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Effects of Satisfaction with the Socio-Physical Environment of the Local Community on Experiences of Annual Dental Scaling

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Abstract

This study investigated satisfaction with the socio-physical environment of the local community at a personal level, and analyzed the correlations between socio-physical environmental factors and experience of dental scaling. Using data from the 2017 Community Health Survey (CHS), 228,381 subjects aged 19 years or older were included. We performed chi-square tests to investigate differences in whether subjects experienced scaling depending on sociodemographic, socioeconomic, and oral health-related characteristics as well as the socio-physical environment of the local community. We performed a multiple logistic regression analysis to ascertain the factors affecting the rate of scaling experience. When we compared scaling experience according to socio-physical environmental factors in the local environment, subjects who were satisfied with the public transport environment showed 1.06 times more scaling experience than unsatisfied subjects, and subjects who were satisfied with the medical service environment showed 1.08 times more scaling experience than unsatisfied subjects. Subjects who were satisfied with the natural environment showed less scaling experience, at 0.91-fold, compared to unsatisfied subjects. In order to improve oral health and quality of life, it is first necessary to enhance the socio-physical environment of the local community.

Keywords: Dental; Local community; Oral health; Physical environment; Scaling

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Introduction

The local community environment is the sum of the natural and social factors that are regularly encountered by an individual while living in a certain region(Foroughi I *et al*., 2020). The socio-physical environment of the local community is an important factor that continuously affects the health of individuals(Lee K H., 2012). Aspects of the local socio-physical environment, including instability, climate, mobility, and the natural environment, have been shown to be significant risk factors with regard to medical use and access(Foroughi I *et al*., 2020), and an individual's spatiotemporal stability affects their health(Scott G M *et al*., 2019). Local residents' health is affected by the local socio-physical environment, where residents who believe they are living in a region with a poor socio-physical environment show relatively worse health than residents who believe they are living in a region with a better socio-physical environment(Lee J H., 2016). Thus, because the socio-physical environment of the local community is not evenly distributed in space, people are not all affected by the socio-physical environment under the same conditions. Therefore, health inequality can develop due to differences in the socio-physical environment (Fitzpatrick K *et al*., 2011). Since July 2013, South Korean citizens have been able to receive dental scaling once per year under health insurance coverage, as long as treatment is limited to scaling(Ministry of Health and Welfare., 2014). Scaling has been added to services under national health insurance, and the use of dental-medical coverage has been expanded for the population as a whole. However, the accessibility of services and the effects of the socio-physical environment of the local community should be examined; residents' satisfaction with their community environment may impact their scaling experience. Most prior studies investigating factors affecting scaling experience have focused on oral health behaviors(Ko M K *et al*., 2013), or personal economic characteristics, such as socioeconomic factors(Lee M Y *et al*., 2012). One study examining regional differences in the experience of scaling reported differences in dental-medical service usage due to an unequal distribution of medical institutions(Jang Y E *et al*., 2015). Furthermore, genetic, psychological, and physiological factors also greatly affect an individual's health, as well as also regional factors, which have been broadly divided into four types: socioeconomic status (e.g., income level, education), healthcare systems and resources (e.g., presence or absence of healthcare delivery systems, including hospitals, public healthcare centers, and pharmacies), social capital (e.g., level of participation, trust), and socio-physical environment factors (e.g., natural environment and living environment) (Galster G C., 2010). These diverse regional factors have been considered as health-determining factors and, although there is growing recognition of the need to consider the socio-physical environment of the local community with regard to health, there has been limited detailed research on the effects of the

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local socio-physical environment on oral health . The field of oral healthcare needs to develop new perspectives on the potential of the socio-physical environment affecting personal oral health. Hence, in this study, we investigated satisfaction with the perceived socio-physical environment of the local community at the level of individuals and analyzed the correlations between socio-physical environmental factors and experience of scaling.

Materials and Methods

For this study, we requested raw data from the Centers for Disease Control and Prevention (CDC) and used the approved and provided data from the 2017 Community Healthy Survey (CHS). The CDC CHS is a nationwide survey conducted by public health centers to establish and assess regional public healthcare plans. The data were collected through interviews by trained surveyors, who directly visited households included in the sample between August 16 and October 31, 2017. In order to identify the factors affecting the annual rate of scaling experience, we analyzed data from 228,381 persons aged 19 years or older who were eligible for annual scaling insurance coverage (full mouth/fee code U2233). Responses of "No comment" or "Not sure" to the questions were treated as missing values.

The dependent variable was whether or not the subject had experienced annual scaling, defined by the response of "Yes" or "No" to the question, "Have you received scaling in the last year?" The independent variables included sex and age as sociodemographic characteristics, and education, being economically active or inactive, and income quartile as socioeconomic characteristics, where income quartile was defined based on household equivalized income. Oral health-related characteristics, subjective oral health, and subjective periodontal health were included in the CDC CHS, as well as characteristics related to the socio-physical environment of the local community, the safety level of the environment, natural environment, living environment, public transport environment, and medical services environment. Satisfaction with the local socio-physical environment was defined separately as satisfaction with safety levels (natural disasters, traffic accidents, agricultural accidents, and crime), the natural environment (air quality, water quality), the living environment (electricity, waterworks, garbage collection, sports facilities, etc.), the public transport environment (buses, taxis, subway, trains, etc.), and the medical services environment (public health centers, hospitals and clinics, traditional Korean medicine, pharmacies, etc.).

Chi-square tests were performed to investigate differences in scaling experience according to subjects' sociodemographic characteristics, socioeconomic characteristics, oral health-related characteristics, and the socio- physical environment of the local community. A multiple logistic regression analysis was performed to identify factors affecting the rate of the scaling

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experience. STATA 11.0 was used for all data analyses.

Results and Discussion

We investigated differences in scaling experience according to sociodemographic characteristics. There were statistically significant differences in scaling experience related to both age and sex ($p < 0.001$). Male and female subjects both showed a high proportion of individuals who had not experienced scaling (males, 58.2%; females, 56.8%). When subjects were divided by age, the rate of scaling experience was highest in the 45–64-year-old group (47.0%) and lowest in the ≥ 65-year-old group (31.2%) in Table 1.

Table 1: Differences in scaling experience according to sociodemographic characteristics

Variables	Scaling experience		p
	Yes	No	
Gender			
Male	138,466(41.8)	53,445(58.2)	<0.001
Female	47,643(43.2)	62,546(56.8)	
Age			
19-44 years	32,335(44.5)	40,263(55.5)	<0.001
45-64 years	39,734(47.0)	44,824(53.0)	
≥65 years	14,040(31.2)	30,904(68.8)	

We investigated differences in scaling experience according to the socioeconomic characteristics of education level, income quartile, and economic activity. There were statistically significant differences in scaling experience related to socioeconomic characteristics ($p < 0.001$). Scaling experience rates increased with higher education level. The proportion of subjects with no scaling experience increased with higher income, from the "low" income group at 48.4% to the "high" income group at 73.9%. Finally, the scaling experience rate was higher in economically active subjects (44.5%) than in economically inactive subjects in Table 2.

Table 2: Differences in scaling experience according to socioeconomic characteristics

Variables	Scaling experience		p
	Yes	No	
Education level			
Elementary school graduation or below	9,235(25.7)	26,664(74.3)	<0.001
Middle school graduation	8,647(38.6)	13,776(61.4)	
High school graduation	27,029(43.9)	34,561(56.1)	
University graduation or above	41,092(50.2)	40,853(49.8)	
Income quartile			
Low	35,164(51.6)	32,930(48.4)	<0.001
Low-middle	30,726(43.5)	39,872(56.5)	
High-middle	11,324(36.8)	19,402(63.2)	
High	8,014(26.1)	22,742(73.9)	
Economic activity			

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Activity	59,740(44.5)	74,511(55.5)	<0.001
Non-activity	26,349(38.9)	41,458(61.1)	

We investigated differences in scaling experience according to oral health-related characteristics. There were statistically significant differences in scaling experience rate depending on subjective oral health status and subjective periodontal health status ($p < 0.001$). Better subjective oral health status was associated with a lower proportion of subjects with no scaling experience ("good" subjective oral health, 51.1%; $p < 0.001$). In terms of subjective periodontal health status, the rate of scaling experience was higher in subjects with "normal" periodontal health (44.4%) than in those with "abnormal" periodontal health (38.2%), meaning that better subjective oral health and subjective periodontal health were both associated with a higher rate of scaling experience in Table 3.

Table 3: Differences in scaling experience depending on oral health-related characteristics

Variables	Scaling experience		p
	Yes	No	
Subjective oral health status			
Poor	22,347(35.0)	41,496(65.0)	<0.001
Average	37,625(44.4)	47,169(55.6)	
Good	26,134(48.9)	27,314(51.1)	
Subjective periodontal health status			
Abnormal	22,108(38.2)	35,780(61.8)	<0.001
Normal	63,898(44.4)	80,013(55.6)	

When we investigated differences in scaling experience depending on the socio-physical environment of the local community, the safety level of the environment, natural environment, public transport environment, and medical services environment had statistically significant effects on scaling experience ($p < 0.001$). Subjects who were satisfied with the safety level of the environment and the natural environment showed lower scaling rates (42.4% and 42%, respectively) than those who were dissatisfied with these elements. Subjects who were satisfied with the public transport environment and medical services environment showed higher scaling rates (43.3% and 43.2%, respectively) than those who were dissatisfied with these elements Table 4.

Table 4: Differences in scaling experience depending on the local socio-physical environment

Variables	Scaling experience		p
	Yes	No	
Safety level of the environment			
Dissatisfied	16,472(43.6)	21,344(56.4)	<0.001
Satisfied	68,070(42.4)	92,486(57.6)	
Natural environment			

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Dissatisfied	18,743(45.0)	22,854(55.0)	<0.001
Satisfied	66,842(42.0)	92,377(58.0)	
Living environment			
Dissatisfied	15,503(42.8)	20,695(57.2)	.417
Satisfied	70,151(42.6)	94,541(57.4)	
Public transport environment			
Dissatisfied	23,096(41.0)	33,253(59.0)	<0.001
Satisfied	61,688(43.3)	80,746(57.7)	
Medical services environment			
Dissatisfied	23,176(41.2)	33,082(58.8)	<0.001
Satisfied	61,832(43.2)	81,339(56.8)	

Table 5 shows the results of the analysis of the factors affecting the rate of the scaling experience. Regarding sociodemographic factors affecting the rate of scaling experience, males showed 1.21 times higher scaling experience rates than females. In addition, compared to 19–44-year-olds, those in the age group of 45–64-year-olds showed 1.51 times higher scaling experience rates, and for those aged ≥ 65 years, the rates were showed 1.42 times higher. Among socioeconomic factors, for education level, compared to elementary school graduation or below, university graduation or above was associated with a 2.57 times higher rate of scaling experience. When economic activity was analyzed, economically inactive subjects showed 0.92 times the rate of scaling experience compared to economically active subjects. Subjects in the "high" income quartile showed approximately 5% lower rates of scaling experience compared to subjects in the "low" income quartile. In terms of oral health-related characteristics, better subjective oral health and better subjective periodontal health were associated with 1.40 times and 1.07 times higher scaling experience rates, respectively. Finally, among local socio-physical environmental factors, subjects who were satisfied in the public transport environment showed 1.06 times higher scaling experience rates than those who were dissatisfied, and those who were satisfied in the medical services environment showed 1.08 times higher scaling experience rates than those who were dissatisfied. On the other hand, subjects who were satisfied with the natural environment showed 9% lower rates of scaling experience compared to those who were dissatisfied.

Table 5: Factors affecting experience of scaling

Variables		OR(95%CI)	p
Sociodemographic characteristics	Gender		
	Male	Reference	
	Female	1.21(1.19-1.24)	.000
	Age (years)		
	19–44	Reference	
	45–64	1.51(1.48-1.55)	.000
	≥ 65	1.42(1.38-1.48)	.000
Socioeconomic characteristics	Education level		

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	Elementary school graduation or below	Reference	
	Middle school graduation	1.57(1.51-1.63)	.000
	High school graduation	1.90(1.84-1.97)	.000
	University graduation or higher	2.57(2.47-2.67)	.000
	Income quartile		
	Low	Reference	
	Low-middle	0.81(0.79-0.83)	.000
	High-middle	0.69(0.67-0.71)	.000
	High	0.51(0.49-0.53)	.000
	Economic activity		
	Activity	Reference	
	Non-activity	0.92(0.90-0.95)	.000
Oral health-related characteristics	Subjective oral health		
	Poor	Reference	
	Average	1.20(1.18-1.23)	.000
	Good	1.40(1.36-1.44)	.000
	Subjective periodontal health		
	Abnormal	Reference	
	Normal	1.07(1.05-1.10)	.000
Local socio-physical environment	Safety level of the environment		
	Dissatisfied	Reference	
	Satisfied	0.98(0.95-1.00)	.211
	Natural environment		
	Dissatisfied	Reference	
	Satisfied	0.91(0.89-0.93)	.000
	Living environment		
	Dissatisfied	Reference	
	Satisfied	0.99(0.97-1.02)	.873
	Public transport environment		
	Dissatisfied	Reference	
	Satisfied	1.06(1.04-1.09)	.000
	Medical services environment		
	Dissatisfied	Reference	
	Satisfied	1.08(1.05-1.11)	.000

To achieve equality and efficiency, which are important goals for public healthcare delivery systems, and to improve and maintain oral health and quality of life, in addition to the health of individuals, it is important to pay attention to the socio-physical environment of local communities. There has been some interest in the idea of socioeconomic factors and socio-physical characteristics as factors that have a significant effect on health(Kim W J *et al*., 2013). Local socio-physical environmental factors that have been found to improve health include the natural environment (e.g., air and water quality), the safety of the environment (e.g., safe housing, public order), the medical services environment (e.g., medical care and welfare services), and the construction of services supporting daily living (e.g., the public transport

environment) (Macintyre S *et al*., 2002).

Among socioeconomic characteristics, higher education level was associated with a higher rate of scaling experience, which is consistent with previous studies(Kim J M *et al*., 2015). A high-income quartile was associated with a lower rate of scaling experience, which also supports findings from previous research(Heo Y M *et al*., 2015). Among oral health-related characteristics, better subjective oral health and periodontal health were associated with higher rates of annual scaling experience, which is in agreement with previous studies(Kim J M *et al*., 2015), and we believe that scaling experience increased for the purposes of prevention rather than treatment. Notably, since subjective oral health status is the individual's subjective assessment of their oral health, it can reflect one's quality of life better than an objective oral health index. Moreover, it is reported to strongly correlate with usage of dental-medical services(Locker D., 1996). Among local socio-physical environmental factors, we found that subjects who were satisfied with the public transport environment and the medical services environment showed higher rates of scaling experience, while subjects who were satisfied with the natural environment showed lower rates of scaling experience. This can be understood by considering previous studies, such as the finding that individuals living in more socioeconomically unequal regions had lower rates of scaling experience(Choi E S *et al*., 2016), and that health is improved by the provision of diverse transport methods, good accessibility to public transport facilities(Frank L D., 2000), and the presence of abundant green spaces and parks(Potwarka L R *et al*., 2008).

Since there may be differences between the subjective and perceived conditions of a region and the actual conditions existing there, it is possible to conclude that the actual socio-physical environment of a local community is not a health risk factor. In order to improve quality of life and strengthen oral health in the face of this underlying danger, it is essential to improve the local socio-physical environment. The value of the present study is that we ascertained the importance of the socio-physical environment of the local community in which individuals lead their daily lives with regard to the experience of annual scaling. Nevertheless, there are some limitations in the generalization of the results, since this was a cross-sectional study that only included data from 2017.

Conclusion

Using raw data from the 2017 CHS, we identified the effects of socio-physical environmental factors in the local community on the rate of scaling experience among adults aged 19 years or older. The scaling rate was significantly affected by sex and age, and was higher for subjects

with higher education levels, who were economically active, had a lower income quartile, and had better subjective oral and periodontal health ($p < 0.001$). Among local socio-physical environmental factors, the natural environment, public transport environment, and medical services environment showed statistically significant correlations with scaling experience. Subjects who were satisfied with the public transport environment and medical service environment showed higher rates of scaling experience ($p < 0.001$). By ascertaining the effects of socio-physical environmental factors in the local environment on scaling experience, we anticipate that our findings will have a positive effect on improving effective and efficient accessibility and strengthening coverage of dental healthcare, in order to enhance the oral health and quality of life of the national population.

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