical risk factors associated with dementia by alleviating feelings of isolation and enhancing a sense of well-being, thus helping them acquire healthy lifestyle habits. This is supported by the results of advanced researches that showed the use of urban green spaces is associated with not only the basic desire for human connection with other people in terms of personal encounters, recreation, and activities, but also with a desire for connection with the larger community, nature and one's inner self (Svendsen et al., 2016).

The findings that urban forests and the therapy program helped human beings form relations and facilitate connectedness are more important when considering the increasing trend of elderly people living alone in an aging society. For example, the proportion of elderly people compared with the total population will increase to 37.4% in 2050, and the number of elderly people with dementia is expected to increase to 15% among the elderly (MHW, 2015). Therefore, it would seem that this kind of program can contribute to the prevention of dementia and reduction of social costs by using the program as a source of social support for the elderly living alone. This suggestion is based on advanced studies that reveal that social interaction (House et al., 1988) and group activity can have a positive impact on motivation (Sonntag-Öström et al., 2015); the people within the group become more open to each other

as the level of group solidarity increases (Yalom and Crouch, 1990); and processes of psychological change are stimulated through mutual understanding and interest when social relations are established in a forest environment (Rogers, 1995). As mentioned above, this effect suggests that the elderly living alone, many of who lack family and social support, have the ability to cope with their own problems, such as improving chronic diseases through healthy lifestyle habits as well as reducing depression and stress. In other words, the urban forest therapy program can be proposed as one of different policy alternatives to reduce the financial burden of the government and local governments by improving the self-health management ability of the elderly by promoting regular exercise and lifestyle changes.
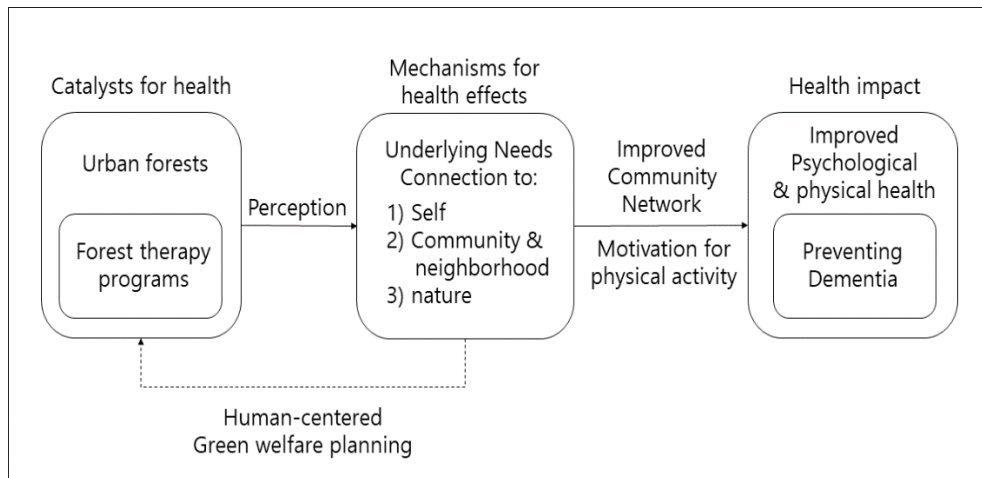
Figure 1. A human-centered green welfare framework to understand potential implications regarding the effects of urban forests and forest therapy programs on health for preventing dementia.

4.4. Conclusion

This study examined the effects and pathways of a regular urban forest therapy program that included 'Dementia prevention exercises and forest walking', 'Five senses meditation', and 'Traditional therapeutic play', based on in-depth interviews with focus groups among the elderly living alone on low income. First, awareness about urban forests and the therapy program appeared to promote making connections with oneself, neighbors and nature. Second, this awareness developed into a willingness and effort to alleviate depression and feelings of isolation and improve health-related lifestyles. These results suggest the potential pathways for preventing dementia, in which intervention based on a nature-centered therapy program reduces psychological dementia risk factors by reducing stress and improving depression symptoms of the elderly living alone; and reduces risk factors associated with dementia such as chronic diseases by developing into a willingness and effort to improve health-related lifestyle.

However, a limitation of this study is that it was based on a short-term program composed of five sessions and outcomes and experiences could be different in relation to one-session or long-term programs. In addition, participants' personal characteristics as residents living in a specific region, the regional characteristics of their area of residence, and empirical characteristics depending on the nature of the urban forest could influence the result of the study. However, this study is considered important as a new way to refer to the use of urban forests and the development of

relevant programs as health resources in the future in terms of the fact that the research was conducted by recruiting people on a voluntary basis and that the research was conducted on elderly people living alone on low income who lived in an urban area. Future research, as part of more extensive studies, will need to develop human-centered, continuous, and periodic green welfare services for the elderly living alone on low income, and it also should be expanded to include local welfare networks in order to find ways to actively combine with local issues regarding the prevention of dementia by exploring various examples of other vulnerable groups. This will provide essential information to policy makers in order that they can understand how to use urban forests as a health resource for their citizens and to support urban public health policies.

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5. CHAPTER 4: Healing Experiences of Middle-Aged Women through an Urban Forest Therapy Program

5.1. Introduction

Many urban residents who live in a structure-dominant environment believe that experiences in nature help their physical and mental health (Nilsson et al., 2011). This phenomenon is explained by the Attention Restoration Theory, which was developed by Kaplan and Kaplan (1989). It contends that urban residents need a restorative environment to replenish energy lost through directed attention fatigue and to relieve chronic fatigue. One restorative environment is a nature setting (Kaplan and Kaplan, 1989; Kaplan, 1995). The Stress Reduction Theory, developed by Ulrich, also explains the need for urban residents to experience nature. It asserts that human emotions aroused through interaction with nature reduce stress and assist with human physiological functions (Ulrich et al., 1991; Shanahan et al., 2015; Jiang et al., 2016). In addition, Hartig et al. proposed a social ecology model in which environmental intervention could mediate daily chronic stress (Hartig et al., 2003).

Urban natural environments provide a positive impact on physical and psychological health outcomes (Shanahan et al., 2015; van den Bosch and Ode Sang, 2017). In particular, the health benefits of rich and well-connected environmental support at the neighborhood level are assessed through objective and subjective measurements. Many previous studies have examined the importance of neighborhood natural environments by measuring the physical and psychological impacts associated with the quality of neighborhood green spaces on diverse

populations such as children, adolescents, and the elderly (Norman et al., 2006; Jackson and Tester, 2008; Wang et al., 2012; Kim et al., 2014, 2016). According to Kulinkina, an urban green area can provide sustainable health benefits because it is accessible (Kulinkina, 2015). The urban forest characteristics that play a role in the restorative environment are vegetation structure (Tomao et al., 2018) and closure of view to the urban matrix (Hauru et al., 2012). In addition, experiences in neighborhood green spaces improve physical activity, social relationships, and psychological health (Neuvonen et al., 2007; Raymond et al., 2017; van den Berg et al., 2017; van den Bosch and Ode Sang, 2017; Vujcic et al., 2017).

Many studies have demonstrated the benefits of nature-human interaction on human health, such as through forest therapy, especially in Asian countries (e.g., South Korea, Japan, Taiwan). These studies have called for a new governmental paradigm called forest welfare (Shin et al., 2017). This research usually focuses on the physical, psychological, and physiological impacts of forest therapy, which is a health promotion method that uses proven effects of a forest environment, such as relaxation (Song et al., 2017). Several studies have demonstrated the beneficial effects of forest therapy programs, which generally consist of walking, guided activity, or educational sessions in a forest environment. For example, Yu et al. found that middle-aged and elderly participants in a short-term forest therapy experience reduced pulse rate, blood pressure, heart rate variability, tension, nervousness, and depression, and increased energy (Yu et al., 2017). Ochiai et al. also showed forest therapy's positive impacts on pulse rate, cortisol concentration, and mentality for

middle-aged women (Ochiai et al., 2015). Mao et al. found that forest therapy reduces blood pressure in elderly people (Mao et al., 2012). Some studies demonstrated the positive impacts of exposure to landscape images and forest soundscapes on human mental health (Takayama et al., 2014; Joung et al., 2015; Akpinar, 2016; Song et al., 2018). Additionally, the forest environment and forest therapy programs can relieve office workers' stress (Jung et al., 2015) and depressive symptoms (Lee et al., 2017).

However, these studies have limitations. First, large number of the studies are based on a quantitative approach. Even though each of these studies showed positive effects for forest therapy, it is difficult to understand what process drove those effects. Second, most forest therapy programs in previous studies were conducted in non-urban forests, suggesting limited applicability for busy or vulnerable individuals (Shin et al., 2017). Although the health benefits of urban forests have been highlighted, urban forest therapy programs are currently lacking. Third, much of the research was conducted with young volunteers or patients. These past studies are unable to address the impact of urban forest therapy on other population groups. Ochiai et al. reported that the impact of forest therapy programs differs by age, and that the group most in need of the program is middle-aged individuals because concerns regarding aging and health usually occur in this age group (Ochiai et al., 2015). Middle-aged women are especially likely to experience menopausal symptoms such as depressed feelings and anxiety (Ayers et al., 2010; Sassarini, 2016). While career women may have been focused on work achievement and

recognition, rather than on anxious or depressed feelings, homemakers may have lacked the awareness or motivation to cope with anxious or depressed feelings because they were focused on mothering (Giele, 2008).

Therefore, this study focuses on the impact of forest therapy on middle-aged individuals, particularly homemakers, using a qualitative approach to study a site in an urban forest. The purpose of this study is to investigate: 1) how the psychological changes of middle-aged women occurred through the urban forest and therapy program, and 2) why such changes occurred in the group.

5.2. Materials and methods

5.2.1. Study site

The study was conducted at Yangjae Citizen's Forest in Seocho-gu, Seoul Metropolitan City, South Korea. Seocho district is generally referred to as a part of greater Gangnam area, located in the southern part of Seoul, and 60% of the district's total area is green space, giving it a pleasant residential environment. The total area of Seocho-gu is 47 km^2, the population is 451,477 (male 48.0% [216,886], female 52.0% [234,591]), the population density is 9,610 people/km^2, and specific use areas consist of residential zones of 40.3% (1,890,070 m^2), commercial zones of 2.8% (1,317,259 m^2), and green zones of 56.9% (26,692,558 m^2). There are 120 urban parks including children's parks, neighborhood parks, urban natural parks, and lake area parks (total area of 15,071,000 m^2); the park area per capita is 35.16 m^2. In May

2017, the mean air temperature in Seocho-gu was approximately 13.6°C and the mean relative humidity was 59.0% (Seocho-gu, 2017).

The Yangjae Citizen's Forest is a neighborhood park that has good accessibility as it is adjacent to a residential area with a subway station, highway toll gate and bus stop (Lee et al., 2018). The northern and eastern part of the forest is adjacent to the riverside green area, and the western part is adjacent to the highway buffer green (Figure 1). The size of the forest is 258,991 square meters. The forest was built in the 1980s, and mature trees have shaped the forest landscape. The main species are *Pinus densiflora, Pinus koraiensis, Zelkova serrata,* and *Aesculus turbinata*. It contains over 90,000 trees, the average height of which is 23 meters. The main facilities are trails (4.8 km), acupressure trails, grass, ponds and fountains, barbecue grounds, outdoor weddings, toilets, and sports facilities such as volleyball courts and tennis courts. Social situations include various events for residents such as forest commentaries, ecological learning, concerts, and exhibitions.
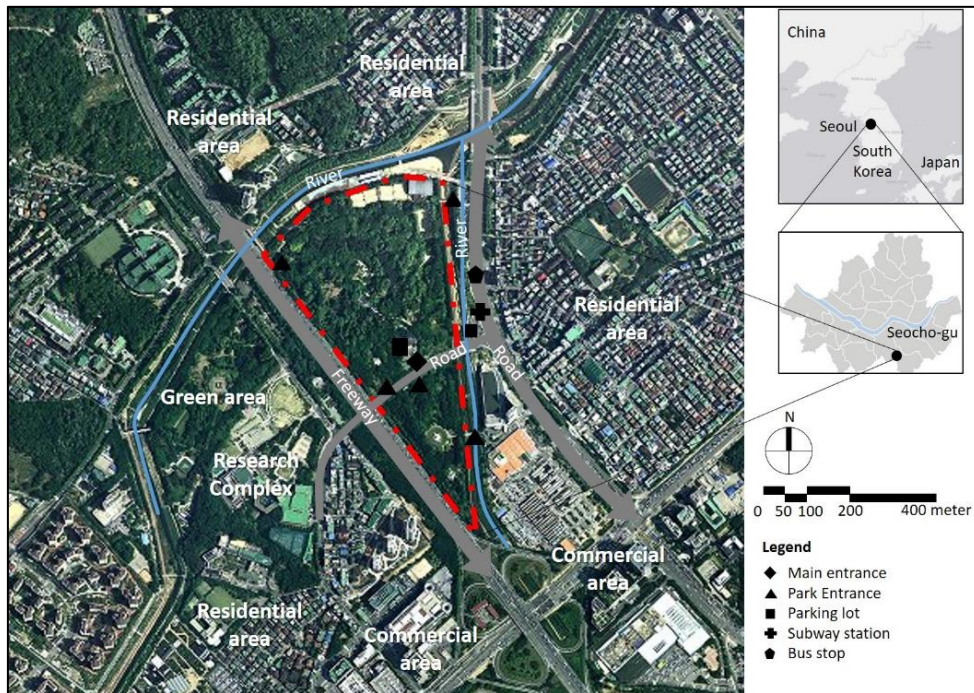
Figure 1. Study Site: Yangjae Citizen's Forest

5.2.2. Forest therapy program

The urban forest therapy program, which met weekly from May 9 to May 30, 2017 from 10 am to 12 pm in a total of four sessions, was operated by the city as a pilot project to improve the general health of citizens utilizing urban forests at the neighborhood level. Two trained forest therapy guides helped participants engage in activities to experience the natural environment with all their senses. The main activities of this program were "warming up and stretching exercise," "therapeutic activities," and "meditation and feedback" (Table 1). "Warming up and stretching exercise" is effective for emotional relaxation through physical activities (Fox, 1999).

A previous study reported that resting and engaging in crafts activities in nature reduce fatigue and stress (Dolling et al., 2017) and boost self-esteem and self-confidence (Sonntag-Öström et al., 2015). Observing nature or just understanding it effectively works to restore concentration (Taylor et al., 2001; Maller et al., 2006) and enhances people's ability to cope with stress (Ulrich et al., 1991). Meanwhile, social contact within nature in parks and gardens enhances health and well-being by dissolving prejudices about race, as well as economic or educational status (Lewis, 1992; Maller et al., 2006), and better social cohesion reduces stress (Ulmer et al., 2016). Based on previous studies, "therapeutic activities" focus on observing nature, creating crafts using natural materials, communicating with trees, and communicating with other people in the participant group through cooperating and consideration of activities. "Meditation in forest" is effective in reducing unnecessary concentration and focusing on one's own body and internal circumstances (Peterson and Pbert, 1992; Unsworth et al., 2016).

Table 1. Activity Details of Forest Therapy Program

Sessions	Theme	Contents	Activities
1st (May 9, 2017)	Communicating with the forest and others (Open mind)	▪ Introductions, stretching exercise	▪ Upper and lower body stretching, stretching each other
		▪ therapeutic activities (game)	▪ Creating a fancy name related to nature, a fancy name-calling game throwing a bundle, tree hugging
		▪ Meditation by reading poetry	▪ Focusing on reading poetry in the forest
		▪ Herbal tea time with group communication	▪ Talking and sharing experiences while drinking herbal tea, asking questions

2nd (May 16, 2017)	Finding and experiencing the forest	▪ Stretching exercise in pairs	▪ Upper and lower body stretching, stretching each other
		▪ Therapeutic activities (observing and crafts)	▪ Listening to explanations and observing the shapes of plants and trees, engaging in crafts using natural materials
		▪ Meditation	▪ Focusing on deep breathing
		▪ Herbal tea time with group communication	▪ Talking and sharing experiences while drinking herbal tea, asking questions
3rd (May 23, 2017)	Discarding and filling (Time to find me)	▪ Stretching exercise, breathing and walking	▪ Upper and lower body stretching, stretching each other, walking slowly while concentrating of breath
		▪ Therapeutic activities (disability experience)	▪ Guiding a blind partner along a woodland path
		▪ Contemplation meditation	▪ Focusing on looking at the sky and experiencing the nature by lying in the forest
		▪ Herbal tea time with group communication	▪ Talking and sharing experiences while drinking herbal tea, asking questions
4th (May 30, 2017)	Self-reflection	▪ Stretching exercise in pairs, Yoga	▪ Upper and lower body stretching, stretching each other
		▪ Therapeutic activities (aromatic hand massage in pairs)	▪ Giving each other hand massages with aromatic oils
		▪ Idle Meditation	▪ Focusing on the stream of consciousness while sitting in the forest
		▪ Herbal tea time with group communication	▪ Talking and sharing experiences while drinking herbal tea, asking questions

5.2.3. Research participants

Nine middle-aged women, between 50 and 60 years, participated the program, and researchers were not involved in their program participation. All participants

voluntarily agreed to take part in the program through an online application. These nine middle-aged women participants were asked if they were interested in participating in this research, and seven participants agreed to be interviewed. All participants were native Korean, with a mean age of 58.7 years (SD ±3.7; see Table 2). All of them were married and lived with their spouse. They had an average of two to three children, and three of them were living with their children. Regarding educational level, one participant was a high school graduate and six had higher than college level education; all participants were housewives and had no discomfort with physical activity. Five participants lived within a 1-kilometer radius to the forest. The other two were within 10 kilometers (20 minutes of driving or 10 minutes of taking a subway); of those two, one had previously lived within a 1-kilometer radius of the forest and the other had lived within 2.5 kilometers of it. No participants had previously experienced a forest therapy program.

Study participants were apprised of the study purpose and the provisions for protecting their privacy and confidential information. All research participants provided informed consent and received $20.00 compensation for the participation.

Table 2. Characteristics of Research Participants

No.	Sex	Age (Old)	Periods after marriage (Years)	Children	Education level	Distance to the urban forest	Transportation
P1	Female	53	27	One son, One daughter	Higher than college	Within 1 km	15 minutes walking

P2	Female	55	27	One son, One daughter	Higher than college	Within 1 km	15 minutes walking
P3	Female	57	30	One son	Higher than college	Within 1 km	15 minutes walking or 4 minutes riding a bicycle
P4	Female	59	35	One son, One daughter	High school	Within 10 km	20 minutes driving
P5	Female	61	36	One son, One daughter	Higher than college	Within 1 km	15 minutes walking
P6	Female	61	35	Two sons	Higher than college	Within 1 km	15 minutes walking
P7	Female	65	44	Two sons, One daughter	Higher than college	Within 10 km	20 minutes driving or 10 minutes taking a subway

5.**2.4. Study design**

To explore and analyze the middle-aged women's healing experiences from the urban forest therapy program, Grounded Theory, one of the representative qualitative research methods developed by Glaser and Strauss, was selected to draw new perspectives (Glaser and Strauss, 1967). The reason is given below. First, research on the psychological healing process in an urban forest requires exploration through qualitative methods because few studies have been conducted and hypotheses, which require verification, have not yet been established. Second, this study is an empirical research with the aim of gaining a deep understanding of specific situations and object-oriented interpretations rather than generalizations. In

addition to the existing theoretical model, we investigated how psychological recovery occurs in middle-aged women who lack self-esteem and self-confidence. In addition, we examined how the urban forest and therapy program works.

5.2.5. Data collection and analysis

Focus group interviews were conducted to gather data. This is an efficient approach for collecting participants' thoughts and feelings on a new topic and has a synergistic effect such as becoming aware of things they had not noticed after others mention them (Morse, 1994). Moreover, it is easier to disclose information in a group interview with peers than in a one-on-one setting with a person of higher status (Gubrium, 2012).

The interview items were semi-structured and included questions such as: "What are the concerns that you want to treat?" "Why did you participate in the program?" "What experiences did you have throughout the program?" and "What changes did you experience through the program?". Semi-structured interviews were useful for gathering data for this study because participants could freely answer questions based on their experience. This type of interview is also useful for obtaining rich data related to interview questions, as the questions can be changed to encourage participants to expand the topics for meaningful areas. This qualitative approach to data collection aims to provide information on how urban forest and forest therapy programs affect psychological healing experiences.

Two in-person focus group interviews were conducted 24 weeks after the program intervention ended. The first group interview was conducted on November 7, 2017 with participants P1, P2, P3, and P4, and the second group interview was conducted on November 14, 2017 with participants P5, P6, and P7. The location for the interviews was a café with a nature-dominant environment in the city. Each interview took one-and-a-half hours. Before each interview, explanations were provided concerning the intent of this research and the process for recording the interviews.

Recorded audio was transcribed verbatim and coded line by line. The transcripts were read several times to ensure reliability of the interpretations. To increase the reliability of the study, a triangulation technique was conducted (Lincoln and Guba, 1985). Three experts in the fields of landscape architecture, forest therapy, and hygiene analyzed the interviews to set a broader picture of the material. The researchers continuously compared data, codes and categories during the coding process and discussed the emerging themes until they reached agreement. The analysis started with open coding which is deriving new descriptions from the phrases and words in the transcripts (Glaser and Strauss, 1967). Codes with similar elements were grouped into categories agreed upon researchers through discussion. These categories were related to each other using axial coding. The core category, one with a central role that connected to all other categories, was then identified. When new analyses revealed no new information, we considered theoretical saturation to have been reached.

5.3. Results

5.3.1. Core category: Efforts to recognize self-worth

Most participants wanted to recover their self-identity, and they felt the forest therapy program helped with this. Thus, the core category was selected as "efforts to recognize self-worth" (Figure 2). When participants entered the forest for the first time, even though it was located at their neighborhood, they reported that they felt strange in it. However, participants were able to rediscover the value of nature through their experiences with it and to obtain peace of mind. As the program progressed, they acquired knowledge of nature and developed psychological ties with other group members. This resulted in a change in their inner attitude by improving self-confidence and self-esteem. This process allowed them to have an accepting attitude with forgiveness and understanding, which helped improved their mental health and made them want to make positive changes for themselves (Table 3).
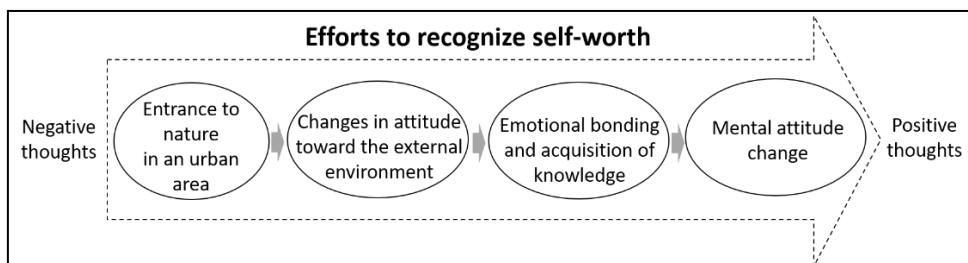
Figure 2. The Participants' Therapeutic Processes throughout the Forest Therapy Experience.

5.3.2. Stage 1: Entrance to nature in an urban area

Good accessibility provided motivation for visiting the urban forest therapy program. One participant stated, "I felt like I wanted to go once because it is close to my home." With one exception, the participants had not previously visited the urban forest and had no experience with forest therapy programs. They first engaged in the program with a sense of novelty and curiousness. They stated, "I just thought it was strange at first" and "I also felt unfamiliar with it…."

Participants perceived the environment of the forest as safe and tranquil after the introduction (10–15 minutes) in the first session. It was a kind of new place in an urban area. One noted, "Here in the forest, it is very comfortable, unlike outside of it where it is crowded and complex" and another said, "It's very tranquil and relaxed…." Even though sounds of vehicles on the road adjacent to the forest were still audible, participants said they still accepted that they were in nature. This is the effect of the white noise of nature. However, there were some participants who felt that those sounds detracted from their meditations.

5.3.3. Stage 2: Changes in attitude toward the external environment

Changes in attitude toward the external environment involve a process of experiencing relaxation and tranquility through exposure to a nature environment with guided activities during the first and second sessions. More

specifically, participants recognized the urban forest as a provider, and accepted it as a relaxing space in which they could immerse themselves in the forest environment.

5.3.3.1. Awareness of the existential value of urban forests.

As more program sessions occurred, participants started recognizing the existential value of the urban forest as an unexpected bit of nature in the city where they lived. One asked, "How were they able to create this forest in this busy city? It's such a valuable resource" and another stated, "Unlike recreational forests where I go to relax, this forest is in the middle of the city which is totally unexpected; this is why it is so fascinating."

Participants reported that their visual, auditory, olfactory, and tactile sensitivity was restored as they contact with various natural elements and stayed silently in the forest. The characteristics of the forest they experienced as fascinating included the sunlight penetrating through the trees, the sound of the wind, the sky and clean air that could be seen and inhaled as they lay on the forest floor, and the sound of their steps on the soil. These sensory experiences revived sensory functions that had been desensitized during their daily lives and provided a positive overall experience, which ultimately allowed them to express their emotions. One participant stated:

The sound of the wind was as if the forest was singing through the trees.

The sound of the trees struggling with one another, and the sunlight

between the trees—this was the first time I had experienced all these things. I thought I would never be able to let go of my anger… but when I felt the tranquility in nature, I felt I could let it go.

5.3.3.2. Time for self-flow in a relaxing space.

Participants experienced quiet time through meditation and reflection in nature and experienced relaxation when their minds were quieted. They expressed feeling warm enough and comfortable enough to fall asleep in the forest, a sense of reduced negative emotions such as anxiety and tension, and increased positive emotions including a sense of freshness and vigor. One participant noted, "I fell asleep during the meditation. It was warm in the blanket… and I was comfortable enough to snore. Even after a brief nap, I felt so refreshed." Another stated, "I was able to concentrate on thinking when I was meditating while walking slowly. I felt relaxed and cleansed when I was lying down in the forest with my eyes closed," and another said, "It was the first time I had laid down in the forest; when I looked up at the sky, I felt that it blew a vigor into me for the first time in my life." 'Flow' is being fully immersed in a feeling of full involvement. In nature this occurred during program intervention rather than forest observation; this was reflected in common participant statements that they had not gone into the forest alone before the therapy program, nor laid down in the forest and looked up at the sky nor taken some quiet time for themselves.

Moreover, the participants reported that forest experiences provided them with the opportunity to feel innocence in their hearts again. This also made them livelier, which led to positive psychological changes when combined with the fun and positive experience they were having in the forest. One participant stated, "Each of us made up a pseudonym for ourselves, such as the 'Forest with Singing Cuckoos.' It's corny, but it still was nice to be called this; it was like I went back to my adolescence." Another noted "When we were asked to bring poetry books and read a poem of our choice. I felt very sentimental. I became a girl again," and one suggested "It seems that my innocence had come back for a moment."

5.3.4. Stage 3: Emotional bonding and acquisition of knowledge

Participants experienced emotional bonding and accumulation of knowledge during the second and third sessions. Participants fulfilled their need for knowledge through forest-related information and experiential activities led by a guidance leader. Their newfound knowledge led them to feel self-confident. It was evident from their statements that they enjoyed nature more when they knew more about it, and it made them feel happy and enriched to take pleasure in the benefits of nature after their need to learn about it was fulfilled by the forest experience. One participant stated, "I used to be curious about wildflowers because they are pretty, but I didn't know much about them. The information the leader provided made me feel enriched and satisfied my curiosity." Another noted, "After listening to the explanation of the tree, I feel the feeling of seeing the tree."

Meanwhile, participants felt that their psychological needs were met; they felt care and respect through the program activities and became open themselves to others. In addition, they felt their sense of identity as an individual with social relationships. One participant stated, "People who walked in front helped those coming behind them because the latter couldn't see what was happening at the front. I wondered if they would do the same if we were somewhere else." Another said, "I think that I became healed when I started expressing myself."

These psychological changes were influenced by the forest's calm and leisurely environment. One participant noted, "We first met in nature, and I think that nature made me feel more generous; that's why talking to them was not uncomfortable. Suppose we met in a busy downtown area; what would we talk about?"

5.3.5. Stage 4: Mental attitude change

'Mental attitude change' is a process of mental reflection that moved to a deeper level during the third and fourth sessions, and this stage includes the process of change and actions during the five months after the program intervention ended. As participants discovered opportunities to identify their true selves by opening themselves to others, they recognized the need for self-healing and developed coping skills to heal themselves. Furthermore, the combination of the urban forest environment and therapeutic program evolved into a commitment to self-care, which led to further therapeutic benefits for participants.

5.3.5.1. Awareness of the need for self-healing.

All participants had persistent negative emotional experiences that became traumatic damage. They stated that they had experiences with relational conflicts with their parents-in-law. Two reported having lived with parents-in-law whose treatment could be considered abusive. They also unconsciously blamed themselves because they felt that their social status as homemakers was low and felt it was unfair that they had devoted themselves to their families without the recognition they felt they deserved. The distortion and insecurity that had increased within them over a long period as a result of their transition into the role of homemakers and these a fore mentioned conflicts with parents-in-law after marriage had eroded their self-esteem. One participant asked, "What's happening to me? I was educated, my parents raised me with high expectations, and both my husband and I have thrived so far." Another noted, "Over time, I wondered whether I was just tagged to my husband. I'm just a well-married wife. I think it was really hard when I couldn't accept it." Another said, "I lost confidence over time."

However, looking at their own lives with a positive attitude provided them with opportunities to recognize and cope with subconscious negative emotions. One participant stated, "When I looked at the trees in the forest following the words for meditation that the person read… I thought that it may be time to let it go… I felt such a lightness in my heart," and another said, "That must be the power of nature. Nature seems to have relaxed my mind."

Eventually, as participants recognized their self-worth, they became inspired to heal themselves. One participant stated, "No one could do things for myself. I should not expect to be healed by someone else." Another noted, "In nature, getting in with the most basic principles, I can find [my happiness] there [by myself]."

5.3.5.2. Awareness of self-healing methods.

The forest experience led the participants to identify with the principles of nature as the method of self-healing, which brought about psychological changes. These psychological changes expanded to an attitude of acceptance; they let go of thoughts and feelings about others rather than fixating upon them. For example, some stated that they made efforts to release a desire to wield authority over their adult children. One participant noted, "I was involved in all of my children's work. I've always talked to her [daughter] before. But [I] leave it now." This can be interpreted as a change from denying and suppressing their own emotions to respecting others' emotions.

In addition, the attitude of understanding and acceptance led to emotional changes in terms of feeling compassion rather than a hatred. One participant stated, "I think about taking pity on my mother-in-law, about whom I tortured myself; let's be compassionate with her."

5.3.5.3. Practice of self-care.

At the end of the program, participants exhibited a desire to change their life focus. In addition, participants stated they were practicing self-care for the approximately five months from the end of the program until the interview. They reported that they decided to surrender control over their families and focus instead on themselves. One participant stated, "I appreciate and care for myself more. I am the one who needs to be happy first." Another noted, "I can only spread my happy energy when I'm happy. I should live with a sense of pride that I'm very much needed by others and take up a hobby and be happy."

Most participants stated that they had greater self-care capacity because they were happier at home; they reported that they had higher self-esteem and had the strength and tools to express their feelings. For example, one participant noted, "When I wake up in the morning, I tie up my hair and tell myself in the mirror, 'You're so pretty,' when I'm washing my face." They also felt satisfied that their presence was appreciated when others recognized their changes. One participant said, "When people around me told me that I had changed, it felt really good because I felt that I had a presence and it was such a delight to feel that."

Finally, participants expressed a desire to continue participating in the forest therapy program for their own self-care. One stated, "We can make friends, too and dine together. It would be nice to join a program that lasts a few days."

Table 3. Description of Categories Relating to the Experience of Urban Forest Visits

Categories	Description
Core category	

Efforts to Recognize Self-Worth	▪ The therapeutic process can be described by the participants' transformation along the path to recognize their self-worth (Fig. 1). They were at first unfamiliar with the forest environment, but gradually found peace of mind by finding the value of nature. Afterwards, they gained knowledge about nature and felt psychological ties through interaction with nature and group members through the program.
Category	
Stage 1: Entrance to Nature in an Urban Area	▪ At the start of the intervention, participants were unfamiliar with nature and other people. The forest itself was a new world they had never imagined. ▪ Feelings associated with the urban forest were: (1) a place for curiosity, (2) cozy, (3) a safe space, (4) a space to absorb noise naturally, and (5) a place for relaxation.
Stage 2: Change in Attitude toward the External Environment	1. Awareness of the Existential Value of Urban Forests ▪ Positive sensations and emotions were reawakened in participants as a result of their experience in an urban forest. ▪ They experienced the sights, sounds and texture of nature while closely observing natural phenomena, such as: (1) the sunlight through the trees, (2) the sound of the breeze, (3) clean air, and (4) the sound of stepping on the soil. 2. Time for Self-Flow in a Relaxing Space ▪ The feelings about the forest generated during the program, including: (1) warmth, (2) comfort, (3) relaxation, (4) cleansed, (5) vigor, and (6) freshness. Each contributed to participants' peace of mind.
Stage 3: Emotional Bonding and Acquisition of Knowledge	▪ Self-assurance and self-expression were achieved. ▪ This category is dominated by the participants' experience of being mentally supported by others through: (1) yielding, (2) empathy, (3) understanding, and (4) listening which allowed them to better express themselves. ▪ Knowledge of nature contributed to improving participants' confidence.

Stage 4: Mental Attitude Change	1. Awareness of the need for self-healing.
	▪ Participants recognized negative feelings such as low self-esteem, grievance, and depression, and realized that they had to heal themselves.
	2. Awareness of self-healing methods.
	▪ The changes in participants' mental state were characterized by: (1) being confident in and aware of their own value, (2) being willing to yield to others, and (3) forgiving and understanding someone who has made them depressed through reflecting on the principles of nature
	3. Practice of self-care
	▪ Participants placed themselves in the priorities of life and recognized themselves as precious. They also wanted to take care of themselves consistently.

5.4. Discussion

Clearly, there is no simple and quick method to recover from constant negative emotions that produce low self-esteem and self-confidence. Even though there was a good natural healing resource in their neighborhood, they were not aware of the need or the means to destress themselves through nature. Participants initially perceived the urban forest in the program as an unfamiliar and strange environment because they had not previously experienced forest therapy. This unfamiliarity demonstrated that they were not motivated to visit the forest although it was easily accessible.

They discovered the value of the urban forest as they explored its natural elements and reported that they perceived it as a restorative environment. Afterward, they experienced a peaceful flow state, which changed their attitudes toward the environment. This is a unique characteristic that provided a foundation for positive

psychological change in individuals who reported traumatic damage. This process of psychological change is explained by environmental psychology theory, which suggests that the physical and mental relaxation effects of natural healing factors activate the parasympathetic nervous system (Kaplan and Kaplan, 1989; Ulrich et al., 1991). In addition, the sense of safety experienced in the forest environment served as a foundation for positive experiences (Sonntag-Öström et al., 2015), and these experiences provided a motive for self-actualization (Maslow, 1943). Therefore, positive experiences in the urban forest motivated participants to recognize their own self-worth, which was a major achievement during the forest experience.

Through this intervention program, participants acquired knowledge about nature and reported forming emotional bonds with one another. This served as a strong motivation for them to openly express their thoughts and feelings about the experience and its effects on their self-esteem. This is consistent with research findings that social interaction (House et al., 1988) and group activities can positively affect motivation (Sonntag-Öström et al., 2015). It also demonstrates that as individuals increasingly share their inner world and emotions with others and the group's level of cohesion increases, the more willing individuals within the group will begin to open to one another (Yalom and Crouch, 1990). The process of psychological changes instigated by building social relationships in a forest environment was similar to the process of developing rapport, in which clients begin to share their negative feelings after positive feelings have developed through mutual

understanding and regard (Rogers, 1995). This demonstrates the therapeutic effects of the integrative approach of the urban forest environment and the forest therapy program.

The forgiveness shown at Stage 4 (mental attitude change) is like a proactive self-healing method and a combination of emotional, cognitive, and behavioral phenomena common to positive behavior (Enright and Fitzgibbons, 2000). Therefore, the psychological change resulting from developing a mindset of forgiveness in the forest environment implies that a requirement for healing emotional conflicts and scars has been satisfied.

The results of this study show that middle-aged women who had been homemakers involved in the study had suffered from psychological decline, low self-esteem, and low self-confidence. Therefore, they needed mental health support to recognize and cope with it.

To date, most forest therapy programs have taken place in suburban areas, while programs in urban forests, which have good accessibility, have not been as actively promoted. The participants of this study recognized the existential value of the urban forest and that visiting it helped to relax their minds. This indicates that urban forests have the potential to be a restorative environment that supports mental health in middle-aged women. This revealed an exploratory process related to a previous research finding that experience in a forest improves emotional recovery and psychological well-being (Maller et al., 2006). To use the forest as a restorative environment, incrementally staged programs are needed that consider participant's

psychological changes. In addition, well-designed regular programs that are personalized for participants are necessary to maintain the effects of the forest therapy program.

This study is meaningful in that it showed nature-human interaction and discovered the potential of urban forests to serve as restorative environments. This study has suggested directions for forest therapy programs through its in-depth analysis on the restorative effects of urban forests.

5.4.1. Methodological considerations

Interviews were conducted five months after participants had completed a four-week forest therapy program, which is a potential limitation because memories are not always reliable; however, interviews provided much information about the process of change after the intervention of the forest experience.

Another consideration is that participants experienced the program in spring which may have promoted different emotional characteristics than programs that are offered in other seasons, such as autumn and winter.

Finally, the purpose of this study was not to produce generalizable data for large populations but to obtain knowledge of the psychological healing process for middle-aged women with intrinsic stress and experiencing an urban forest therapy program for the first time. In this study, nine middle-aged women participated, and the reliability of this study can be considered to reflect the interviews of seven of them. However, some of the results may be applicable to other healing effects, although

the results of this study, using a small sample and specific regions, may not be generalized in other contexts.

5.5. Conclusions

Our results show the impact of an urban forest therapy program on the psychological healing of middle-aged women through in-depth focus group interviews. The positive effects of the forest experience included participants' discovery of self-worth and their development of coping strategies through changes in attitude toward their external and mental environments. Further research should explore different cases for other groups within the population to develop forest therapy programs according to participants' needs. Further exploration of psychological restoration through urban forest intervention programs will provide essential information for policymakers seeking to understand how to use urban forests as health resources for citizens and inform the development of incrementally staged forest therapy programs to support public health policy in urban areas.

5.6. References

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6. DISCUSSION AND CONCLUSION

In Chapter 1, we examined the odds ratios of socio-demographic and environmental factors that make older adults living in seven Korean cities vulnerable to stress and depression. In Chapter 2, we analyzed the influence of psychological factors on depression in urban. In Chapter 3, we assessed the psychological and physical changes in depth for low-income older adults living alone and receiving medical aid after experiencing the urban forest therapy program. Finally, in Chapter 4, we analyzed in depth the path of psychological and emotional changes in urban middle-aged women after experiencing a forest therapy program in an urban forest.

Chapter 1 has a few limitations. The range of some variables is inadequate and there are inevitable constraints because we selected and analyzed some data that is suitable for the purpose of our research from Community Health Survey (CHS) data, which was collected for a broader purpose. However, the findings of the study indicate that the group of older adults who are vulnerable to mental health problems can be identified based on the demographic and social characteristics, and that the ratio of the area of the green space in the administrative area is an important component in improving the mental health of urban older adults. Chapter 2 also has a limitation that some variables are inadequate and there are inevitable constraints because the Korea Welfare Panel Study (KOWEPS) results collected for a wide range of purposes have been selected and processed for with the purposes of this research. However, the results of the study suggest that it is necessary to develop a

policy to improve the reliability of social relations in order to alleviate depression in older adults by elucidating the pathway between social and psychological variables and depression. Chapters 3 and 4 show limitations with regard to analyzing the experience of healing programs for specific subjects in specific areas. However, these studies are meaningful in that we explored the psychological change process and the themes of the psychological therapeutic function of an urban forest, which cannot be understood quantitatively.

The methodology and results of Chapter 1 and Chapter 2 consisted of different sample sizes and variables, exploring the relationship between demographic and societal variables, environmental variables, and psychological variables affecting mental health. The empirical case studies of Chapters 3 and 4 show that the urban forests were recognized as familiar and comfortable places for the subjects, however, easy accessibility did not motivate them to visit the forests. Participation in the therapy program provided motivation for old and middle-aged people not belonging to the social group to visit the urban forest, and the urban forest is used as a psychological healing resource. In addition, the social interaction between the program participants and the program guides acted as a social and psychological variable affecting the mental health of the subjects. The results of each chapter can be used as indicators by policy makers to identify vulnerable groups and may be utilized in programs and spatial planning for the use of green resources as psychological healing spaces.

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국문초록

도시노인의 정신건강 영향요인과
도시숲의 치유적 활용

이현진

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한국은 도시화의 증가로 인구의 대부분이 도시에 거주하며, 도시 노인은 2014년 76.6%를 차지하였고 꾸준히 증가하는 추세이다. 도시환경은 녹지의 접촉이 부족하고 사회적 단절로 인한 소통의 기회가 적어 스트레스 및 우울증과 같은 정신건강 문제에 더욱 취약한 환경이다. 노인은 신체적 질병의 증가와 함께 사회, 경제적 지위의 감소로 인해 스트레스, 우울증과 같은 정신건강 문제에 노출되기 쉽다. 정신건강은 신체적, 사회적 건강과 관련되어 있으며 결과적으로 건강관리의 부담과 전반적인 생존율에도 영향을 미친다. 그러므로 도시 노인의 정신건강 문제는 개인의 문제를 넘어 사회적 문제로 인지하여 예방을 강화하고 정신건강에 영향을 미치는 특성을 파악하는 연구가 중요시 되고 있다. 따라서 정신건강에 영향을 미치는 사회적, 인구통계학적, 물리환경적, 심리적 특성들을 고려하여 대상의 특성을

이해할 필요가 있다.

한편 도시의 공원과 녹지대는 인간에게 사회적 접촉과 상호작용을 장려하고 심리적 스트레스를 저감시켜 정신건강을 향상시키는데 도움을 준다고 알려져 있다. 최근에는 국가 및 지방자치단체에서 숲치유의 건강효과에 대한 중요성을 인지하고 산림 뿐 아니라 도시숲을 활용한 치유 프로그램의 시범적 적용 사례가 증가하고 있다. 그러나 대부분 일반인을 대상으로 적용되고 있으며, 저소득층 또는 독거노인과 같은 특정 취약계층을 대상으로 한 도시숲 치유 프로그램은 시범 운영 수준이다. 또한 도시숲의 활용이 정신건강 개선의 효과로 나타나는 경로에 관한 연구는 상대적으로 부족한 편이다. 한편, 도시숲의 심리적 치유 효과는 연령 및 생애주기에 따라 차이가 있으며 노인 뿐 아니라 중장년기에 가장 효과적으로 나타나는 것으로 보고된다. 그러므로 도시숲을 활용한 치유 프로그램의 실증적 사례는 대상층을 구분하여 적용할 필요가 있다. 따라서 본 연구에서는 노년기 취약계층과 중년층의 정신건강을 위한 도시숲 치유 프로그램에 대한 실증적 사례를 적용하였다.

연구결과, chapter 1에서는 노인의 정신건강에 영향을 미치는 인구사회통계학적 특성들이 발견되었다. 주관적 스트레스 수준의 예측지표는 여성, 초기노년, 3세대 가구, 저소득층, 질병이환자, 흡연자, 노동활동 참여자, 주기적 사회활동 비참여자로 나타났으며, 우울감 경험의 예측지표는 여성, 1인가구, 저소득층, 질병이환자, 노동활동 비참여자, 흡연자, 비음주자, 주기적 사회활동 비참여자로 나타났다.

또한 행정구역 구단위의 생활권 도시림 면적 비율이 낮을수록 주관적 스트레스와 우울감이 높은 경향을 나타냈다.

노인의 경우 주기적 신체 활동의 유무는 정신건강과 상관관계가 나타나지 않은 반면, 사회 활동의 유무는 유의하게 나타났다. 이러한 연구결과에 기반하여 chapter 2에서는 사회 활동과 관련한 사회적 자본이 우울증에 영향을 미치는 경로를 분석하였다. 그 결과, 사회적 자본 중 신뢰 요인이 사회적 자본 만족도와 자아존중감을 통해 우울증을 감소시키는 것으로 나타났다. 다시말해, 양적인 사회적 자본 보다 질적인 사회적 자본이 우울증에 영향을 미치는 요인임을 발견하였다. 이는 노인의 정신건강 개선과 증진을 위해서는 인구사회적 특성을 통해 취약계층을 판별하여 관리할 필요가 있으며, 사회적 자본 중 신뢰 요인의 향상을 위한 정책이 효과적임을 시사한다.

chapter 3에서는 의료수급을 받는 저소득층 독거노인을 대상으로 생활권 도시숲을 치유자원으로 활용하여 숲치유 프로그램을 적용한 결과, 자연 속에서 알아차림(awareness)과 내면적 몰입(flow) 과정을 통해 자아, 타인 (이웃), 자연과의 관계가 형성되어 고립감이 저감되고, 자기돌봄 대처능력(coping)의 일환인 건강생활습관의 동기가 부여된 것으로 나타났다. 이는 도시숲의 활용이 사회적 관계를 형성되는 데에 기여하였으며, 사회적 자본의 형성은 정신건강 개선 뿐 아니라 신체적 건강에도 영향을 미침을 시사한다.

한편, chapter 4에서는 노년기를 준비하는 중년기 여성에게 도시숲 치유 프로그램을 적용한 결과, 내재된 부정적 감정을 자연 속에서

알아차리고, 내면적 몰입 과정을 통해 자아존중감의 회복과 자연의 섭리에 기반한 대처능력을 갖게됨으로서 부정적 감정이 긍정적 감정으로 변화되는 경로를 발견하였다.

각 연구결과는 특정 그룹을 대상으로 하였기에 일반화에 한계가 있음을 고려할 필요가 있다. 그러나 본 연구 결과는 고령화 시대를 대비한 노년층의 정신건강에 대한 이해와 도시숲을 활용한 치유 프로그램의 효과에 대한 심층적 분석을 통해 향후 녹색 복지의 정책적 방향을 수립하는 데에 도움이 될 것으로 사료된다.