

# Senior Citizens' Image Preference for Interior Design Styles

## 실내디자인 스타일에 대한 노인들의 선호이미지 연구

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**Abstract** As Korea has rapidly entered the aging society, the Korean government and academia are currently undergoing many researches on senior citizens. There also has been an increase in senior citizens' awareness on the importance of spatial designs that reflect the newly emerged needs brought out by their psychological and emotional changes as well as their physical aspects. Therefore, the purpose of this research is to propose a model for senior citizens' image preference to be adopted in future developments for senior-friendly spatial designs. A literature review and a questionnaire survey were implemented as research methods. The questionnaire survey was conducted at two senior welfare centers located in Seoul and Ansan and two disparate senior colleges, on the subjects of 86 senior citizens aged 60 and older. 7 styles of Romantic, Classic, Country, Modern, Natural, Casual, and Traditional were chosen for the study and the realms to apply the image preference were divided into Space, Element1 and Element2. For Space, its subcategories have been restricted to living room and bedroom while color, furniture and lighting for Element1 and material, pattern and props for Element2. Survey results were statistically analyzed for the correlation among socio-demographic factors of senior citizens, spaces and the elements. The study result showed that older age and men tended to prefer the modern style than younger age or women, and younger women preferred the romantic style. For the color preference in Element1, older men preferred the classic style while women preferred the romantic style. And, for the furniture preference, men with higher income preferred the natural style while women preferred the romantic style. For the pattern preference in Element2, younger people preferred the casual style and it showed that the housing type was the main reason for their preferences. Therefore, the image preference according to their age and gender shall be taken account of as the most important factors when designing environments for senior citizens.

**Keywords** 노인, 선호 이미지, 실내디자인 스타일  
Senior, Image Preference, Interior Design Style

## 1. Introduction

### 1.1. Purpose of the Study

Korea is experiencing rapid socio-demographic changes due to its low birthrate and growth of aging population. According to National Statistical Office, the percentage of the elderly population above 65 years old was 11.3% of total population in (2010), which was increased by 23.5% compared to 5 years ago.

Population of Korea already showed aged society figures and National Statistical Office also predicted that senior population will rise up to 20% of the entire

population by 2026, which called a hyper-aged society.

Increasing elderly population requires a senior-friendly spaces that reflect their needs in the public and residential spaces. It also leads changes to the image preferences of elderly people. Image preferences based on personal and social characteristics of senior citizens, which reflect both their psychological aspects and physical aspects, can be used as indicator in order to measure interior requirement of elderly people. Thus, the image preference reflecting the social and economical characteristics of senior citizens is a crucial factor when designing environments for senior citizens.

The purpose of this study is to find the preferred interior design styles depending on socio-demographic factors such as gender, age, economic status and educational background, to investigate the correlation between the preferred image and the socio-demographic factors, and to eventually understand the interactions between senior citizens and their environments.

## 1.2. Methods and Range of the Study

Through the literature review and questionnaire survey, this research analyzes the trend in image preferences of senior citizens that are expected to be extensively affected in the future.

After reviewing the literature in order to learn how the personal characteristics, space and the visual environment affect senior citizens, we determined standard styles of image for survey which could represent trend of the interior design. we also divided elements of image into space, element1, and element2.

Two senior's welfare centers and two senior's colleges in Seoul and Ansan was selected for survey. After finishing survey, SPSS was used for analyzing cross tabulation, Spearman correlation, and non-linear canonical correlation.

The contents of this study are as follows.

The chapter 1 proposes the purpose and methods of the study and chapter 2 considers the relationship between the senior environment and the image preference. Chapter 3 explains the general outline and the methods of the questionnaire survey throughout the process. Chapter 4 is an analysis on the research findings in which the correlation between the image preferences and the socio-demographic factors were analyzed for the purpose of proposing and applying the preferred styles to the living spaces and the environments.

## 2. Literature Review for the Elderly and Interior Design Styles

### 2.1. Review for the Elderly

The characteristics of senior citizens show differences from those of younger generations due to the deterioration of various body functions; their spatial

and directional perceptions and visual preferences range differently when compared to their young days. Senior citizen's understanding of the spatial structure and visual perception is also connected to their psychological, and social characteristics. In order to improve the environment to live pleasantly for seniors, designer should understand interaction between detail elements of indoor environments and the users. They should also consider an easy recognition of color and visual image for seniors.

As senior citizens experience the deterioration of visual, auditory, olfactory, kinesthetic and gustatory sense, the color schemes and sign designs must be easily and clearly readable; also, the intensity of luminance and the acoustic design need to be carefully integrated. Additionally, when picking flooring or finishing materials, the materials need to be thoroughly inspected if they are properly equipped with slip-resistant property. One other consideration shall be the fact that senior citizens are more vulnerable for emotional insecurity as they lose their social positions and financial capabilities so that they tend to become introverted and reserved. Therefore, spatial designs targeting senior citizens must provide counter solutions for the specific design requirements. The changes made in senior citizens' image preference tendency are detectable from their physical and emotional changes and are also influenced by the socio-cultural changes that our society may demand. In other words, as senior citizens lose their senses as they get older, their reactions to what they feel and sense through their sensory nerves such as smells, visual perceptions on things like colors and patterns, laughs during their tea time conversations, textures, etc. will get affected and changed also. For this reason, various methods of stimulating their senses when they collect given information throughout the day are necessary to be provided. Furthermore, image preference plays a crucial role to support the psychological aspects that are closely connected to the sensitivity of senior citizens.

In the interaction of Parr, the importance of environmental influence is explained as follows: 'Environment plays a go-between role so that seniors can sensibly live as normal as they can'. Environment can also serve as psychological function tool. This

means the environment as a cognitive, intellectual, educational and memory tool, which describes the importance of environment, is of great value to the elderly since it leads to self-regulating psychological activity.<sup>1)</sup> In Lawton and Nahemow's Person-Environmental Model, they pointed that when the level of personal ability is high, the resistance against environmental pressure is sufficient enough not to be disturbed by it but when the level of personal ability is low, the ability to handle environmental demand decreases along with the ability. This indicates that as the satisfaction degree on environmental setting lowers, each individual's ability also decreases.<sup>2)</sup> Environments and spaces for senior citizens, where their physical and psychological emotions perceptions continuously change, require the preferred images to be reflected and eventually integrated into a comprehensive and positive indoor environment model to support the ever-changing demands of senior citizens.

## 2.2. Review for Interior Design Styles

Prior to the selection of interior design styles to be used for the research's analytic framework, an advanced research on precedent cases of interior design styles was conducted in order to grasp the overall picture.

Kim, Kyung-Sook<sup>3)</sup>(2004) categorized interior design styles into 10 subdivisions such as Romantic, Ethnic, Classic, Hi-tech, Elegant, Country, Modern, Minimal, Natural and Casual.

Kim, So-Hee<sup>4)</sup>(2008) categorized the design styles into 8 subdivisions such as Modern, Classic, Romantic, Minimal, Natural, Mix-match, and Oriental while Lee, Chun-Hyup<sup>5)</sup>(2009) divided them into 3 main

categories such as the Contemporary style, Contemporary-traditional style, and the Traditional style. Baek, Jin-young<sup>6)</sup>(2010) categorized the interior styles into 10 such as Romantic, Ethnic, Classic, Hi-tech, Elegant, Modern, Minimal, Natural, Casual, and Zen style.

The dictionary meaning of style in interior design includes motif, material, technique that shows the style and pattern of the historical period and designer's uniqueness.<sup>7)</sup> Namely, it means the distinctive thought or trend and atmosphere of the indoor space and reflects the lifestyle of current trends.

This research study was based on the analysis of Kim, Kyung-Sook's interior design style classification system since it serves well as a common scale for a basic analysis of image preferences. Some of the categories that are considered as uncommon or inappropriate from this system such as Ethnic, Hi-tech, Minimal, and Elegant styles were excluded<sup>8)</sup> and one additional category which is Traditional style was added<sup>9)</sup> to the 7 existing categories as the style is familiar to the senior citizen group. The final chosen image preferences for this study were Romantic, Classic, Country, Modern, Natural, Casual, and Traditional. The chosen image preferences were arranged into space, Element1 and Element2. Space had two sub categories which were bedroom and living room; Element1, color, furniture and lighting and Element2, material, pattern and decoration.

The final interior design styles for the study were shown in <table 1>.

1) Chun, Jin-Hee, Residential Design to Improve the Quality of Life for the Elderly, Jipmoondang, 2008, p.25

2) Kim, Young-Joo·Lee, Yun-Hee·Shin, Hwa-Kyung, Characteristics of Space Design and Design Elements of Aging Simulation Centers, Journal of Korean Institute of Interior Design, April, 2008, p.112

3) Kim, Kyung-Sook, Classification of Interior Design Style and Corresponding Characteristics, Ph. D. Thesis, Yonsei University, 2004, p.90

4) Kim, So-Hee·Han, Young-Ho, A Study of Present Housing Coordination through Analyzing the Classification of Interior Design, Journal of Korean Institute of Interior Design, October, 2008, p.170

5) Lee, Chun-Yeop·Oh, Chan-Ohk, Elderly Preference of Interior Design in Residential Space, Journal of Korean Housing Association Vol.20 No.6, 2009, p.68

6) Baek, Jin-Young, A Study on the Characteristics of Interior Coordination Trends of Brand Apartment Model House, Master's Thesis, Graduate School of Construction Engineering, Chung-Ang University, 2010, p.18

7) Kim, Kyung-Sook, Op. Cit., p.10

8) During the survey because the 10 images that were chosen from preliminary research seemed too many, images that were thought unnecessary had been excluded from the category.

9) From the advanced thesis research of Kim, So-Hee, Lee, Chun-Yeob and Baek, Jin-Young's styles, although the styles were named differently, there were more oriental styles that were added to categories. However, Kim, Kyung-Sook's 10 styles included a variety of western styles and oriental styles were missing, so they were added to the category.

<Table 1>Criteria for the Classification of Interior Design Style

Style	Space (Bedroom, Living room)	Elements 1 (Color, Furniture, Lighting)	Elements 2 (Material, Pattern, Decoration)
Romantic	Feminine spatial Image presentation	Soft color such as pink and purple	Transparent fabrics are used. Feminine props and flower patterns
Classic	Traditional western style, elegance, and luxury concepts	Brownish darker colors, traditional pattern furniture and chandelier	Geometrical flower design and strip, clock, frame and pottery
Country	Pastoral, folksy, positive space	Use of Wooden color, and furniture with curvy ornaments	Use oak, maple wood materials, tiles, wave and snowflake pattern
Modern	Modern contemporary simple functional space	Achromatic colors, Simple style furniture and lighting	Use Simple, plain, stripe pattern and stainless steel products
Natural	Natural and pastoralized space	Use natural colors, natural materials	Flower or leaf pattern props
Casual	Light and bubbly design	Bright and Colorful contrasting colors. Modern Italian styled furniture	Use of natural and artificial materials. Abstract pattern such as polka-dot pattern.
Traditional	Korean atmosphere and marginal space	Traditional color and floor high furniture	Traditional design pattern and props

### 3. Survey of Image Preferences

#### 3.1. Outline of the Survey

This survey was conducted in June 2010 to senior citizens aged 60 or above. It was performed after receiving permissions from the facilities where the senior citizens frequently visit. In a span of 4~6 days, 4 facilities in Seoul and Asnan were selected where about 25 respondents per facility were asked to do the survey. Eighty six survey result were used for statistical analysis after excluding survey sheets which showed too many missing values.

<Table 2> Survey Respondents per Facility

Facilities	No. of people	Percentage (%)
Seoul Seniors' College	24	27.9
Seoul Seniors' Welfare Center	22	25.6
Ansan Seniors' College	17	19.8
Ansan Seniors' Welfare Center	23	26.7
Total	86	100.0

The preliminary, primary, secondary, and tertiary investigations were used as image preference selection methods. For selecting proper style images, we performed several processes as shown <Table 3>

<Table 3> Processing for selection of the Interior Design Styles

	Purpose	Subject	Respondents	Procedure Result
Preliminary Phase	A study on the Trends	Precedent theses and online documents as a tool	2	10 types of interior design were Selected
Primary phase	To select images that suit the style	Interior Design Professionals	20	2-3 pictures that suits each style were respectively
Secondary phase	Experiment on the selected primary preference Image	60-80 years old elderly	20	Experiment on the 10 types of interior design preference Image was implemented
Tertiary phase	Final selection of the interior design	Interior Design Professionals (More than 15 years of experience)	15	7 types of interior design preference images were selected

From the pictures priory chosen, based on a range of advanced studies, for the respective 10 preference images, the selection was once again narrowed down to 2-3 pictures through the process of sorting out based on another survey conducted to 20 interior design professionals. The 10 priory selected pictures were shown to 20 senior citizens as a preliminary research, and the result indicated that the senior citizens had difficulties in choosing an image because they thought the image selection was too complicated. In the secondary research, professional designers with 15-20 years of career experience and CEOs were consulted to select the 7 final styles.

#### 3.2. Questionnaire Construction and Survey

The questionnaire was composed of 2 components.

The first part contained questions on the socio-demographic factors. To obtain the basic information of participants, their personal details such as age, gender, educational background, occupation and residence were collected. The respondents' economic statuses were also collected.<Table 4>

The second mainly consisted of question items on the image preferences. The pictures representing each style were laid out in an order and the respondents were asked to choose three pictures they like and one picture that they dislike. After choosing the corresponding numbers according to the order they liked, they were asked to write the reasons for their choices.

<Table 4> Questionnaire Construction

Category	Items
Socio-demographic	Age, gender, education, residence, occupation, allowance, total income, housing type
Personal Preference	Preferred style of space and elements

The survey was led by a authors and two assistant researchers and was implemented before or after the program of the senior's college or welfare center was held. During the questionnaire survey, since the subjects were senior citizens the survey questions were read and explained 1:1 or 1:2 when necessary. Thus, the survey duration lasted about 30~40 minutes per each survey.

### 3.3. Image Preference board

The authors composed an image board prior to the survey. A set of eight large image boards with the dimension of 297mm×420mm was prepared for each space and factor in order to help the senior citizens to understand and visualize the research items for the survey.

The spatial image was divided into bedroom and living room space, Element1 was divided into color, furniture, and lighting, and Element2 was divided into material, pattern and decoration, which were shown in <table 5> through <table 7>.

<Table 5> Board for Spatial Image Preference

		Living Room	Bedroom
Romantic	Feminine, Complex, Dynamic		
Classic	Masculine, Weighty, classical.		
Country	Exotic, folksy.		
Modern	Contemporary, Simple, Static.		
Natural	Natural, Pastoral.		
Casual	Modern, Urban, Dynamic		
Traditional	Traditional, Beauty of space		

<Table 6> Board for Element Image Preference1

		Color	Furniture	Lighting
Romantic	Feminine, Colorful, Romantic			
Classic	Classical, Antique			
Country	Folksy, Natural			
Modern	Linear, Simple, Concise			
Natural	Natural, Pastoral			
Casual	Colorful, Sophisticated			
Traditional	Korean, Oriental sensibility			

<Table 7> Board for Element Image Preference2

		Material	Pattern	Decoration
Romantic	Comfortable, Warm			
Classic	Weighty, Luxurious			
Country	Pastoral, Folksy			
Modern	Clean, Simple			
Natural	Comfortable, Playful			
Casual	Cute, Colorful			
Traditional	Oriental, Restrained			

## 4. Results

### 4.1. Statistical Analyses

<Table 8> Analyzing Method

Category	Methods
Socio-demographic	Frequency, Percentage
Personal Preference	cross tabulation, Spearman's Correlation, non-linear canonical correlation

The socio-demographic factor was analyzed by utilizing frequency analysis and the image preference investigation was analyzed through a mean value analysis, a cross-tabulation process and a correlation analysis. The correlation was calculated based on the answers of respondents for numbering the given items in the least preferred order. 1st preference was given a score of 6, 2nd, a score of 5, 3rd, a score of 4, none selection a score of 2 and dislike a score of 0.

#### 4.2. Characteristics of Respondents

The information on research subjects were collected on the areas of Gender, Age, Residence, Education, Occupation, Income, and Housing Type. <table 9>

<Table 9> Characteristics of Respondents

Data	Category	No. of People	Percentage(%)
Gender	Male	27	31.4
	Female	59	68.6
Age	Ages 61~65	6	7.0
	Ages 66~70	19	22.1
	Ages 71~75	33	38.4
	Ages 76~80	19	22.1
	Ages 81 & above	8	9.3
Education	Elementary graduate	20	23.3
	High school graduate	45	52.3
	College graduate	20	23.3
Occupation	Manufacture	6	7.0
	Agriculture & Fishery	3	3.5
	Sales services	10	11.6
	Office worker	7	8.1
	Business management	5	5.8
	Government official	16	18.6
	Housewife	28	32.6
	Other	6	7.0
Total income	Below \$1,000	27	31.4
	\$1,000-2,000	24	27.9
	\$2,000-3,000	10	11.6
	\$3,000-4,000	6	7.0
	Above \$4,000	4	4.7
Housing type	Single detached housing	9	10.5
	Multi-family housing	21	24.4
	Low-rise apartment	11	12.8
	High-rise apartment	39	45.3

\* Missing values have been excluded

The gender information for 86 subjects were researched, 31.4% were male (27 seniors) and 68.6% were female (59 seniors). For the age factor, 60% (52 seniors) were in their 70's taking the greatest percentage while 29% (25 seniors) were in their 60's and 9.3% (8 seniors) were 80 and above.

In terms of education, most senior citizens were high school graduates who took about 52.3% (45 seniors) and elementary/college graduates took 23.3% (20 seniors), respectively. For occupations, with 32.6%

(28 seniors), the majority were housewives followed by government officers taking up 18.6% (16 seniors). Other jobs showed mostly even distributions. Meanwhile, for monthly income, senior citizens with income below US \$1,000 dollars and income ranging US\$1,000~\$2,000 dollars showed much gravity with 59.3% (51 seniors). For housing types, survey showed that the majority of the senior citizens lived in high-rise apartment buildings with about 45.3% (39 seniors), followed by multi-family housing.

#### 4.3. Distribution of Image preference according to Respondents

From an observation on the mean values of senior citizens' image preference research, it was discovered that for living space, the Natural look relatively had a high preference with 3.99% (1.59) which were followed by 3.64% for Modern, 3.55% for Casual, 3.49% for Romantic. The preference for living space showed a scattered distribution. Meanwhile, for bedrooms, Traditional marked the highest preference with 3.66% (1.75). For color, the survey result indicated a preference distribution of Romantic with 4.03%, Natural 3.91%, and Casual 3.81%. For furniture, Modern was the highest with 3.83% and for lighting, the Classic style was the highest with 4.43%. For material and shape, the Romantic was preferred while the Traditional was preferred for decoration. For better understanding on the survey form and concept, an analysis result of the cross-analysis and correlation is given as the following data obtained through a rank average analysis.

<Table 10> Average Score Distribution for Image Preference

Category	Romantic	Classic	Country	Modern	Natural	Casual	Traditional
	Mean (s.d)						
Living Room	3.49 (2.10)	1.66 (1.48)	1.80 (1.52)	3.64 (1.88)	3.99 (1.59)	3.55 (1.57)	2.49 (1.32)
Bed Room	2.86 (1.89)	3.01 (2.04)	2.60 (1.79)	2.97 (1.94)	3.00 (1.57)	2.50 (1.83)	3.66 (1.75)
Color	4.03 (1.88)	1.63 (1.54)	1.74 (1.42)	3.27 (1.61)	3.91 (1.52)	3.81 (1.83)	2.45 (1.40)
Furniture	2.90 (1.65)	3.07 (1.71)	2.60 (1.89)	3.83 (1.93)	3.10 (1.65)	1.50 (1.43)	3.77 (1.68)
Lighting	3.80 (1.86)	4.43 (1.90)	2.97 (1.46)	3.26 (1.58)	2.23 (1.55)	1.30 (1.33)	2.85 (1.52)
Material	3.95 (1.85)	2.90 (2.80)	3.23 (1.76)	1.80 (1.53)	2.88 (1.72)	3.23 (1.64)	2.52 (1.51)
Pattern	3.84 (1.85)	3.59 (1.89)	2.92 (1.71)	3.17 (1.77)	3.43 (1.74)	1.85 (1.46)	1.93 (1.49)
Decoration	2.90 (1.74)	3.02 (2.06)	2.94 (1.78)	2.35 (1.56)	3.08 (1.71)	2.30 (1.62)	3.77 (1.86)

#### 4.4. Analysis of Image Preference according to Respondents

Next, image preference survey results were analyzed through a cross-tabulation process.

##### (1) Spatial Image Preference

<Table 11> Spatial Image Preference Analysis

		G	A	E	T	H
Living Room	Romantic	2.57 (.109)	3.12 (.538)	5.25 (.629)	4.87 (.300)	1.70 (.791)
	Classic	4.60 (.032)	8.65 (.070)	5.98 (.542)	2.95 (.566)	2.32 (.677)
	Modern	7.69 (.006)	12.09 (.017)	16.26 (.023)	4.86 (.301)	9.05 (.060)
	Casual	3.24 (.072)	5.23 (.264)	7.88 (.343)	3.84 (.427)	12.53 (.014)
	Traditional	.576 (.448)	1.63 (.802)	8.92 (.258)	5.92 (.205)	12.95 (.012)
Bed Room	Romantic	1.61 (.205)	11.00 (.027)	8.98 (.254)	5.16 (.271)	7.57 (.109)
	Classic	.938 (.333)	3.14 (.533)	12.44 (.087)	16.61 (.002)	8.29 (.081)
	Modern	2.52 (.112)	16.00 (.003)	9.47 (.221)	8.33 (.080)	4.32 (.363)
	Casual	.058 (.810)	10.01 (.040)	6.82 (.447)	11.89 (.018)	6.36 (.173)
	Traditional	1.50 (.220)	1.27 (.865)	4.32 (.742)	8.15 (.086)	2.71 (.606)

\*G-Gender, A-Age, E-Education, T-Total Income, O-Occupation, H-Housing Type

The following table represents the calculated values for the differences showed in preferred images of senior citizens by space categories and by socio-demographic figures, respectively, utilizing the Chi-squared statistics. The Classic style in living rooms displayed a different preference distribution between the genders ( $\chi^2=0.032$ ). For Modern, the differences showed in Gender ( $\chi^2=0.006$ ), Age ( $\chi^2=0.017$ ), and Occupation ( $\chi^2=0.023$ ). The Casual and the Traditional showed differences in Housing type ( $\chi^2=0.014, 0.012$ ). The Romantic ( $\chi^2=0.109$ ) and Casual ( $\chi^2=0.072$ ) in living rooms showed differences in Age. From these numbers obtained in Chi-squared statistics, it was ascertained that for living rooms, Gender was the key factor in regards to image preferences. For the Romantic style in bedrooms, Age ( $\chi^2=0.027$ ) and Income ( $\chi^2=0.002$ ) were the most affecting factors; for the Modern and the Classic Style, both indicated that Age difference is the most influential factor in terms of image preferences with the values of  $\chi^2=0.003, 0.040$ , respectively.

##### (2) Element Image Preference 1

<Table 12> Element Image Preference 1 Analysis

		G	E	T	H
Color	Romantic	3.61(.057)	1.79(.407)	1.59(.809)	3.63(.458)
	Classic	2.72(.099)	2.66(.263)	4.056(.398)	.339(.987)
Furniture	Romantic	7.69(.006)	1.29(.524)	1.68(.794)	4.95(.292)
	Modern	1.09(.295)	2.12(.345)	8.63(.071)	9.20(.056)
	Natural	6.38(.012)	6.28(.043)	6.60(.158)	12.36(.015)
	Casual	1.46(.227)	4.72(.094)	2.60(.627)	6.41(.170)
	Traditional	.000(.982)	2.73(.255)	9.71(.046)	2.45(.653)
Lighting	Classic	1.21(.271)	5.15(.076)	2.67(.613)	1.85(.762)
	Country	2.01(.156)	5.21(.074)	5.88(.208)	5.30(.258)
	Modern	.337(.561)	1.149(.563)	2.36(.669)	5.84(.211)
	Natural	.013(.908)	.922(.613)	4.94(.293)	6.73(.151)
	Casual	.320(.527)	2.01(.366)	11.43(.022)	2.57(.631)
Traditional	2.02(.155)	.471(.790)	2.17(.704)	.797(.939)	

The following data represent the image preference differences acquired between Element Design 1 and Gender, Education Level and Financial Capability. For color preferences, the Romantic and the Classic showed differences between the genders, with the values of  $\chi^2=0.57, 0.99$ . In regards to furniture preferences, Romantic had a ( $\chi^2=0.006$ ) difference in Gender and Natural in Age ( $\chi^2=0.012$ ), Education ( $\chi^2=0.043$ ), and Housing type ( $\chi^2=0.015$ ). Under Total Income category, the Traditional Style ( $\chi^2=0.046$ ) didn't find any socio-demographic determining factor in terms of furniture image preferences. In Lighting, likewise, the Classic and the Country Style, respectively with ( $\chi^2=0.076, 0.074$ ), are given the probability of 0.05 and above but have only slight differences as Education Level changes. Meanwhile, the Traditional showed differences along with Total Income changes ( $\chi^2=0.022$ ), and the Lighting category, similarly to the case of Furniture, indicated no major preference reasons in relation to any determining socio-demographic factors.

##### (3) Element Image Preference2

<Table 13> Element Image Preference 2 Analysis

		G	A	E	O	T	H
Material	Classic	.397 (.529)	6.39 (.171)	4.53 (.103)	7.39 (.389)	1.08 (.897)	3.02 (.553)
	Natural	6.56 (.010)	8.43 (.077)	10.71 (.005)	7.50 (.378)	11.43 (.022)	6.08 (.193)
Pattern	Classic	.032 (.857)	3.11 (.539)	1.65 (.438)	4.53 (.716)	9.41 (.052)	11.91 (.018)
	Traditional	.040 (.842)	1.62 (.805)	.662 (.718)	8.28 (.308)	3.64 (.457)	8.12 (.087)
Decoration	Classic	.004 (.953)	3.30 (.509)	.495 (.781)	11.67 (.112)	4.86 (.301)	4.06 (.398)
	Country	.633 (.426)	1.96 (.743)	7.95 (.019)	12.03 (.099)	3.24 (.517)	2.82 (.587)
	Modern	.024 (.878)	2.27 (.686)	.801 (.670)	2.25 (.944)	7.84 (.097)	3.77 (.438)
	Natural	3.03 (.082)	4.94 (.293)	12.39 (.002)	12.78 (.077)	3.44 (.486)	3.62 (.459)

The image preference differences between Element Design 2 and socio-demographic factors are as follows. For material preferences, the Classic with  $\chi^2=0.103$  showed a slight difference along with the Education factor; while the Natural displayed differences with Gender ( $\chi^2=0.010$ ), Education ( $\chi^2=0.005$ ), and Total Income ( $\chi^2=0.022$ ) change. Under the pattern category, the Classic showed preference differences over Income ( $\chi^2=0.052$ ) and Housing Type ( $\chi^2=0.018$ ) change, and the Traditional over Housing Type ( $\chi^2=0.087$ ) change. Within the decoration category, the Classic showed a difference in Age ( $\chi^2=0.048$ ); for Country, an Education ( $\chi^2=0.019$ ) and Occupation ( $\chi^2=0.99$ ); for Modern, Total Income ( $\chi^2=0.097$ ). The Natural showed a difference in Age ( $\chi^2=0.002$ ) and Occupation ( $\chi^2=0.077$ ). In the material category, Age and Education served as image preference factors while in the pattern category, the Housing Type did. Lastly, the decoration category displayed preferences changes along with Occupation change, making it an image preference variation factor.

#### 4.5. The Correlation between Image Preference and Social, Financial Variables

##### (1) Spatial Image Preference

<Table 14> Correlation between Spatial Image Preference and Personal Identification Data

Classification		G	A	E	O	T	H
Living Room	Romantic	.207	-.171	.020	.064	-.075	.008
	Classic	.059	.168	-.162	.071	-.061	-.215
	Country	-.004	-.052	-.042	-.161	-.068	.168
	Modern	-.355**	.123	.038	-.144	-.066	.159
	Natural	.110	-.048	-.104	-.063	.073	-.142
	Casual	-.179	-.073	.073	-.006	.074	.100
	Traditional	-.134	-.057	.258*	.071	.271*	-.009
	Traditional	.166	-.333**	.071	-.058	-.028	-.029
Bed Room	Classic	-.066	-.011	.135	-.161	.136	.239*
	Country	.082	-.072	.014	-.089	-.130	.028
	Modern	-.158	.224*	.104	.024	.013	.031
	Natural	-.002	.092	-.050	.036	.034	.042
	Casual	-.131	.159	-.277*	.053	.011	-.303**
	Traditional	-.121	-.015	-.044	.081	-.155	.084
	Traditional	-.121	-.015	-.044	.081	-.155	.084

\*p<.05 \*\*p<.01

Image preferences for living rooms under the Gender category had a negative correlation to the Modern Style which indicates that most male respondents had the tendency of preferring the Modern Style living room ( $r=-0.355^{**}$ ). Image preferences for bedrooms under the Age category had a negative correlation to the Romantic Style which most of

younger people preferred ( $r= -0.333^{**}$ ), and the Modern Style showed a positive correlation which majority of old people preferred ( $r=0.224^*$ ). This leads to a thought that young people tend to be greatly affected by ambient styles when they choose design elements. On the other hand, the higher the respondent's education level was, the more they tend to choose the Traditional Style ( $r=0.258^*$ ) and the Casual Style was less likely to be chosen for bedroom designs ( $r= -0.277^*$ ). The total income was given a positive correlation with the preference towards the Traditional Style ( $r=0.271^*$ ).

##### (2) Element Image Preference1

<Table 15> Correlation between Spatial Element Image Preference 1 and Personal Identification Data

Classification		G	A	E	O	T	H
Color	Romantic	.171	-.034	.017	-.087	.169	.031
	Classic	-.176	.225*	.036	.099	-.025	-.029
	Country	.084	-.112	.039	.060	.108	.218
	Modern	-.081	.079	.095	-.126	-.110	.329**
	Natural	-.028	.111	-.152	-.135	-.176	-.085
	Casual	-.099	-.050	-.072	-.039	-.055	-.250*
	Traditional	-.147	-.171	.029	.088	-.089	-.090
Furniture	Romantic	.359**	-.198	.000	-.011	.068	.171
	Classic	-.028	-.144	-.062	-.243*	-.100	-.058
	Country	-.018	.058	.097	.134	-.151	-.084
	Modern	-.179	.050	.071	-.092	.184	.145
	Natural	-.274*	-.063	.158	.054	.269*	.025
	Casual	-.055	-.063	-.095	-.083	-.030	-.051
	Traditional	.069	.165	-.108	-.016	-.277*	-.064
Lighting	Romantic	-.027	-.025	.205	.000	.148	.125
	Classic	.100	-.064	-.023	.059	-.072	-.096
	Country	-.157	-.037	-.220*	-.180	-.219	-.244*
	Modern	.004	-.042	.105	.096	-.052	.255*
	Natural	-.093	.106	.063	-.117	.050	-.020
	Casual	.170	.008	-.137	.127	.169	.001
Traditional	-.141	.078	-.103	-.174	-.091	.040	

\*p<.05 \*\*p<.01

In regards to furniture, women displayed a significant positive correlation and they preferred the Romantic Style while men showed a negative correlation and they seemed to prefer the Natural Style ( $r=0.359^{**}$ ,  $r= -0.274^*$ ). With the age distribution, color had a positive correlation; older people preferred the Classic Style ( $r=0.225^*$ ). Related to educational levels, the Country Style was less likely chosen for lightings by the ones who had obtained higher educations ( $r= -0.220^*$ ). In respect to total income, senior citizens with higher income presented a higher degree of preference towards the Natural Style when choosing furniture ( $r=0.269^*$ ), and a lower degree of preference towards the Traditional Style ( $r= -0.277^*$ ).

The tendency of higher degree preferences in the Romantic and the Natural Style in Element Image Preference1 indicates that the respondents preferred bright images in general.

### (3) Element Image Preference2

<Table 16> Correlation between Spatial Element Image Preference 2 and Personal Identification Data

Classification		G	A	E	O	T	H	
Material	Romantic	-.161	-.040	-.096	-.205*	.013	.106	
	Classic	-.134	-.272*	.169	-.089	.136	-.045	
	Country	-.110	.020	.201	-.026	.165	-.043	
	Modern	-.013	.096	.087	.236*	.079	.127	
	Natural	.232*	.153	-.287**	-.067	-.225	-.104	
	Casual	.049	.041	.055	.163	-.074	-.071	
	Traditional	-.063	.028	-.032	-.140	-.069	.007	
		Romantic	.011	-.099	.262*	-.128	.238*	.027
Pattern	Classic	.035	.093	.069	.018	-.134	.406**	
	Country	-.083	.042	-.153	-.084	-.033	-.194	
	Modern	-.028	.091	-.177	-.051	-.145	-.118	
	Natural	-.158	.005	.089	-.102	-.025	-.049	
	Casual	-.083	-.281**	.024	-.075	.151	-.230*	
	Traditional	.126	.033	-.048	.232*	.051	.104	
		Romantic	.015	-.015	-.101	-.214	-.202	-.067
	Classic	-.014	-.186	-.111	-.148	-.099	-.077	
Deco- ration	Country	.116	.108	-.248*	-.100	-.103	-.066	
	Modern	-.087	.206	.048	.057	.176	.101	
	Natural	-.163	-.183	.362**	.062	.136	.174	
	Casual	.070	-.079	.092	.217	.082	-.092	
	Traditional	-.177	.089	.064	.033	-.082	-.030	

\*p<.05 \*\*p<.01

In relation to gender, material displayed a positive correlation indicating that women tend to prefer the Natural Style ( $r=0.232^*$ ). It was also shown that the preference towards the Casual Style by older people was low when they choose images for patterns ( $r=0.281^{**}$ ): a negative correlation is given. With the education level data, material and decoration displayed negative correlations, which meant that, there found a lower degree of preference in the Natural style for materials and the Casual Style for decorations by people with higher education ( $r=-0.287^{**}$ ,  $r=-0.248^*$ ), whereas there found positive correlations with respect to pattern and decoration. The respondents with higher education tend to prefer the Romantic Style in pattern and the Natural Style in decoration ( $r=0.262^*$ ,  $r=0.362^{**}$ ). Total income showed a positive correlation in terms of pattern designs, which means that the respondents with higher income are likely to prefer the Romantic Style ( $r=0.238^*$ ).

The next research finding explains the image preference tendencies for respective categories; Space, Element 1 and Element 2. The statistics for the Space

category was analyzed with the numbers obtained by adding living room and bedroom scores, Element 1 by adding color, furniture and lighting scores and Element 2 by adding material, pattern and decoration scores.

<Table 17> Preference Correlations

Classification		G	A	E	T
Total	Romantic	.192	-.282**	.083	-.052
	Classic	-.044	-.051	.098	-.075
	Country	.015	-.026	-.066	-.145
	Modern	-.271*	.207	.098	.042
	Natural	-.134	.018	.039	.063
	Casual	-.109	-.095	-.067	.071
	Traditional	-.197	.055	.005	-.142
Space Preference	Romantic	.244*	-.296**	.031	-.060
	Classic	-.004	.059	.055	.078
	Country	.073	-.069	-.025	-.112
	Modern	-.276**	.205	.082	-.017
	Natural	-.044	.004	-.078	.073
	Casual	-.167	.031	-.140	.094
	Traditional	-.162	-.024	.087	-.013
Element Preference1	Romantic	.250*	-.131	.105	.175
	Classic	-.047	-.032	.022	-.093
	Country	-.060	-.047	-.016	-.202
	Modern	-.160	.048	.150	.034
	Natural	-.214	.085	.038	.094
	Casual	-.013	-.066	-.153	.028
	Traditional	-.070	.000	-.063	-.285*
Element Preference2	Romantic	-.054	-.109	.029	.029
	Classic	-.075	-.108	.108	-.119
	Country	-.051	.066	-.085	.019
	Modern	-.084	.222*	-.028	.053
	Natural	-.049	-.015	.097	-.079
	Casual	-.026	-.118	.096	.042
	Traditional	-.083	.109	.021	-.020

\*p<.05 \*\*p<.01

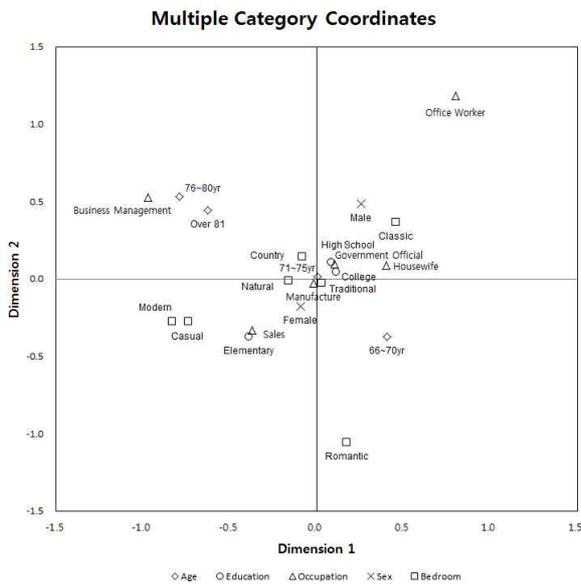
For the spatial preference, younger respondents exhibited a tendency of preferring the Romantic Style ( $r=0.296^{**}$ ) and men preferred the Modern Style ( $r=0.276^{**}$ ). In regard to Element Preference 1, women preferred the Romantic Style ( $r=0.250^*$ ) and men preferred the Natural Style ( $r=0.214^*$ ). Furthermore, the Traditional Style was preferred by the respondents with lower income ( $r=0.285^*$ ). For the Element Preference 2, older respondents preferred the Modern Style ( $r=0.222^*$ ). As stated above, the tendency of image preferences, with particular subdivisions for the purpose of investigating the overall picture, displayed similar results.

## 4.6. Non-linear Canonical Correlation

The non-linear canonical correlation analysis showed grouping result between image preference and group of socio-demographic factor such as gender, age, occupation and education. In other words, while the coefficients in a canonical correlation analysis only

display the correlation between the two variables (e.g. Age - Preference), a non-linear canonical correlation analysis linearly combines a group of socio-demographic factors (e.g. Age, Education Level, Occupation, Gender) to maximize the correlation, which clearly is helpful to understand relationships among every realm utilizing multiple category coordinates (e.g. The people aging between 60 and 70 are located closely in the coordinates in case of preferring the Traditional Style.)

(1) Spatial Image Preference

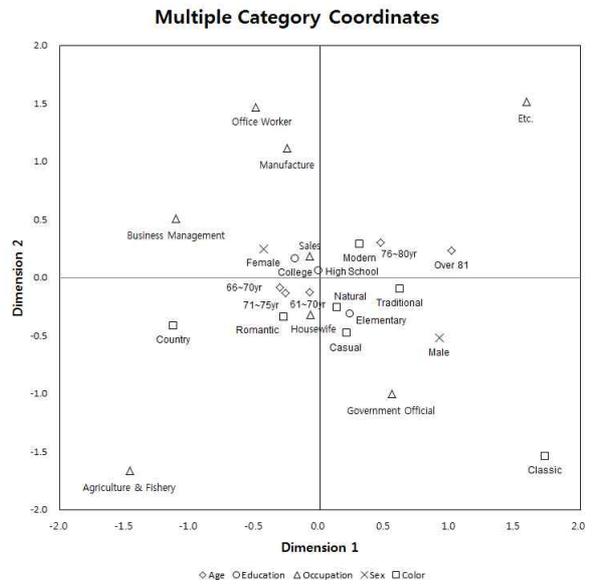


<Figure 1> Bedroom, Non-linear Canonical Graph

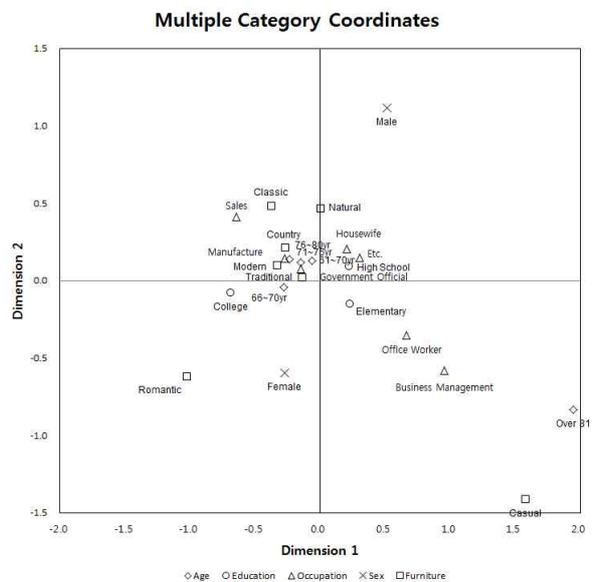
In the Non-linear Canonical Correlation Analysis, a tendency was observed for the category of Bedroom and Pattern. It was observed that those who had lower education and work in sales service preferred the Casual Style for patterns, whereas women who worked in the manufacture field preferred the Natural and the Traditional patterns. For bedrooms, the natural Traditional Style was more preferred.

(2) Element Image Preference1

The current trends for patterns are observable through the research findings in color and furniture category. For color preferences, it was observed that housewives preferred the Romantic patterns while people who were elementary or middle school graduates preferred the Casual patterns. Those who aged 70 to 80 preferred the Modern patterns. The



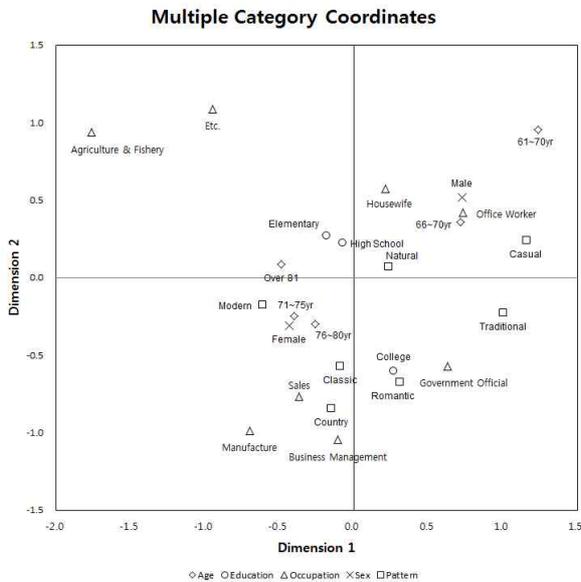
<Figure 2> Color, Nonlinear Canonical Graph



<Figure 3> Furniture, Nonlinear Canonical Graph

study findings showed that for colors, people preferred the Natural, Romantic, and Casual patterns. For furniture, those who aged 76 to 80 and worked in the manufacture field preferred the Modern and Country patterns. However, those who were a bit younger ranging in age 66~70 and were college graduate or above tended to prefer the Traditional patterns. It also showed that people in the sales service preferred the Classic trends.

(3) Element image preference 2



<Figure 4> Design patterns, Nonlinear Canonical Graph

The patterns observed in designs for those who aged 65 to 66 and were office workers preferred the Casual patterns. Women in their 70's preferred the Modern Style patterns. And people that were College graduates or more and worked for the government preferred the Romantic patterns.

## 5. Conclusion

The purpose of this research was to study the image preference reflecting the emotional status of senior citizens and applying the found image preferences to the elderly environments as they are highly affected by the socio-demographic differences. The findings are as follows.

1) The study on the spatial preference image guided us to a better understanding on preference tendencies for living room and bedroom settings. For living spaces, men tended to prefer the Modern Style while women preferred the Romantic Style. The higher their income or education level was, the more inclination towards the Traditional Style was found. For bedrooms, the younger age indicated the more preference towards the Romantic Style and the older age meant more preference inclined towards the Modern Style. However, the Casual Style was preferred by those with lower education levels, and this tendency was more found among people working in sales services.

In spatial preference, gender and age played important roles in choosing preferred images. Living room and bedroom can serve both as a public and private space upon the user's personal preference. The Modern Style may be chosen and applied for older people and the Romantic Style for younger people. Also, more traditional Styles can be applied to luxurious spaces and the Casual Style to brighter and simpler spaces.

2) In the study for the Element Image Preference 1, the color, furniture, and lighting trends were analyzed. For color preferences, men preferred the Classic Styles more as they get older while house wives preferred the Romantic Style more. In regards to furniture preference, younger women tended to prefer the Romantic Style while men with more income preferred the Natural Style. For lighting, those who were highly educated seemed to like the Romantic Style while those who had lower income and education level preferred did the Country Style. Women showed more tendency of preferring the Romantic Style while men did that of preferring the Natural Style. For lighting, gender seemed not making much preference differences but showed that their education and income levels did make differences.

3) In the study for the Element Image Preference 2, the material, pattern and decoration trends were observed. For materials, the Natural Style was preferred by women who had higher education but lesser income. The Classic Style was preferred by younger senior citizens and showed a positive correlation with the education level. For patterns, the Romantic Style was preferred by those who received higher education and the government employees with higher income, while the Casual Style was preferred by the younger with more income having office jobs. For decorations, those with higher education preferred the Natural Style and the category's correlation with the younger was less significant. The modern Style displayed a lesser correlation with those who were older and with more income. From the study on the Elements Preference 2, it is noticeable that the respondent's occupation and total income makes an impact on their preference and the housing type affects the preference on patterns.

According to research findings, it was ascertained that respondents' gender, age, education and income

greatly affect the image preference of senior citizens. Thus, considerations on the image preferences as they reflect the socio-demographic figures are critical when planning environments for senior citizens. This study may exhibit its implicit limitations as its sampling could not cover the entire distribution of senior population, especially due to uneven distribution of gender and age; for this reason, there raises a necessity to increase the sample size and the research findings include certain restrictions when being applied to designing environments. However, the study is a helpful tool as a general guideline when designing built environments and spaces for senior citizens.

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[논문접수 : 2012. 08. 31]

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[게재확정 : 2012. 12. 10]