



The Relationship between Social Infrastructure and Happiness

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Abstract

As a social animal, human beings feel happy (or unhappy) in their relationships with others. This study tries to demonstrate the relationship between 'social infrastructure', the place that mediates social relations, and happiness. It is very important to study this relationship because the social infrastructure organizes and shapes everyday life in the city, and may contribute to enhancing the emotional well-being of urban dwellers. Using the 'Civic Happiness Index Satisfaction Survey' by Busan and 'Neighborhood Unit Basic Living Infrastructure' by the Ministry of Land, Infrastructure, and Transport (MOLIT) as data, the empirical results are as follows. First, social relations are highly related to happiness. Every indicator that represents social relations, such as 'Personal-relationship Satisfaction', 'Job, Community or School Satisfaction', 'Social Participation Status', 'Experience on Discrimination', 'Respect on Human Rights', and 'Capability on Mobile Devices' are significantly related to happiness. Second, social infrastructure, where social relations are practiced, is also relevant to happiness. Among 12 Neighborhood Unit Basic Living Infrastructures, four facilities (Kindergarten, Elementary School, Nursery, and Pharmacy) showed a significant relationship between their average distance from the residence and happiness. Although place is one of the crucial factors that affect human happiness, many studies on happiness nonetheless have overlooked the factor. This study is significant in that it verifies that place may either promote or undermine individual happiness, and thus spatial planning may contribute to happiness discourse.

Keywords Happiness, Social Infrastructure, Basic Living Infrastructure, Multilevel Ordered Logistic Regression Model

주제어 행복, 사회적 인프라, 기초생활 인프라, 다수준 순서형 로지스틱 회귀모형

I . Introduction

1. Research background and purpose

All human beings pursue happiness. They strive to be happy, and to maintain a state of happiness. In every period of history, happiness has been universally sought, and regarded as the "ultimate goal" that is "self-evidently good" (Layard, 2005;113).

Space is inseparable from human happiness. Space is a fundamental human need (Hall, 2002:32-33; Jun, S.I., 2014:14), and

humans experience continuous everyday life as temporally reconstructed rhythms in space (Lefebvre, 2013:20). It is not an overstatement to say that "place is the key to happiness" and "takes precedence over other elements of happiness" (Florida, 2008).

Efforts have been exerted to make cities, which are spaces artificially created by humans, lend greater happiness. For instance, the architect Daniel Burnham proposed the City Beautiful Movement, which places emphasis on symmetry and typicality of cities, for social reform and enhanced sense of ethics among the people. Le Corbusier, the pioneer of

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high modernist architecture, stated that “human happiness already exists expressed in terms of numbers, of mathematics, of properly calculated designs, plans in which the cities can already be seen.” That is, using simple, repetitive straight lines to improve the efficiency of city spaces enhances human happiness (Scott, 2010; Montgomery, 2014:30-70).

However, such assertions are closer to utopian urban planning. They rely on intricate plans to simplify cities, and strengthen legibility, rationality, aesthetics, and efficiency. Cities as the target of urban planning are empty, uniform spaces, i.e. geometricalized spaces, and humans who occupy such spaces were excluded from consideration (Scott, 2010; Kim, M.Y. and Jun, S.I., 2014).

Spaces are not completely separated from humans (Hall, 2002:32-33) and gain value and significance through communication and interaction with their occupants. They shift from ‘mathematische raum’ to ‘erlebter raum’ or ‘Lebens raum’ when human experiences and emotions are reflected, and when specific activities are being conducted (Bollnow, 2011:14-18).

Since humans are “social beings,” their communication and interaction with spaces extend beyond the individual level. Humans build social relations with family, friends, neighbors and peers, and engage in social interactions centered on such spaces. As long as the premise of humans being social beings holds true, social relations are an essential element of individual happiness, and physical spaces clearly play an important role in the pursuit of happiness.

This study focuses on the relationship between “social infrastructure,” as a space that mediates social relations and happiness. Social infrastructure refers to facilities that lay the foundation for public life, such as libraries, schools, kindergartens and hospitals, not facilities that support manufacturing activities related to roads, ports, aviation, rail, electricity, communications, and power plans (Klinenberg, 2019). The fact that happiness is derived from thoroughly everyday contexts at the individual level and in relationships among individuals (Choi, I.C., 2018) indicates that social infrastructure is essential in enhancing the happiness levels of urban dwellers. First, this study examines the relationship between social relations and happiness at the individual level. Second, it empirically explores the relationship between social infrastructure, as places where social relations are realized at the spatial level, and happiness.

Despite being a crucial element that influences human happiness, spaces have been overlooked in research on happiness. Most studies have adopted a psychological/philosophical approach to genetic/cognitive properties of individuals and adaptive mechanisms to situations (Suh, E.K., 2014; Choi, I.C., 2018), or a social science framework emphasizing systematic conditions or the roles of relational goods (Han, J. et al., 2014). The significance of this study lies in integrating happiness discourses and spatial planning by demonstrating the power of spaces to enhance or diminish individual happiness.

2. Research scope and method

The spatial and temporal scope of this study was Busan and 2019, respectively. Individual happiness was scored on a 7-point Likert scale, and a multilevel ordered logistic regression model was employed considering the hierarchical structure (individual level, spatial level) of data.

For empirical analysis of the relationship between social relations and happiness, and between social infrastructure and happiness, this study utilized the results of the Civic Happiness Index Satisfaction Survey by Busan. The survey was conducted from July 17 to August 31, and the respondents were 5,000 Busan residents aged 19 or higher.¹⁾ In addition to individual happiness scores, data was retrieved on various aspects of social relations, including “personal-relationship satisfaction,” “job, community or school satisfaction,” “experience in discrimination,” “respect for human rights,” and “mobile device capability.” The happiness of individual citizens could be more easily determined because the survey examined the happiness levels of individuals rather than “satisfaction with life” or “quality of life,” which are sometimes used interchangeably with individual happiness.

Social infrastructure, which are spaces that mediate social relations and happiness, was defined as Neighborhood Unit Basic Living Infrastructure, as provided by the Ministry of Land, Infrastructure and Transport. Basic Living Infrastructure refers to “facilities that enhance convenience of living and provide welfare necessary to sustain residential and everyday activities in the neighborhood,” and can be divided into local base facilities and neighborhood facilities depending on hierarchy and size. Neighborhood facilities, which are facilities that provide small-scale everyday services, include

kindergartens, elementary schools, libraries, nurseries, senior centers, elderly schools, clinics, pharmacies, sports facilities, parks, retail stores, and parking lots (Ministry of Land, Infrastructure and Transport, 2019). Accessibility to facilities was set as the average value of shortest distance to each facility by individuals, as provided in city, county, and district units. Assuming that residents used Basic Living Infrastructure closest to their residence, average values were calculated for the shortest distance from individual homes to facilities in city, county, and district units.²⁾ Accessibility is more useful than other indicators such as number of facilities and area in determining the enjoyment of facilities and likelihood of use among residents.

II. Theory and Literature Review

1. Social relations and ‘social infrastructure’

“No man is an island”. This is a line from the poem *For Whom the Bell Tolls* by the 17th century English cleric and poet John Donne. The symbolic message behind this is that humans are relational beings who live in harmony with others.

With humans being social animals, individual happiness cannot be achieved separately from society. Social relations built with family, friends, and peers play a major role in determining individual happiness. Harmonious social relations enhance emotional connectedness and psychological stability, thereby raising the possibility of enhancing happiness (Walen and Lachman, 2000). In addition, building positive relations with others helps to alleviate stress, reduce depression and anxiety, and prevent social isolation (La Greca and Harrison, 2005).

Social relations can act as intangible capital, either strengthening bonds among people with similar characteristics or bridging people who appear different but complement one another. Social capital is the capacity, while not owned by individuals, to mobilize others’ finances and personal connections based on social relations (Putnam, 2000).

Some focus on the negative correlation between social relations and happiness. If the strength of social relations is excessive, individuals may feel restricted by norms, and even see themselves as inferior compared to persons of higher status or better circumstances (Podolny, 2001; Han, J. et al., 2014). The costs, burdens, and risks involved in maintaining social

relations may also act as social liabilities (Leenders and Gabbay, 1999).

Regardless of the Janus-like relationship between happiness and social relations, space sharing is essential for humans, who find meaning in building ties with others. Spaces serve as the physical foundation of mediation of all social relations. The places where social relations are forged with family, neighbors, friends, and peers are none other than homes, neighborhoods, companies, schools, cities, regions, and countries.

Neighborhoods are the basic public spatial unit of the mediation of social relations, and set the stage for meetings, exchange, and socialization. For instance, streets are an element of the neighborhood environment that promote interactions with neighbors. Jacobs stressed that the everyday use of streets increases, and that neighbors engage in more active communication when buildings of various purposes co-exist along a street. This activates “eyes on the street,” and helps to maintain street safety (Jacobs, 2010).³⁾

Neighborhood facilities such as libraries, kindergartens, playgrounds, parks, exercise facilities, and swimming pools enable the formation of healthy social relations. The American sociologist Eric Klinenberg defined “social infrastructure” as spaces that determine the form and outcome of social relations.

Properly functioning social infrastructure allows people to gather repeatedly and regularly, and acts as a social glue behind healthy social relations and cultural activities. Unlike hard infrastructure such as highways, airports, and railways that contribute to isolation by facilitating the circulation of people and resources, social infrastructure sustains various types of social relations while performing different roles within the area (Klinenberg, 2019:6-36, 63-66).

In addition to physical spaces, virtual spaces such as Facebook, Twitter, and Myspace that promote meaningful social relations also fall under social infrastructure. Private commercial facilities may function as social infrastructure as well. This is especially true for “third spaces”,⁴⁾ such as cafes, restaurants, bookstores, pubs, barbershops, and hotels since people can comfortably drop by such places for “unofficial public gatherings” and realize the “joy of the everyday” (Kim, M.Y., 2017; Oldenburg, 2019; Klinenberg, 2019:113).

2. Neighborhood environment and happiness

How was the relationship between neighborhood environment and happiness examined in past research? First, there are studies that analyzed the influence of objective conditions of neighborhood environment on the happiness of citizens. Chang, I.S. and Kim, H.S. (2016) found that the urban park area per person, green space area, and green streetscape area positively influenced the subjective health and happiness of Seoul citizens. Lee, W.M. et al. (2016) classified urban environment into physical factors (population density, commercial facility area, number of cultural facilities, area of public sports facilities, and satisfaction with walking environment), natural factors (park area, satisfaction with green space), and social factors (city safety, social reliability). They found that individual happiness was higher at lower population densities, higher satisfaction with walking environments, larger park area per person, and greater satisfaction with green space. However, these studies were limited to only a few types of neighborhood facilities, such as parks and sports facilities.

In a study of the relationship between social infrastructure and individual happiness, Lee, Y.B. and Jung, C.M. (2013) showed that individual happiness improved as social infrastructure (roads, parks, water supply facilities, cultural facilities) expanded. However, they focused on large-scale facilities installed to enhance urban efficiency and safety, and the term “social infrastructure” was used differently from this study.

Choi, Y.R. and Lee, S.G. (2018) explained that the increase in aging index, number of old buildings, and commercial floor area negatively affects the subjective happiness of residents. Also, they found that residents living in more developed neighborhoods were happier. The factors examined were mostly related to planning and design, and lacked consideration for social infrastructure as a space where social relations are formed.

Second, some studies have examined the relationship between neighborhood environment factors and happiness. While there were slight differences in the choice of factor, most studies showed that higher satisfaction with the neighborhood environment led to greater happiness (Choi, M.O. and Moon, Y.S., 2011; Lee, J.E. et al., 2014; Han, J.W. and Lee, S.G., 2019).

Lee, J.E. et al. (2014) showed that satisfaction with residential environment, economy, social environment, educational environment, and cultural environment was positively correlated to happiness. Choi, M.O. and Moon, Y.S. (2011) found that Busan residents who were more satisfied with education and the economy felt greater happiness. Han, J.W. and Lee, S.G. (2019) surveyed the satisfaction of elderly aged 65 years and above with convenience facilities such as traditional markets and supermarkets, cultural facilities such as museums and theaters, and neighborhood facilities such as parks and sports facilities. In general, elderly residents who were more satisfied with facilities reported greater satisfaction in life.

The subjective satisfaction of respondents may reflect the extent to which individual residents are enjoying the urban environment, but it is less effective in objectively determining the level of satisfaction perceived by individuals. Considering the elementary stage of happiness research involving objective indicators on urban environment and their applicability to policy development, it is essential to conduct research using objective indicators.

3. Significance of research

First, this study focused on Neighborhood Unit Basic Living Infrastructure as a neighborhood environment factor affecting happiness.⁵⁾ Basic Living Infrastructure refers to small-scale facilities that improve convenience of living and welfare to support housing and everyday life, and are directly related to the quality of life and happiness of citizens (Ministry of Land, Infrastructure and Transport, 2019). The importance of living SOCs in areas such as childcare, welfare, culture, and sports has been increasingly emphasized.⁶⁾ The only study on the relationship between social infrastructure and happiness was conducted by Lee, Y.B. and Jung, C.M. (2013), and this too is limited to the effects of large-scale facilities.

Second, the objectivity of data was improved by using accessibility to Basic Living Infrastructure as an objective indicator instead of relying on subjective satisfaction. As a variable, accessibility reflects the experience of services from the perspective of citizens, and is thus more accurate than administrative indicators such as number of facilities and area.

Third, data was retrieved from a survey on present happiness, which served as a dependent variable. Most research

measured happiness using proxy variables such as quality of life, satisfaction with life, and depression. Other research on happiness analyzed the relationship between happiness and urban environment by calculating happiness in average values by area. While quality of life and satisfaction with life are sometimes used interchangeably with happiness, more accurate measurements are required to generalize the influence of the urban environment on happiness. Since this study used the results of a survey that directly measures happiness among residents, it is expected to provide more accurate and valuable insights into happiness.

Lastly, discussions on urban environment and happiness were expanded from Seoul and Gyeonggi-do Province to Busan. Past research on the relationship between happiness and city was limited to the metropolitan area, and research with Busan as subject did not go beyond analyzing the relationship between individual satisfaction with urban environment and happiness. This study further segmented the factors affecting happiness of Busan citizens to neighborhood environment factors, and distinguished itself from past research by using the shortest distance to Basic Living Infrastructure as an objective indicator.

III. Framework of Analysis and Data Construction

The dependent variable in this study is individual happiness. In the Civic Happiness Index Satisfaction Survey, Busan assessed individual happiness through the question, "How happy are you overall?" The respondents scored their happiness on a 7-point scale, ranging from "Not at all happy" (1) to "Very happy" (7) (Table 1).

The independent variables were social relations and social infrastructure. To examine the relationship between social relations and happiness at the individual level (level 1), variables related to demographics and social relations were established based on responses to the Civic Happiness Index Satisfaction Survey. Demographic characteristics included gender, age, marital status, number of household members, parental status, family support status, education level, housing type, housing tenure type, length of residence in Busan, and average monthly income. All variables, except continuous variables such as age and number of household members, were set as dummy variables. Gender was classified into male

and female, marital status into married and single, parental and family support status into yes and no, housing type into apartment and non-apartment, housing tenure type into rent and owned. Education level, average monthly income, and length of residence in Busan were surveyed using four, nine, and six options, respectively. Ordinal scales were adopted to describe the education level, income level, and length of residence.

Variables under social relations were personal-relationship satisfaction, job/community/school satisfaction, social participation status, experience with discrimination, respect for human rights, and mobile device capability. Personal-relationship satisfaction and job/community/school satisfaction were rated on a 7-point scale ranging from "Very dissatisfied" (1) to "Very satisfied" (7). The reference for variables in social participation status (volunteering, political/social group activities, rallies, etc.) was "Did not participate." Experience in discrimination was measured on a 7-point scale from "Never" (1) to "Always" (7). Respect for human rights and mobile device capability were rated from "High disrespect/incapability" (1) to "High respect/capability" (7).

At the neighborhood level (level 2), this study examined the relationship between happiness and social infrastructure where social relations are realized. Data on Neighborhood Unit Basic Living Infrastructure provided by the Ministry of Land, Infrastructure and Transport was used to determine accessibility to facilities in each city, county and district. While Neighborhood Unit Basic Living Infrastructure covers kindergartens, elementary schools, libraries, nurseries, senior centers, elderly schools, clinics, pharmacies, sports facilities, parks, retail stores, and parking lots, spaces such as elderly schools, clinics, and retail stores were excluded from analysis due to the high correlation in average distance per facility. Meanwhile, accessibility was the "average of the shortest distance from one's residence to facility" (m), as provided by the Ministry of Land, Infrastructure and Transport in city, county and district units.

A multilevel ordered logistic model was selected for analysis in consideration of the hierarchical structure of data and 7-point scale of the dependent variable. The multilevel model reduces ecological fallacies by controlling differences across classes, and the ordered logistic regression model allows more accurate analysis than linear regression when the dependent variable is an ordered variable (Lee, S.G. et al., 2014).

Table 1. Definition of variables

Variables		Description		
Dependent variable (DV)	Happiness	Very unhappy(1) – Very happy(7)		
	Gender	Male(0), Female(1)		
	Age	Age(20-88 years old)		
	Marital status	No(0), Yes(1)		
	Parental status	No(0), Yes(1)		
	Family support status	No(0), Yes(1)		
Individual level (Level 1)	Personal characteristics	Education level	Middle-school grad. and below(1) High-school grad.(2) College student and above(3) Graduate school and above(4)	
		Number of household members	Alone(1) – Number of people(6)	
		Housing type	Non-Apartment(0), Apartment(1)	
		Housing tenure type	Rent(0), Own(1)	
	Independent variable (IV)	Social relations	Length of residence	Under 3 years(1) – over 40 years(6)
			Average monthly income	Under 1million won(1) – Over 5 million won(6)
			Personal-relationship satisfaction	Very dissatisfied(1) – Very satisfied(7)
			Job, community or school satisfaction	Very dissatisfied(1) – Very satisfied(7)
			Social participation status	No(0), Yes(1)
			Experience on discrimination	Never(1) – Always(7)
Neighborhood level (Level 2)	Social infrastructure	Respect on human rights	High disrespect(1) – High respect(7)	
		Capability on mobile devices	High incapability(1) – High capability(7)	
		Education	Average distance to kindergarten (m)	Average distance to neighborhood unit facility for each district (m) (Average of distance to nearest facility per person)
			Average distance to elementary school (m)	
		Learning	Average distance to library (m)	
			Average distance to nursery (m)	
		Daily care	Average distance to senior community center (m)	
			Average distance to school for the elderly (m)	
		Medical care	Average distance to clinic (m)	
			Average distance to pharmacy (m)	
			Average distance to sports facility (m)	
		Physical	Average distance to park (m)	
		Rest	Average distance to retail (m)	
		Amenity	Average distance to public parking lot (m)	

Among multilevel models, the random intercept model was selected for empirical analysis. The random intercept model, under which dependent variables have the same gradient but different intercepts, was deemed more appropriate than the random coefficient model in clearly distinguishing the differences among dependent variables at the spatial level (Chang, I.S. and Kim, H.S., 2016).

IV. Relationship Between Social Infrastructure and Happiness

1. Basic statistical analysis

The dependent variable of happiness was scored from 1 (Very unhappy) to 7 (Very happy). The majority of respondents

Table 2. Descriptive statistics

Variable		Obs.	%	Variable		Obs.	%	
DV	Happiness	Very unhappy(1)	4	0.1	Personal-relationship satisfaction	Very dissatisfied(1)	20	0.4
		Unhappy(2)	85	1.7		Dissatisfied(2)	56	1.1
		Somewhat unhappy(3)	328	6.6		Somewhat dissatisfied(3)	256	5.2
		Neutral(4)	1,559	31.4		Neutral(4)	1,075	21.6
		Somewhat happy(5)	2,122	42.7		Somewhat satisfied(5)	1,743	35.1
		Happy(6)	787	15.8		Satisfied(6)	1,467	29.5
		Very happy(7)	86	1.7		Very satisfied(7)	354	7.1
Gender	Male(0)	2,422	48.7	Job, community or school satisfaction	Very dissatisfied(1)	14	0.3	
	Female(1)	2,549	51.3		Dissatisfied(2)	82	1.7	
Age	20 to 29 years	788	15.9		Somewhat dissatisfied(3)	403	8.1	
	30 to 39 years	765	15.4		Neutral(4)	1,358	27.3	
	40 to 49 years	884	17.8		Somewhat satisfied(5)	1,773	35.7	
	50 to 59 years	1,005	20.2		Satisfied(6)	1,125	22.6	
	60 to 69 years	1,219	24.5		Very satisfied(7)	216	4.3	
	Over 70 years	310	6.2	Social participation status	No(0)	4,257	85.6	
Marital status	No(0)	1,065	21.4		Yes(1)	714	14.4	
	Yes(1)	3,906	78.6	Experience on discrimination	Never(1)	528	10.6	
Parental status	No(0)	2,304	46.3		Rarely(2)	1,351	27.2	
	Yes(1)	2,667	53.7		Occasionally(3)	1,241	25.0	
Family support status	No(0)	1,691	34.0		Sometimes(4)	1,129	22.7	
	Yes(1)	3,280	66.0		Frequently(5)	605	12.2	
Education level	Middle-school grad. and below	741	14.9		Usually(6)	114	2.3	
	High-school grad.	1,895	38.1		Always(7)	3	0.1	
	College student and above	2,251	45.3	Respect on human rights	High disrespect(1)	15	0.3	
	Graduate school and above	84	1.7		Disrespect(2)	207	4.2	
Individual level (Level 1)	Number of household members	1 person	511	10.3	Somewhat disrespect(3)	624	12.6	
		2 people	1,060	21.3	Neutral(4)	1,837	37.0	
		3 people	1,280	25.8	Somewhat respect(5)	1,565	31.5	
		4 people	1,808	36.4	Respect(6)	657	13.2	
		5 people	290	5.8	High respect(7)	66	1.3	
		6 people	22	0.4	Capability on mobile devices	Highly incapable(1)	128	2.6
Housing type	Non-apartment(0)	2,271	45.7	Incapable(2)		439	8.8	
	Apartment(1)	2,700	54.3	Somewhat incapable(3)	416	8.4		
Housing tenure type	Rent(0)	1,297	26.1	Neutral(4)	915	18.4		
	Own(1)	3,674	73.9	Somewhat capable(5)	1,336	26.9		
Length of residence	Under 3 years	58	1.2	Capable(6)	1,173	23.6		
	3 to 5 years	193	3.9	Highly capable(7)	564	11.3		
	5 to 10 years	575	11.6	Average monthly income	Under 1 million won	226	4.6	
	10 to 20 years	879	17.7		1~2 million won	505	10.2	
	20 to 40 years	1,891	38.0		2~3 million won	635	12.8	
	Over 40 years	1,375	27.7		3~4 million won	1,176	23.7	
Average monthly income	Under 1 million won	226	4.6	4~5 million won	1,194	24.0		
	1~2 million won	505	10.2	Over 5 million won	1,235	24.8		
	2~3 million won	635	12.8					
	3~4 million won	1,176	23.7					
	4~5 million won	1,194	24.0					
Over 5 million won	1,235	24.8						

(Continued on next page)

Variable		Obs.	Mean	S.D.	Min	Max
Neighborhood level (Level 2)	Education	Average distance to kindergarten (m)	363.1	62.8	276	542.3
		Average distance to elementary school (m)	351.3	43.9	291.5	451.9
	Learning	Average distance to library (m)	570.8	493.3	297.6	2,328.3
	Daily care	Average distance to nursery (m)	212.5	49.1	164.2	372.8
		Average distance to senior community center (m)	155.5	33.4	127.3	239.3
		Average distance to school for the elderly (m)	978.7	1,065.4	401.3	4,370.1
	Medical care	Average distance to clinic (m)	548.6	576.2	174.2	2,195.9
		Average distance to pharmacy (m)	462.8	526.5	163.7	2,105.3
	Physical	Average distance to sports facility (m)	421.9	457.2	163.5	1,755.6
	Rest	Average distance to park (m)	384.3	114.8	216.7	701.5
	Amenity	Average distance to retail (m)	180.1	158.2	72.2	605.0
	Transportation	Average distance to public parking lot (m)	697.5	513.5	162.1	2,209.4

or 42.7% (2,122 persons) chose 5, and those who chose neutral (4) or higher accounted for 91.6%, indicating that most respondents felt happy overall (Table 2).

Among the respondents, there were more females (51.3%, 2,549 persons) than males (48.7%, 2,422 persons). The age group with the most respondents was the 60s group (24.5%, 1,219 persons). Out of the total, 78.6% (3,906 persons) were married, 53.7% (2,667 persons) had children. 66.0% (3,280 persons) had family members to support, and having four household members was the most common at 36.4% (1,808 persons). College student and above (45.3%, 2,251 persons) was the most common response for education level, and 20 years or longer (65.7%, 3,267 persons) for length of residence in Busan. 54.3% (2,700 persons) were living in apartments, and 73.9% (3,674 persons) owned their own house.

To assess social relations, Busan residents were asked to rate their personal-relationship satisfaction and job/community/school satisfaction from 1 (Very dissatisfied) to 7 (Very satisfied). The proportion of respondents who chose 5 accounted for 35.1% and 35.7% respectively. The second most common was 6 points at 29.5% for personal-relationship satisfaction, and 4 points at 27.3% for job/community/school satisfaction. This shows that the respondents were less satisfied with job/community/school satisfaction than personal-relationship satisfaction.

In the case of social participation status (volunteering,

political/social group activities, rallies, etc.), 85.6% (4,257 persons) of respondents answered “No.” For the question on experience in discrimination, the most common response was 2 points at 27.2% on a scale of 1 (Never) to 7 (Always). Those who chose 4 (Sometimes) or lower amounted to 85.5%, which indicates that most had little or no experience in discrimination. As for respect for human rights, the majority or 37.0% chose 4 (Neutral) on a scale of 1 (High disrespect) to 7 (High respect). The next most common response was 5 points at 31.5%.

For mobile device capability, which rates the capability of using devices such as mobile phones, smartphones, and tablet PCs, 26.9% chose 5 points on a scale of 1 (Highly incapable) to 7 (Highly capable). 80.2% of respondents chose 4 (Neutral) or higher, which indicates that most Busan residents are fairly capable of using mobile devices.

For the 16 autonomous districts in Busan, the shortest average distance to Neighborhood Unit Basic Living Infrastructure was 155.5 m for senior centers, followed by 180.1 m for retail stores, and 212.5 m for nurseries. The average distance of kindergartens and elementary schools was 363.1 m and 351.3 m, respectively, falling within the neighborhood radius of 500 m. The average distance, in increasing order, was 384.3 m for parks, 462.8 m for pharmacies, 548.6 m for clinics, 570.8 m for libraries, and 697.5 m for parking lots.

Elderly schools were the least accessible as they had the longest average distance of 978.7 m.

Neighborhood Unit Basic Living Infrastructure arranged in decreasing order of deviation between districts with good accessibility and those with poor accessibility were: senior facilities (1,065.4 m), clinics (576.2 m), pharmacies (526.5 m), parking lots (513.5 m), libraries (493.3 m), and sports facilities (457.2 m).

2. 'Social relations' and happiness

Model 1, which excludes independent variables, is a basic model that shows how the variance at the individual level and neighborhood level changes when independent variables are included. Through this model, we can determine whether the independent variables of each level can be introduced in order (Kwak, H.K., 2003; Chang, I.S. and Kim, H.S., 2016). The estimated intercept was statistically significant at 1% (Table 3).

Intra-class correlation (ICC)⁷⁾ determines how much the dependent variable occupies in the total variance, and serves as an objective indicator of the descriptive power of independent variables. The variance at the Neighborhood level (Level 2) under Model 1 was 0.184, and the ICC at the neighborhood level was 0.053. This indicates that neighborhood differences affect the happiness of Busan residents by about 5.3%.

Model 2 was used to analyze the relationship between social relations at happiness at the individual level. Marital status, family support status, housing type, housing tenure type, and length of residence in Busan were found to be closely related to happiness. Happiness scores were higher for unmarried persons than married, for persons without family to support than those with family to support, those living in apartments than those in non-apartments, those who owned their own homes than those who paid rent, and those who had lived in Busan for a relatively longer time. While gender, age, parental status, education level, number of household members, and average monthly income had no significant effect on happiness, the trends observed in this study were consistent with past research.

Busan residents reported higher happiness when they had higher personal-relationship satisfaction. This was also true when they had higher job/community/school satisfaction.

Those who had experienced social participation (in the past year) felt happier than those without such experience. Happiness scores were higher among those with less experience in discrimination, and those who felt that their human rights were respected. Lastly, respondents who were more capable of using mobile phones, smartphones, and tablet PCs to form social ties in virtual space had higher happiness scores.

The variance at the Level 2 under Model 2 was 0.1757, which was smaller than that of Model 1 by 0.008. Based on the variance ratio statistic,⁸⁾ the variables at the individual level (Level 1) describe 4.3% of the variance of the dependent variable, happiness.

3. 'Social infrastructure' and happiness

Model 3 added social infrastructure variables at the neighborhood level to social relations at the individual level (Model 2), and analyzed the relationship between social infrastructure and happiness. While those living in areas more accessible to Neighborhood Unit Basic Living infrastructure were expected to be happier, the results were the opposite for certain facilities, and not statistically significant for many facilities.

The average distance from one's residence to kindergartens, elementary schools, nurseries, and pharmacies significantly influenced happiness, but there was no significant relationship between average distance and happiness in the case of libraries, senior centers, sports facilities, parks, and parking lots. The average distance to elementary schools and nurseries was negatively correlated to happiness, meaning that those who lived nearer to such facilities felt greater happiness than those who did not.

Meanwhile, the average distance from one's residence to kindergartens and pharmacies was positively correlated to happiness. Although kindergartens and elementary schools had similar average distances of 363.1 and 351.3, respectively. The difference in their relationship with happiness is due to parents preferring to send their children to public kindergartens. In general, public kindergartens are in higher demand than private kindergartens. They are distanced further apart from one another, and thus take a longer time to commute. However, most parents prefer public kindergartens even if they are further from their homes because of the more

Table 3. Multi-level analysis of social relations and social infrastructure affecting happiness

Variables		Model 1 (Unconditional)		Model 2 (Conditional with IV Level 1)		Model 3 (Conditional with IV Level 1&2)			
		Estimate	S.E.	Estimate	S.E.	Estimate	S.E.		
Fixed effects									
Intercept 1 (Below basic)		-4.115***	0.153	-13.262***	0.406	-11.172***	0.763		
Intercept 2		-1.606***	0.114	-10.428***	0.382	-8.337***	0.752		
Intercept 3		0.417***	0.112	-7.854***	0.369	-5.764***	0.746		
Intercept 4 (Basic)		2.445***	0.120	-5.357***	0.362	-3.275***	0.744		
Intercept 5		4.072***	0.152	-3.497***	0.370	-1.418	0.749		
Intercept 6 (Below basic)		7.195***	0.512	-0.312	0.587	1.886*	0.895		
Individual level (Level 1)	Personal characteristics	Gender (0=Male)		-0.019	0.056	-0.016	0.055		
		Age		0.005	0.004	0.007*	0.004		
		Marital status (0=Single)				0.279**	0.133	0.219*	0.133
		Parental status (0=None)				-0.039	0.094	-0.022	0.094
		Family support status (0=None)				-0.276***	0.073	-0.239***	0.073
		Education level				0.053	0.054	0.058	0.054
		Number of household members				0.003	0.037	0.006	0.037
		Housing type (0=Not apartment)				0.386***	0.059	0.395***	0.059
		Housing tenure type (0=Rent)				0.164***	0.068	0.179***	0.068
		Length of residence				0.107***	0.027	0.106***	0.027
	Average monthly income				0.065***	0.023	0.058***	0.023	
	Social relations	Personal-relationship satisfaction				0.524***	0.035	0.532***	0.035
		Job, community or school satisfaction				0.458***	0.035	0.458***	0.035
		Social participation status (0=None)				0.358***	0.080	0.316***	0.079
		Experience on discrimination (0=None)				-0.107***	0.023	-0.101***	0.023
		Respect on human rights (0=None)				0.222***	0.030	0.224***	0.030
		Capability on mobile devices (0=None)				0.274***	0.024	0.276***	0.024
	Neighborhood level (Level 2)	Social infrastructure	Education		Average distance to kindergarten (m)		0.0122***	0.0027	
			Average distance to elementary school (m)		-0.0090***	0.0023			
Learning			Average distance to library (m)		0.0004	0.0005			
			Average distance to nursery (m)		-0.0189***	0.0032			
Daily care			Average distance to senior community center (m)		-0.0014	0.0028			
Medical care			Average distance to clinic (m)		0.0009**	0.0004			
Physical			Average distance to sports facility (m)		-0.0001	0.0002			
Rest			Average distance to park (m)		0.0007	0.0007			
Transportation			Average distance to public parking lot (m)		-0.0002	0.0003			
Error variance									
Intercept		0.1836***	0.07	0.1757***	0.07	0.01615***	0.009		
Model fit									
-2 Log Likelihood		13188.7		11390.4		11358.8			

Note: *p< .1 **p< .05 ***p< .01; obs =4,971, No. of groups(gu)=16; ICC=0.053
 Values based on SAS PROC GLIMMIX. Estimation Method=Laplace

affordable costs and higher reliability (Choi, E.Y. and Hwang, S.O., 2013; Lee, H.R. et al., 2014). The kindergartens in this study included both public and private kindergartens, and the preference for public kindergartens was deduced from the finding that parents' happiness levels are largely unaffected by the distance to kindergartens.⁹⁾

The positive correlation between pharmacies and happiness can be traced to location and frequency of use. Since the separation of prescription from medical practice in July 2007, pharmacies have become concentrated near hospitals and clinics instead of general retail stores (Kim, W.Y. and Choi, M.S., 2012). The higher happiness scores reported by residents living further away from pharmacies is related to the distance to the commercial area in which pharmacies are located. The relatively lower use of pharmacies also describes the relationship between average distance to pharmacies and happiness. A past study on elderly use of neighborhood facilities found that the monthly average of facility use by elderly residents was 24.6 for senior centers, 17.1 for parks, and 4.7 for pharmacies (Kim, Y.J. and Ahn, K.H., 2012). While these results cannot be generalized to other age groups, we can presume that the average distance to facilities used less often will not significantly affect happiness.

The variance at the Level 2 of Model 3 was 0.0162, smaller than that of Model 1 and 2. This attests to the reliability of the basis of introducing Level 2 independent variables. The variance ratio statistic was 0.908, which implies that the independent variables at Individual and neighborhood level describe about 90% of the dependent variable.

V. Summary and Conclusion

Happiness is to "live within walking distance of an enjoyable and secure job, prop up the bar with your friends, and then go home and have sex (Schoch, 2008)." As social beings, humans feel happy at times, and unhappy at times through interaction with others in the space of a city. This study examined the relationship between social relations and happiness at the individual level among Busan residents, and analyzed the relationship between social infrastructure and happiness at the neighborhood. The following results were obtained.

First, there was a significant relationship between social relations and happiness. Busan residents reported higher

happiness scores when they had higher personal-relationship satisfaction and higher job/community/school satisfaction. The happier groups were those with social participation in the past year, those with less experience in discrimination, and those who felt that their human rights were respected. Lastly, those more capable of using mobile devices (mobile phones, smartphones, tablet PCs, etc.) were happier than those who were less capable.

Second, social infrastructure as a physical foundation in the formation of social relations was also found to be closely related to happiness. Among the 12 types of Neighborhood Unit Basic Living Infrastructure provided by the Ministry of Land, Infrastructure and Transport, only four (kindergartens, elementary schools, nurseries, pharmacies) were significantly related to happiness in terms of average distance from one's residence to facility. On the other hand, there was no significant relationship between happiness and average distance to libraries, senior centers, sports facilities, parks, and parking lots.

Among facilities that had a significant relationship with happiness in terms of average distance, elementary schools and nurseries were negatively correlated to happiness. This means that those whose homes were closer to elementary schools and nurseries were happier than those living further away. In the case of kindergartens and pharmacies, the average distance from one's residence to facilities was positively correlated to happiness, indicating that such facilities did not affect happiness even if they were located further away from homes.

The implications of this study are as follows. First, a mature urban environment that supports healthy social relations is essential considering how positive social relations enhance happiness. In particular, to enhance the happiness of citizens, all members of society should participate in social processes, enjoy equal opportunities in welfare, education and employment, and have their human rights respected. Second, the results of this study may serve as a basis in determining the order of supply of Basic Living Infrastructure. In 2019, the government established a three-year plan for living SOC to ensure effective supply of Basic Living infrastructure. Given that happiness is affected to different extents depending on facility, this study may be utilized as a basic reference in deciding which facility to supply first when time and resources are limited.

Despite being of significance as mentioned above, this study has several limitations. First, the data on accessibility to social infrastructure was in the unit of autonomous districts. The unit of autonomous districts, which is larger than the unit of neighborhood, may not accurately reflect happiness as experienced by individuals. The relationship between social infrastructure and happiness can be more accurately assessed if data on social infrastructure is acquired based on the addresses of respondents.

Second, only nine types of Neighborhood Unit Basic Living Infrastructure were reflected as social infrastructure variables. While there are slight differences in the recommended distance to Neighborhood Unit Basic Living Infrastructure, most fall in the range of 250 m to 1,250 m. That is, the facilities examined in this study are considered as providing appropriate services if they are within 1.25 km of homes. In future work, it will be necessary to expand the scope of analysis to social infrastructure providing services across larger spaces, and to include them in studying the relationship between social infrastructure and happiness.

Third, in measuring the relationship between happiness and social infrastructure, this study only considered accessibility to social infrastructure. The use of accessibility to social infrastructure as a variable is meaningful in that it reflects the experiences of citizens more accurately than the number of facilities and area. However, happiness is affected not only by accessibility, but also the form of use. Future work should pay more attention to qualitative properties such as service level, type spent at facility, frequency of visits, mode of access, operation type, user age, and offered programs.

Fourth, the results of this study may not be easy to generalize as it was limited to Busan residents. To generalize the relationship between social infrastructure and happiness, more cities should be included. Comparative analysis should be employed to closely examine the differences between cities.

4,200 were allocated proportionately according to gender, age, and population by county/district. This method allows 100 respondents by district, and keeps the age and gender ratios consistent with that of Busan as a whole.

Note 1. The population was based on Statistics of Registered Population (as of May 2019) provided by the Ministry of the Interior and Safety, and the target population was 2.93 million male and female adults aged 19 and above and living in Busan. If samples are allocated according to population ratio, there will be a large gap between districts with smaller populations (Jung-gu, Seo-gu, Dong-gu) and those with larger populations (Haeundae-gu, Busanjin-gu). As such, 50 persons were allocated by city, county, and district, and the remaining

Note 2. In this study, social infrastructure refers to Neighborhood Unit Basic Living Infrastructure as provided by the Ministry of Land, Infrastructure and Transport. The Ministry of Land, Infrastructure and Transport performed geo-coding on address data for 12 neighborhood unit facilities. 100×100 m residential location data was divided into 200×200 m cells with five or more residents, and the shortest path method was used to calculate accessibility per person for 260,000 neighborhoods nationwide. Appropriate age groups were applied to facilities intended for specific ages such as elementary schools, kindergartens, and senior centers. Residents were presumed to use Basic Living Infrastructure closest to their homes. The average shortest distance between residential homes and Neighborhood Unit Basic Living Infrastructure was acquired in the unit of city, county, and district.

Note 3. The urban planner, sociologist, and educator C.A. Perry, who first proposed the concept of neighborhood in 1924, defined the scope of neighborhood as 400 m within elementary schools (Perry, 1939). However, there are still many discussions on the scope and concept of neighborhood. While early research focused on neighborhood as a physical/geographical space for a certain population within a certain distance, recent studies tend to view neighborhood as a territorial place where social relations and social activities are shared (Galster, 2001).

Note 4. The third place refers to unofficial public places other than the home (first place) and workplace (second place), where people voluntarily gather to relax and interact (Oldenburg, 2019:59).

Note 5. Basic Living Infrastructure can be divided into local base facilities and neighborhood facilities depending on hierarchy and size. Local base facilities are facilities to be supplied on a large scale for the purpose of improving underdeveloped areas. On the other hand, neighborhood facilities are facilities supplied on a small scale in neighborhood units for the convenience and welfare of residents.

Note 6. The government established the Living SOC Plan (1/17/2019) in 2019, and is currently implementing the three-year plan.

Note 7. ICC determines how much the dependent variable takes up in the total variance, and serves as an objective indicator of the descriptive power of independent variables. Since the distributions at Level 1 and Level 2 are different, the resulting model is not a typical multilevel linear model. The error term at Level 1 is assumed to follow a logit distribution, which has an average of 0 and a variance of $\pi^2/3$. The total variance of this model can be expressed as the sum of the Level 2 variance γ and Level 1 variance $\pi^2/3$ (3.29). Here, ICC is calculated by applying the fixed Level 1 variance of 3.29 (O'Connell, 2010; Chang, I.S. and Kim, H.S., 2016).

Note 8. $\theta = \frac{\text{level 2 variance of unconditional model} - \text{level 2 variance of conditional model}}{\text{level 2 variance of unconditional model}}$ (Chang, I.S. and Kim, H.S., 2016)

Note 9. The average distance of public kindergartens in Busan is 861.1 m, and that of private kindergartens is 444.1 m (Ministry of Land, Infrastructure and Transport, 2019).

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