

Evaluation of Clothing Colors for Elderly People (2) – Comparison between Elderly Women and Female Students in Korea –

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Abstract : The present study focused on the color of clothing for elderly Korean women, from the viewpoint of helping elderly people live more interesting lives with regard to their clothing, considering that the Korean society will become elderly-oriented in the near future. We took photographs of the elderly served as the models, displayed them on a computer screen, and produced 75 colors of the clothing in the elderly using computer graphics. The 75 colors were evaluated by 2 groups, one of elderly Korean woman group and a group of female students. We compared the ideal colors for and the colors actually worn by elderly people. The evaluation of the clothing colors for elderly women differed between the elderly woman group and the female student group. Analysis of images of the clothing colors selected by the elderly women showed that they attach importance to elegance when selecting clothing colors and have a strong desire to become active. The images held by female students concerning ideal clothing colors for elderly women closely pertained to commonness and inactivity

Keywords : Korean elderly women, female students, clothing colors

INTRODUCTION

In Japan, the average age of the population has been rising rapidly; that is, there has been an increase in the percentage of elderly people in the total population. The aging of the Japanese population has been advancing at a remarkable rate, faster than that of any other country. Japan must take measures to deal with this trend more quickly than is required of Western countries, where the aging of the population is taking place more gradually. Concrete measures to deal with this aging population include those related to housing, living environments, medical care and social welfare.

Our first report (Shoyama & Tochiwara, 1999) focused on the colors of clothing worn by elderly Japanese people from the viewpoint of creating elderly-friendly living environments. A questionnaire survey concerning what colors of clothing are ideal for elderly people was conducted, asking elderly women and female university students in Japan. The survey revealed differences in the evaluation of clothing colors for elderly women between Japanese elderly women and female students, indicating the necessity of reviewing the conventional way of prod-

uct planning by which young designers were primarily involved in designing clothing for elderly women.

Aging is also proceeding in Korea, Japan's closest neighboring country. According to the report "Estimates of Future Population (World Statistics)" published by the Statistical Bureau of the General Affairs Agency (1999), the percentage of people aged 65 years or older in the total Korean population was 5.6% in 1995 and will increase to 9.0% in 2010 and to 17.4% in 2030. This means that the Korean society will be elderly-oriented by 2010 and elderly-dominated by 2030. Thus, the Korean society will become elderly-oriented in the near future.

It is likely that the Korean society will shift rapidly from elderly-oriented society into elderly-dominated society, resembling the course that has been followed by the Japanese society. This means that like the present Japan, Korea will be required in the near future to take measures against aging society. Colors are visually obtained information and arouse emotions in peoples mind, markedly affecting their living will and power. In particular, the colors of clothing may be an important factor for rich clothing life in elderly people. The present study was undertaken to examine the images held concerning clothing colors for elderly women, with the goal of contributing to improving clothing for elderly Korean women.

There have been studies (Imai *et al.*, 1990; Kageyama *et al.*, 1991) on color emotions in elderly people using

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color samples but no studies using elderly models wearing clothes. Therefore, we carried out a survey by changing the color of the clothes in an elderly woman model using computer graphics.

METHODS

Materials

An elderly (65 years old) Japanese woman served as the photographic model. Whether the color of a dress matches its design or its wearer is a very important point. In this study, therefore, we had the model wear a plain, basic two-piece outfit considered to fit her so that the design of the clothes would not affect the color survey. A picture of the model wearing the basic garments was scanned into a computer, and the color of the clothing was changed by computer graphics manipulation using Adobe Photoshop. Seventy-five colors were tested. These 75 colors are the same as those used in extensive surveys that have been conducted every year since 1981 by the Japan Color Research Institute. Table 1 shows the tested colors (10 hues \times 7 tones = 70 chromatic colors, and 5 achromatic colors).

The numbers shown in this table indicate the color sample numbers. Seventy-five pictures of the female model wearing clothing of different colors (Fig. 1) were arranged against an N6 gray background, in the order of the color sample numbers. Each sample picture was 9 \times 4 cm in size.

Places of investigation

Daegu City (Korea)

Subjects

103 Korean elderly women who were actively receiving lecture classes given by community center (60-79 year old) (mean=67.4 years, SD=5.5)

100 Korean female students (18-25 years old) (mean=19.9 years, SD=1.3)

Survey period

June to July 1999

Survey methods

Interviews were in a questionnaire form, conducted in a room with a window to the north and under daylight illumination, supplemented by a standard light source, at a luminance level of about 1000 Lux.

Material queries

1) Color distinction test (the 40-hue test): We thought it would be essential to select individuals with normal or

better color discrimination ability, so that we would obtain a more precise understanding of older people's perceptions of and ideas about clothing colors. Although there is a 100-hue test that would be good for testing this kind of capability, we chose a simpler 40-hue test (Japan Color Research Institute). We did this to avoid exposing the subjects to excessive testing stress caused by the fact that they would be good for testing this kind of capability, we chose a simpler 40-hue test (Japan Color Research Institute). We did this to avoid exposing the subjects to excessive testing stress caused by the fact that they would have to take all of experimental tests in the same session as this subject-screening color discrimination test. In the 40-hue test, one of the 40 color chips is fixed, and subjects select the color chip that they consider to be the closest to the fixed color chip and repeat this selection, arranging the color chips in order of color appearance.

2) The subject was asked to make a global assessment of each of the 75 colors on a five-point scale: (5) very good, (4) good, (3) neutral, (2) bad, or (1) very bad.

3) Ideal clothing color: The subject was asked to select the 3 most ideal colors for clothing for the elderly after examining the pictures of the model wearing clothing in the 75 colors.

4) Clothing color often worn by elderly people: The subject was asked to select the 3 colors she thought are most frequently worn by elderly people in her country after examining the pictures of the model wearing clothing in the 75 colors.

5) The images the subject had in mind about her No. 1 ideal color and the color she thought was most frequently worn by elderly people were investigated on a five-point scale, using the SD (semantic difference) method involving 20 pairs of adjectives. The 20 pairs of adjectives used in this investigation can be divided into four categories, according to the theory of emotions about clothing emotions reported by Kato *et al.* (The Textile Machinery Society of Japan (ed.) 1990): "evaluation" category (harmonious-inharmonious, favorite-non-favorite, want or wear-don't want to wear, elegant-vulgar, refined-unrefined, beautiful-ugly, modest-forward, common-unique, delicate-dynamic, inconspicuous-conspicuous), "activity" category (functional-decorative, active-quiet, easy-constrained, realistic-romantic), "power" category (soft-hard, new-old, light-heavy) and "warmth" category (warm-cold, showy-plain, bright-dark).

This questionnaire was produced in Japanese first and was translated into Korean who is proficient in Japanese.

Methods of analysis

1) The total deviation of the subjects' color discrimi-

Table 1. Color samples used for the survey

		Hue											
		Red	Orange	Yellow	Yellow Green	Green	Blue Green	Blue	Violet	Purple	Red Purple	neutral	
Pale		1 (3.4R 8.0/5.0)	2 (8.3YR 8.2/2.3)	3 (5.7Y 8.9/3.4)	4 (2.8GY 8.7/3.3)	5 (4.7G 8.4/3.3)	6 (6.5BG 7.9/1.4)	7 (3.4PB 7.9/4.4)	8 (0.2P 7.5/4.4)	9 (5.2P 7.7/4.5)	10 (7.6RP 7.5/5.3)	w 71 (9.4YR 9.0/0.2)	
Light grayish		11 (4.9R 6.5/3.8)	12 (6.6YR 6.4/3.6)	13 (6.1Y 7.0/2.1)	14 (5.2GY 6.9/2.6)	15 (8.6G 6.4/3.2)	16 (3.7B 5.6/2.5)	17 (3.4PB 5.9/3.4)	18 (7.0PB 5.5/3.6)	19 (5.0P 5.9/3.6)	20 (7.4RP 6.0/3.1)	ltGy 72 (0.4PB 7.3/0.4)	
Dull		21 (4.5R 5.0/7.5)	22 (4.3YR 6.3/8.1)	23 (4.5Y 6.4/6.4)	24 (5.1GY 6.0/5.0)	25 (5.2G 5.0/4.6)	26 (0.3B 4.3/5.7)	27 (3.5PB 4.0/6.8)	28 (8.9PB 4.1/6.4)	29 (5.7P 4.2/5.9)	30 (7.1RP 4.5/6.1)	mGy 73 (1.0PB 5.4/0.5)	
Tone Light		31 (6.9R 6.7/9.2)	32 (4.5YR 7.8/6.4)	33 (5.4Y 8.6/7.1)	34 (4.7GY 8.2/7.6)	35 (4.9G 7.7/5.9)	36 (1.0B 6.6/7.5)	37 (3.5PB 6.1/8.1)	38 (0.2P 6.1/8.4)	39 (6.4P 6.1/7.6)	40 (1.6R 7.0/9.0)	dkGy 74 (1.9PB 3.6/0.7)	
Vivid		41 (4.6R 4.2/13.7)	42 (2.0YR 6.2/12.6)	43 (3.2Y 7.7/13.6)	44 (4.6GY 6.6/10.7)	45 (3.8G 5.3/9.8)	46 (2.2B 3.9/7.7)	47 (4.8PB 3.5/10.4)	48 (9.6PB 3.4/10.0)	49 (5.1P 3.5/9.9)	50 (7.3RP 4.0/13.1)	Bk 75 (1.7PB 1.3/0.6)	
Deep		51 (3.7R 3.2/9.6)	52 (3.2YR 3.3/6.2)	53 (4.8Y 5.6/7.9)	54 (4.6GY 4.8/6.9)	55 (3.5G 4.0/7.4)	56 (0.5B 2.8/6.1)	57 (5.2PB 2.5/9.3)	58 (9.4PB 2.5/9.0)	59 (5.4P 2.7/8.0)	60 (6.7RP 3.1/8.2)		
Dark		61 (7.6R 4.6/2.3)	62 (4.2YR 2.5/3.7)	63 (4.9Y 3.9/4.0)	64 (5.5GY 3.4/4.3)	65 (5.6G 3.2/3.4)	66 (0.9B 2.1/4.5)	67 (5.1PB 2.0/5.1)	68 (9.2PB 2.2/6.0)	69 (5.4P 2.5/3.2)	70 (5.9RP 2.6/4.4)		

() Munsellsystem's Hue, Vale, Chroma

Fig. 1. Picture of the model

nation was calculated using the deviation calculating method reported elsewhere (Japan Color Research Institute). The deviation value indicates the degree of the difference between the normal color sample number and the arranged color sample number.

2) The mean score of the global evaluations for each of the 75 colors was compared between the Korean elderly woman and Korean female student groups. The differences in the mean scores were tested between the two groups.

3) For the ideal color and the most frequently worn color, the number of subjects who selected each color was simply totalized, and high-ranking colors according to hues and tones were obtained. A simple analysis of the ideal color and the most frequently worn color, a factor analysis of the images held concerning each color (a principal component method based on mean scores), and a one-way analysis of variance to analyze hue- and tone-related differences in each factor were performed.

RESULTS

The color discrimination ability

Table 2.1 and 2.2 show the results of the 40-hue test taken by 103 elderly Korean women and 100 Korean female students. The numerals in these tables indicate total deviations. According to the 40-hue test criteria, total deviations between 0 and 6 are regarded as indicating excellent discriminating ability, deviations between 7 and 25 indicate normal ability, and deviations of 26 and over reveal poor discrimination. In the elderly woman group

Table 2.1. Color discriminating ability of elderly women

Deviation	No. of subjects	%	Judgment
0	9	8.7	A
4	9	8.7	A
8	12	11.7	B
10	2	1.9	B
11	1	1.0	B
12	9	8.7	B
14	6	5.8	B
16	10	9.7	B
18	2	1.9	B
19	1	1.0	B
20	5	4.9	B
21	1	1.0	B
22	2	1.9	B
23	1	1.0	B
24	1	1.0	B
25	7	6.8	B
32	4	3.8	C
34	1	1.0	C
36	2	1.9	C
38	2	1.9	C
40	1	1.0	C
42	2	1.9	C
44	1	1.0	C
46	1	1.0	C
47	1	1.0	C
49	1	1.0	C
54	1	1.0	C
56	1	1.0	C
62	1	1.0	C
66	2	1.9	C
92	1	1.0	C
107	2	1.9	C
120	1	1.0	C

A; excellent, B; normal, C; poor.

(n=103), color discrimination was rated as excellent for 18 women (17.4%), normal for 60 women (58.3%) and poor for 25 women (24.3%). In the female university student group (n=100), discrimination was rated as excellent for 73 students (73.0%), normal for 15 students (15.0%) and poor for 12 students (12.0%). Thus, the color discrimination ability was poorer for elderly women than for female university students. The average deviation was 22.4 (SD: 22.9) for elderly women and 8.1 (SD: 16.6) for female students. When tested by t-test, the difference in color discrimination ability observed between the elderly group and student group was statistically significant ($P<0.001$). Data from women rated as having excellent or normal color discrimination (78 elderly women and 88

Table 2.2. Color discriminating ability of female students

Deviation	No. of subjects	%	Judgment
0	56	56.0	A
2	2	2.0	A
3	1	1.0	A
4	12	12.0	A
6	2	2.0	A
7	3	3.0	B
8	5	5.0	B
11	1	1.0	B
12	3	3.0	B
16	1	1.0	B
20	1	1.0	B
24	1	1.0	B
27	1	1.0	C
28	2	2.0	C
40	2	2.0	C
43	1	2.0	C
44	1	1.0	C
56	1	1.0	C
64	2	2.0	C
65	1	1.0	C
80	1	1.0	C

A; excellent, B; normal, C; poor.

female students) were subjected to further analyses. These 78 elderly women were 60-79 years old (mean=60.7 years, SD=4.8). The 88 females students were 18-25 years old (mean=19.9 years, SD=1.3).

Overall evaluation of 75 colors

Two groups of subjects (elderly women and female students) evaluated the same pictures of an elderly woman wearing clothing shown in 75 different colors. The evaluations of the two groups were compared. The comparison was based on the average of the score (full score=5) for each of the 75 clothing colors.

Table 3 shows clothing colors which were evaluated very positively by the subjects. Of the colors listed in this table, only pale-BLUE GREEN and dark-RED showed no significant difference in the score between the elderly woman group and the female student group. The scores

Table 3. Clothing color highly ranked by subjects

	1	2	3	3	3	6
Elderly women	pale-VIOLET	pale-BLUE GREEN	light grayish-YELLOW GREEN	dark-RED	dark BLUE	dull GREEN
Female students	medium Gray	light grayish-YELLOW	light grayish-YELLOW GREEN	light Gray	light grayish-RED PURPLE	pale-RED

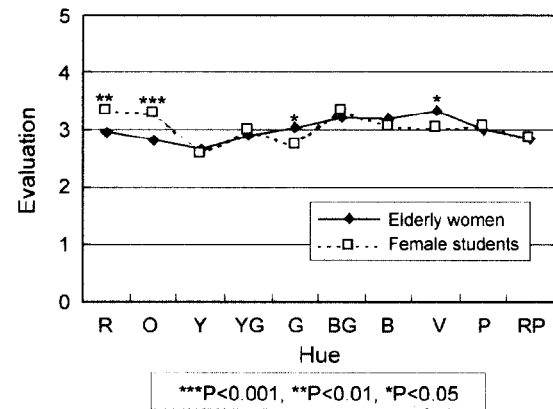


Fig. 2. Evaluation of pale tone (mean).

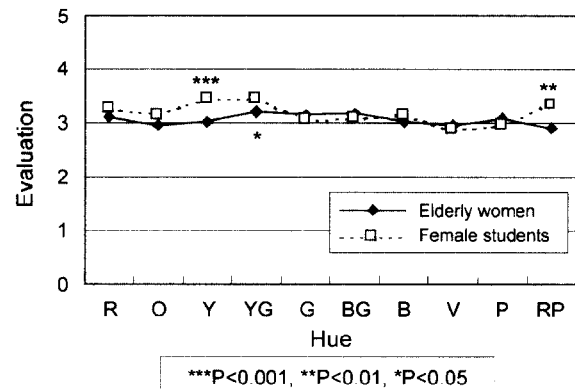


Fig. 3. Evaluation of light grayish tone (mean).

for the other colors listed differed significantly between the two groups. Following this result, we compared the scores for all 75 colors. Figs 2 through 9 show comparison for each tone. These figures plot mean score against hue. Asterisks (*) in the figures show the level of significance. Significant inter-group differences were observed for 42 of the 75 colors. Female students gave higher scores for only 8 colors than elderly women. On the whole, elderly women tended to give higher scores. Particular large inter-group differences were seen for vivid, dull, light and deep tones (P<0.001). Of the achromatic colors, black was evaluated more positively by elderly women, while light Gray and medium Gray were evaluated more positively by female students.

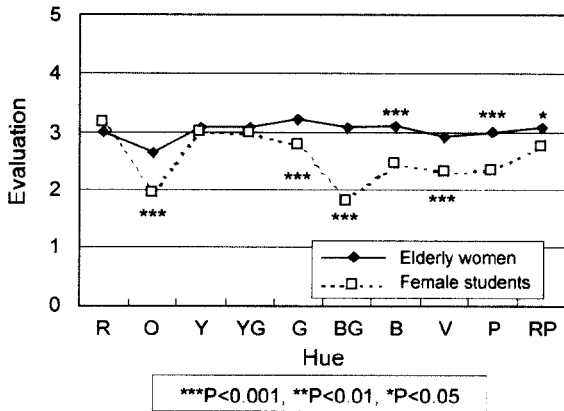


Fig. 4. Evaluation of dull tone (mean).

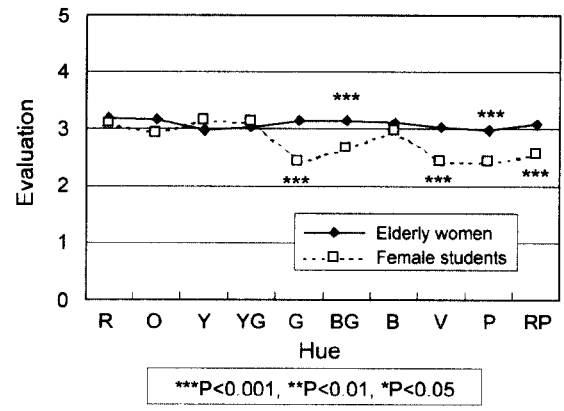


Fig. 7. Evaluation of deep tone (mean).

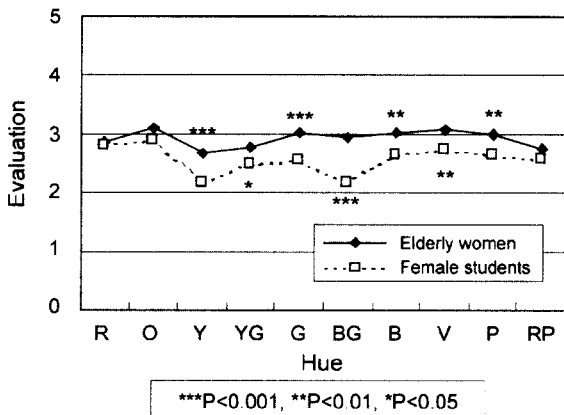


Fig. 5. Evaluation of light tone (mean).

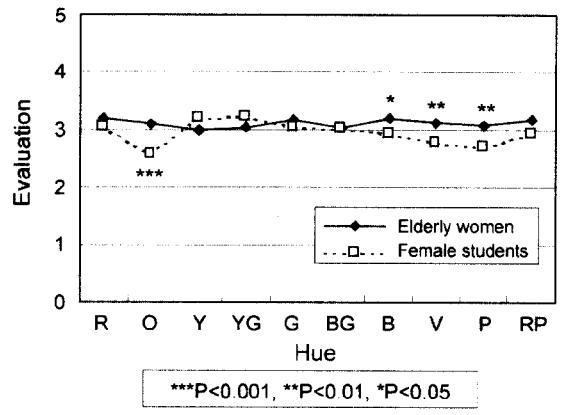


Fig. 8. Evaluation of dark tone (mean).

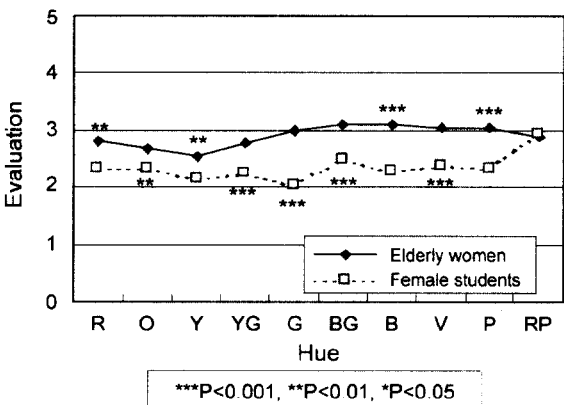


Fig. 6. Evaluation of vivid tone (mean).

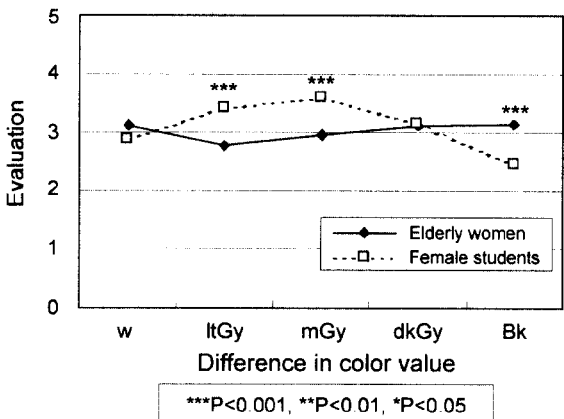


Fig. 9. Evaluation of neutral tone (mean).

Ideal colors

Five leading colors chosen by elderly women to be the most ideal for elderly people's clothing were pale-VIOLET, dark-BLUE, dull-GREEN, light grayish-YELLOW GREEN and White. Five leading colors chosen by female students to be the most ideal for elderly people's clothing

were light Gray, light grayish-ORANGE, medium Gray, light grayish-RED PURPLE and White. These colors were analyzed by hue and tone.

As shown in Fig. 10, 17.9% of the elderly women chose BLUE GREEN as the most ideal. PURPLE, YELLOW and neutral were chosen frequently by elderly women. On the other hand, 25.0% of the female students chose

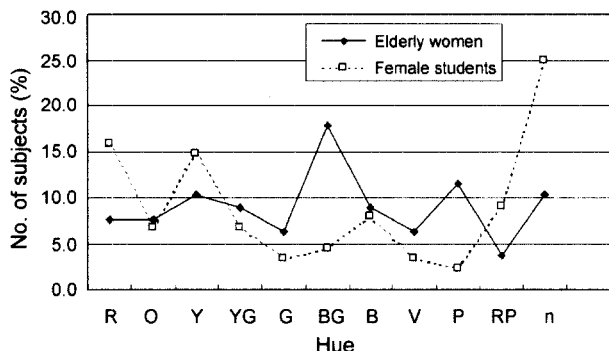


Fig. 10. Ideal clothing color chosen by subjects.

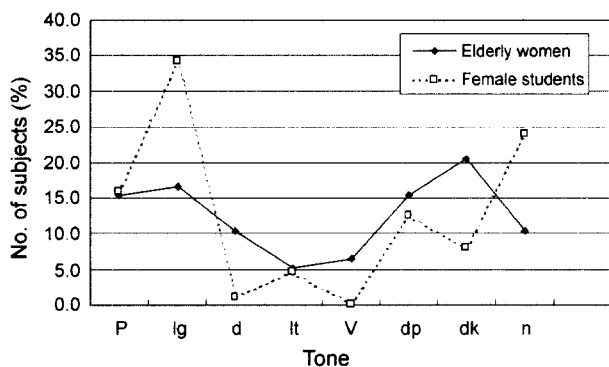


Fig. 11. Ideal clothing color chosen by subjects.

neutral and 15.7% chose RED as the ideal hue for elderly women. YELLOW was also chosen frequently by female students. Cross-analyzed data concerning 11 hues between two groups were subjected to a chi-square test of independence. This test revealed a significant difference ($X^2(10)=28.88, P<0.01$).

Fig. 11 shows the results of tone analysis. Of the elderly women, 20.5% chose dark tone and 16.7% chose light grayish tone as the ideal color. Of the female students, 33.9% chose light grayish tone and 25.0% chose neutral as the ideal color. Cross-analyzed data concerning 8 tones between the two groups were subjected to a chi-square test of independence. This test revealed a significant difference ($X^2(7)=30.78, P<0.001$). Thus, both hue and tone chosen as the ideal differed between the two groups. Next, we plotted the average score for the most ideal color (rated on a five point scale by the SD method using 20 pairs of adjectives). We thus obtained average scores for the images held by each subject concerning ideal clothing colors. Fig. 12 shows the image profile thus obtained. Testing the significance of difference of the mean scores revealed that elderly women more often regarded the ideal color to be “harmonious”, “favorite”, “want to wear”, “easy”, “new”, “beautiful” and “refined”. The mean score differed significantly for 7 of the 20

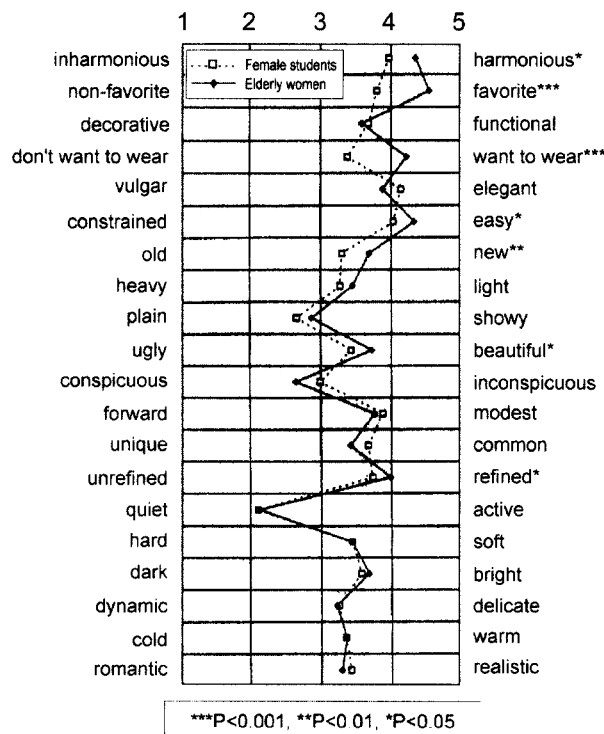


Fig. 12. Images held by subjects concerning the ideal clothing color.

adjective pairs between the two groups.

A factor analysis was carried out using the principal component method with varimax rotation, to determine the structure of the women's images concerning the ideal clothing color. In this analysis, the number of components was determined on the basis of the eigenvalue (over 1) and the scree plot. Table 4 shows the loads of factors for elderly women. Six factors were extracted: factor 1 (showy, unique, beautiful, forward, conspicuous, refined), factor 2 (bright, light, new, delicate, romantic), factor 3 (favorite, want to wear, harmonious), factor 4 (easy, functional), factor 5 (elegant, quiet) and factor 6 (soft, warm). Factors 1 through 6 were interpreted as representing individuality, brightness, taste, functionality, elegance and softness, respectively. The cumulative coefficient of determination was 66.9%.

A factor analysis was also performed on the images that the female students held concerning the ideal color for elderly people. As shown in Table 5, five factors were extracted: factor 1 (realistic, common, functional, inconspicuous, modest), factor 2 (delicate, beautiful, warm, soft, new), factor 3 (favorite, harmonious, easy, elegant), factor 4 (active, bright, light, showy) and factor 5 (refined, want to wear). Factors 1 through 5 were interpreted as representing commonness, beauty, taste, activity and refinement, respectively. The cumulative coefficient of determination was 65.0%.

Table 4. Factor analysis of the ideal clothing chosen by elderly people

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
showy	0.791	0.293	0.179	-0.085	-0.026	-0.028
unique	-0.722	0.051	-0.111	0.405	0.095	-0.070
beautiful	0.625	0.435	0.071	-0.020	-0.049	0.077
forward	-0.607	-0.092	-0.132	0.391	-0.079	0.021
conspicuous	-0.559	-0.217	-0.225	0.167	0.047	-0.206
refined	0.333	-0.203	0.239	0.166	0.000	0.284
bright	0.145	0.765	0.214	-0.337	0.188	0.073
light	0.179	0.763	-0.019	-0.129	0.037	-0.098
new	0.437	0.626	0.090	0.137	-0.056	0.317
delicate	-0.025	0.495	0.168	-0.227	0.352	0.159
romantic	-0.299	-0.316	0.028	0.241	-0.164	0.095
favorite	0.102	0.058	0.775	-0.018	-0.249	0.047
want to wear	0.177	0.008	0.590	0.060	0.038	-0.119
harmonious	0.078	0.119	0.504	-0.008	0.146	0.076
easy	-0.168	-0.119	0.093	0.626	0.106	-0.044
functional	-0.274	-0.352	-0.005	0.569	0.002	-0.027
elegant	0.111	0.224	-0.129	0.072	0.739	-0.101
quiet	0.140	0.014	-0.072	-0.042	-0.429	-0.168
soft	0.165	0.478	0.132	-0.288	0.293	0.583
warm	0.035	0.013	-0.045	-0.012	0.027	0.502
Eigen value	5.615	2.239	1.182	1.352	1.200	1.165
Cum pct(%)	28.1%	39.3%	48.3%	55.1%	61.1%	66.9%
Factor	Individuality	Brightness	Taste	Functionality	Elegance	Softness

Table 5. Factor analysis of the ideal clothing color chosen by female students

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
realistic	0.786	-0.157	0.069	-0.001	-0.101
common	0.734	0.044	0.055	-0.493	-0.063
functional	0.734	0.010	0.027	-0.007	0.053
inconspicuous	0.700	-0.184	0.008	-0.240	-0.008
modest	0.695	0.217	0.223	-0.448	-0.041
delicate	-0.084	0.706	0.125	-0.065	0.012
beautiful	-0.129	0.678	0.128	0.037	0.275
warm	0.259	0.571	-0.046	0.194	0.367
soft	0.103	0.530	0.427	0.083	-0.140
new	-0.254	0.525	-0.077	0.492	0.106
favorite	-0.058	0.041	0.815	0.115	0.293
harmonious	-0.080	0.070	0.811	0.018	0.192
easy	0.411	0.176	0.619	0.122	-0.062
elegant	0.321	0.189	0.613	-0.132	0.265
active	-0.186	-0.169	0.017	0.751	0.176
bright	-0.023	0.478	0.235	0.673	0.032
light	-0.235	0.500	0.138	0.619	-0.178
showy	-0.487	0.212	0.043	0.535	0.447
refined	-0.133	0.187	0.200	0.190	0.742
want to wear	0.032	0.025	0.307	-0.021	0.725
Eigen value	5.122	3.945	1.695	1.145	1.092
Cum pct(%)	25.6%	45.3%	53.8%	59.5%	65.0%
Factor	Commonness	Beauty	Taste	Activity	Refinement

Table 6. Differences in scores of each factor for the hue of the ideal color for elderly people's clothing (Responses by Korean elderly women)

	Factor 1 Individuality	Factor 2 Brightness	Factor 3 Taste	Factor 4 Functionality	Factor 5 Elegance	Factor 6 Softness
R	0.071	0.211	-0.180	0.082	-0.679	0.116
O	0.059	-0.499	-0.186	0.357	0.099	0.484
Y	0.197	-0.544	-0.136	-0.546	0.225	-0.147
YG	-0.256	0.213	-0.368	-0.503	-0.152	0.077
G	-0.061	-0.704	0.428	0.020	0.053	-0.739
BG	0.313	0.201	-0.092	-0.024	-0.072	0.228
B	-0.829	0.112	0.103	0.209	0.322	-0.538
V	0.282	0.629	-0.070	0.041	0.697	-0.044
P	0.634	0.285	0.069	-0.190	-0.103	0.225
RP	0.520	-0.573	0.741	0.182	-0.419	0.007
neutral	-0.938	0.067	0.224	0.623	0.553	-0.064
Fratio	2.742	1.429	0.599	1.274	1.444	1.129
P	0.007**	0.187	0.809	0.263	0.181	0.355

***P<0.001, **P<0.01, *P<0.05

Table 7. Differences in scores of each factor for the tone of the ideal color for elderly people's clothing (responses by Korean elderly women)

	Factor 1 Individuality	Factor 2 Brightness	Factor 3 Taste	Factor 4 Functionality	Factor 5 Elegance	Factor 6 Softness
P	0.233	0.965	-0.043	-0.434	0.683	-0.001
lg	-0.255	0.030	-0.577	0.142	0.431	0.276
d	0.222	-0.111	0.187	-0.441	-0.300	-0.269
lt	0.402	0.624	-0.050	-0.018	0.167	0.290
V	0.598	0.023	-0.285	-0.508	-0.579	0.200
dp	0.622	-0.209	0.019	-0.180	-0.525	-0.016
dk	-0.363	-0.732	0.068	0.416	-0.456	-0.180
neutral	-0.938	0.067	0.224	0.623	0.553	-0.064
Fratio	3.858	5.188	2.253	2.672	5.585	0.525
P	0.001**	0.000***	0.040*	0.016*	0.000***	0.813

***P<0.01, **P<0.01, *P<0.05

For each of these factors, average scores of each hue and tone were obtained, and a one-way layout analysis of variance was conducted, to explore differences between different hues and tones. The results are shown in Tables 6 through 9.

An analysis of the responses of Korean elderly women revealed a significant difference in individuality (factor 1) between different hues (Table 6).

For the factor of individuality, the scores of PURPLE and RED PURPLE were high and the scores of neutral and BLUE were low. Korean elderly women thus tended to suppress individuality because they attached importance to neutral. When compared with other hues, it was found that Korean elderly women attached slightly more importance to softness by selecting BLUE GREEN. The scores for PURPLE, the second most ideal color, showed

that the elderly subjects attach importance to individuality. Comparison between different tones revealed significant differences in individuality (factor 1), brightness (factor 2), taste (factor 3), functionality (factor 4) and elegance (factor 5) (Table 7).

For the factor brightness, the score of pale tone was highest, and that of light tone was second highest. For the factor elegance, the scores of pale tone and neutral were high. For the factor individuality, the scores of deep, vivid and light tones were high. For the factor taste, the score of dull tone was high. For the factor functionality, the score of neutral and dark tones were high. Thus, although the load of factors differed, Korean elderly women attached importance to functionality when selecting dark tone as the most ideal color. They attached importance to elegance and soft-

Table 8. Differences in scores of each factor for the hue of the ideal color for elderly people's clothing (Responses by Korean female students)

	Factor 1 Commonness	Factor 2 Beauty	Factor 3 Taste	Factor 4 Activity	Factor 5 Refinement
R	-0.628	0.389	-0.094	-0.125	0.545
O	0.453	-0.423	-0.187	-0.316	-0.199
Y	0.405	-0.002	-0.093	0.066	0.014
YG	-0.354	-0.442	-0.478	0.873	-0.059
G	-0.241	-0.918	-0.988	-0.011	-0.891
BG	0.256	0.348	-0.017	-0.717	-0.886
B	-0.561	-0.334	0.506	0.251	-0.576
F	-0.712	0.637	0.656	-0.085	0.150
P	-0.675	1.118	-1.034	0.838	0.084
RP	-0.403	0.442	0.213	0.110	0.268
neutral	0.603	-0.192	0.200	-0.164	0.056
Fratio	2.934	1.507	1.139	1.007	1.351
P	0.004**	0.153	0.345	0.445	0.219

***P<0.001, **P<0.01, *P<0.05

Table 9. Differences in scores of each factor for the tone of the ideal color for elderly people's clothing (Responses by Korean female students)

	Factor 1 Commonness	Factor 2 Beauty	Factor 3 Taste	Factor 4 Activity	Factor 5 Refinement
P	-0.464	0.360	-0.337	0.391	-0.079
lg	0.038	0.114	0.125	-0.330	-0.126
d	-0.127	-0.540	0.548	1.615	0.865
lt	-1.332	0.154	-0.259	0.347	-0.787
dp	-0.298	-0.244	-0.180	0.464	0.126
dk	-0.030	-0.179	-0.176	-0.033	0.667
neutral	0.680	-0.219	0.222	-0.165	0.054
Fratio	4.262	0.732	0.690	2.042	1.207
P	0.001***	0.625	0.658	0.069	0.311

***P<0.001, **P<0.01, *P<0.05

ness when selecting light grayish tone as the second most ideal color.

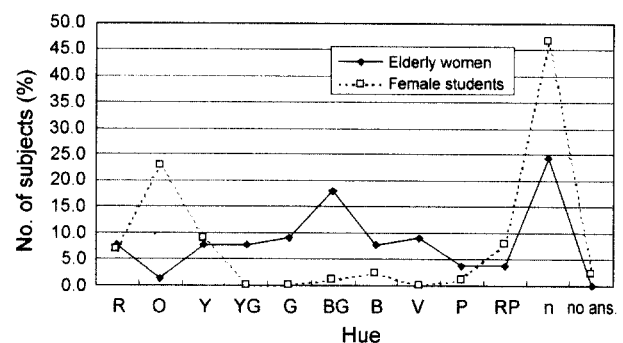
An analysis of the responses of Korean female students revealed a significant difference in commonness (factor 1) between different hues (Table 8).

For the factor of commonness, the score of neutral was high and that of VIOLET was low. Thus, Korean female students attached importance to commonness when selecting neutral as the most ideal for elderly people. Comparison between different tones revealed a significant difference in commonness (factor 1), as shown in Table 9.

For this factor, the score of neutral was high and that of light tone was low. Concerning the light grayish tone, which was selected by Korean students as the most ideal, the score of the factor of activity was low and the scores of other factors were intermediate.

Often worn clothing colors

Five leading clothing colors often worn by Korean elderly women were dark-BLUE, Black, White, pale-VIOLET and dull-GREEN. Five leading colors chosen by

**Fig. 13.** Colors of clothing often worn by elderly people.

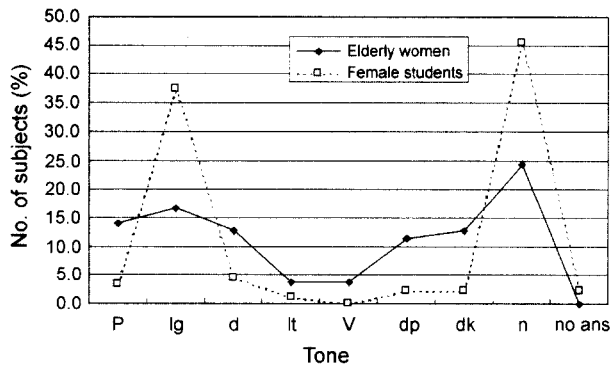


Fig. 14. Colors of clothing often worn by elderly people.

Korean female students as colors often worn by elderly women were light Gray, light grayish-ORANGE, White, light grayish-YELLOW and light grayish-RED PURPLE. These colors were analyzed by hue and tone. Of all elderly women, 24.4% chose neutral and 17.9% chose hue BLUE GREEN as being most frequently worn by themselves (Fig. 13).

Of all female students, 46.6% chose neutral and 22.7% chose ORANGE as being most frequently worn by elderly people. The chi-square test of independence for the data cross-analyzed for 11 hues between the two women groups revealed a significant inter-group difference ($X^2(11) = 77.68, P < 0.001$). In the analysis of tone, 24.4% of elderly women chose neutral and 16.7% chose light grayish tone as being most frequently worn by themselves (Fig. 14).

Of all female students, 46.6% chose neutral and 37.2% chose light grayish tone as being most frequently worn by elderly women. The chi-square test of independence for the data cross-analyzed for 8 tones between the two women groups revealed a significant inter-group difference ($X^2(8) = 16.08, P < 0.05$). Thus, there was significant differences between the two groups in terms of the view about the hue and tone of clothing colors often worn by elderly women.

Fig. 15 shows the images each subject held concerning the color ranked in first place as the color most frequently worn by elderly people. The test of the significance of differences revealed significant inter-group differences in all images but “functional”, “elegant”, “delicate” and “warm”. Female students tended to view the color most frequently worn by elderly people to be “don’t want to wear”, “old”, “heavy”, “plain”, “inconspicuous”, “modest”, “common”, “quiet” and “realistic”. Elderly women, on the other hand, viewed it to be “harmonious”, “favorite”, “want to wear”, “easy”, “new”, “light”, “beautiful”, “refined”, “soft” and “bright”.

We then analyzed the structure of the images held concerning the color most often worn by elderly people and

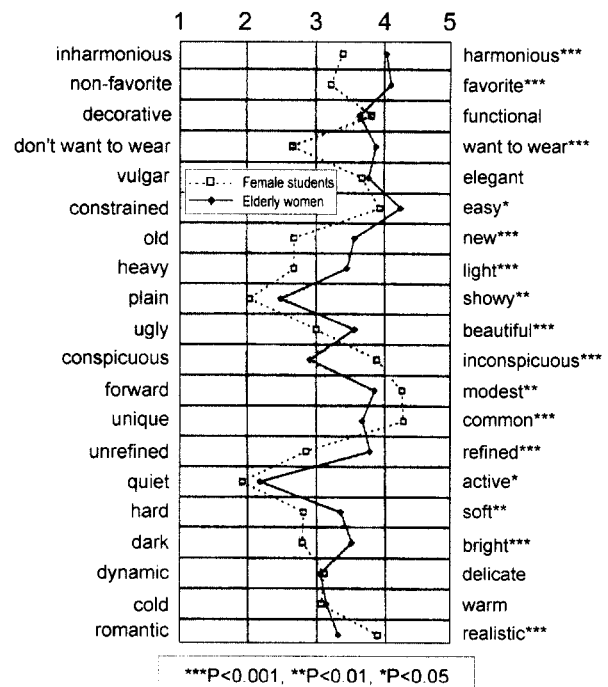


Fig. 15. Images held by subjects concerning the clothing color often worn by elderly people.

examined how the adjectives used for the survey interacted with each other. The factor analysis allowed us to extract 6 factors from elderly women: factor 1 (commonness), factor 2 (brightness), factor 3 (elegance), factor 4 (comfort), factor 5 (taste) and factor 6 (warmth). The cumulative coefficient of determination was 69.9%.

Five factors were extracted regarding the images held by the female students: factor 1 (commonness), factor 2 (brightness), factor 3 (taste), factor 4 (warmth) and factor 5 (quietness). The cumulative coefficient of determination was 64.6%.

For each of these factors, average scores of each hue and tone were obtained, and a one-way layout analysis of variance was performed to analyze inter-hue and inter-tone differences. The results are shown in Tables 10 through 13.

In the elderly women group, significant inter-hue differences in commonness (factor 1), elegance (factor 3), taste (factor 5) and warmth (factor 6) were observed (Table 10).

For the factor of commonness, the average score was highest for neutral and second highest for ORANGE. For the factor of elegance, the average score was highest for VIOLET and second highest for ORANGE and BLUE GREEN. For the factor taste, the average score was highest for neutral and second highest for RED PURPLE. For the factor warmth, the average score was highest for

Table 10. Differences in scores of each factor for the hue of the color often worn by elderly people (Responses by Korean elderly women)

	Factor 1 commonness	Factor 2 brightness	Factor 3 elegance	Factor 4 comfort	Factor 5 taste	Factor 6 warmth
R	0.042	-0.342	-0.029	-0.413	-0.427	-0.401
O	0.345	0.670	0.659	-0.304	-0.531	-2.451
Y	-0.120	-0.969	-0.252	-0.568	0.072	0.327
YG	0.105	0.087	0.311	0.267	-0.387	0.549
G	-0.630	0.377	-0.243	0.701	-0.222	0.445
BG	-0.372	0.092	0.629	-0.120	-0.380	-0.029
B	0.013	0.133	-1.218	-0.126	-0.288	-0.975
V	-0.140	0.514	1.087	0.141	-0.030	-0.151
P	-0.747	0.074	0.167	-0.252	-0.343	0.124
RP	-1.308	-0.269	-0.594	1.323	0.452	0.149
neutral	0.852	-0.056	-0.367	-0.109	0.708	0.157
Fratio	3.974	1.272	6.052	1.897	2.442	2.919
P	0.000***	0.264	0.000	0.061	0.015*	0.004**

***P<0.001, **P<0.01, *P<0.05

Table 11. Differences in scores of each factor for the tone of the color often worn by elderly people (Responses by Korean elderly women)

	Factor 1 commonness	Factor 2 brightness	Factor 3 elegance	Factor 4 comfort	Factor 5 taste	Factor 6 warmth
P	-0.075	0.520	1.156	-0.043	-0.364	0.030
lg	0.218	0.107	0.203	0.314	-0.373	0.592
d	-0.476	0.123	0.126	-0.118	-0.374	-0.132
lt	-0.128	0.565	0.729	-0.072	-0.284	-0.960
V	-0.417	-0.183	-0.479	-0.285	-0.590	-0.928
dp	-0.647	-0.299	-0.383	-0.429	-0.148	-0.402
dk	-0.598	-0.574	-0.695	0.459	0.308	-0.040
neutral	0.582	-0.056	-0.367	-0.110	0.708	0.157
Fratio	5.539	1.532	7.976	1.068	3.956	2.679
P	0.000***	0.171	0.000***	0.393	0.001**	0.016*

***P<0.001, **P<0.01, *P<0.05

YELLOW GREEN and second highest for GREEN. Significant differences between tones were also observed for commonness (factor 1), elegance (factor 3), taste (factor 5) and warmth (factor 6) (Table 11).

For the factor commonness, the average score was highest for the neutral and second highest for the light grayish tone. For the factor elegance, the average score was highest for the pale tone and second highest for the light tone. For the factor taste, the average score was highest for the neutral and second highest for the dark tone. For the factor warmth, the average score was highest for the light grayish tone and second highest for the neutral. The neutral (which the Korean elderly women chose as the tone most frequently worn by themselves) had high scores for the factors commonness and taste. The hue BLUE GREEN, which was chosen to be worn second most frequently, had a high score for the factor

elegance. The light grayish tone, which was chosen as the most frequently worn tone, second to only the neutral tone, had a high score for the factor warmth, and relatively high scores for the factors commonness and comfort.

In the Korean female student group, significant differences between hues were observed for factor 1 (commonness), as shown in Table 12. For the factor of commonness, the average score was highest for BLUE GREEN and second highest for ORANGE. The neutral, which Korean students chose as the color most frequently worn by elderly people, had a somewhat high score for the factor of commonness and intermediate scores for the other factors. The same can be said of ORANGE (the hue worn second most frequently by elderly people in Korea). The score for factor 1 (commonness) also differed significantly between different tones (Table 13). Table score for

Table 12. Differences in scores of each factor for the hue of the color often worn by elderly people (Responses by Korean female students)

	Factor 1 Commonness	Factor 2 Brightness	Factor 3 Taste	Factor 4 Warmth	Factor 5 Quietness
R	-0.457	0.012	0.829	-0.162	-0.562
O	0.210	-0.324	-0.025	-0.159	-0.140
Y	0.002	-0.381	0.101	0.376	-0.019
BG	0.646	0.254	-1.138	-0.967	-0.146
B	-0.298	-0.146	1.113	-1.343	1.135
P	-2.558	1.373	1.487	-0.507	0.554
RP	-0.735	-0.193	-0.220	0.370	-0.124
neutral	0.151	0.222	-0.151	0.075	0.110
Fratio	2.197	1.059	1.739	1.102	0.814
P	0.044*	0.398	0.112	0.371	0.579

***P<0.001, **P<0.01, *P<0.05

Table 13. Differences in scores of each factor for the tone of the color often worn by elderly people (Responses by Korean female students)

	Factor 1 Commonness	Factor 2 Brightness	Factor 3 Taste	Factor 4 Warmth	Factor 5 Quietness
P	-0.138	0.148	-0.733	0.533	0.432
lg	0.091	-0.327	0.138	-0.101	-0.057
d	-0.234	-0.027	0.533	0.021	-0.677
It	-2.558	1.373	1.487	-0.507	0.544
dp	-0.296	0.549	0.216	0.277	-0.459
dk	-0.264	-0.529	0.608	-0.824	0.359
neutral	0.143	0.226	-0.191	0.082	0.074
Fratio	2.574	1.503	1.345	0.520	0.598
P	0.025*	0.188	0.248	0.792	0.731

***P<0.001, **P<0.01, *P<0.05

factor 1 was highest for the neutral and second highest for the light grayish tone. The neutral (which the Korean students chose as the color most frequently worn by elderly people) had high scores for the factor of commonness but intermediate scores for the other factors. The light grayish tone, which was chosen to be worn second most frequently by elderly people, had a somewhat low score for the factor of brightness and intermediate scores for the other factors.

DISCUSSION

In the present study, a color discrimination ability test was incorporated to ensure accurate evaluation of clothing colors. Like in our previous survey of Japanese women (Shoyama and Tochiara, 1999), the color discriminating ability was lower in elderly women than in female university students. The present study thus

Table 14. Summarized survey results

	Korean elderly women	Korean female students
Ideal clothing colors for elderly people	functionality individuality elegance softness	commonness inactivity
Colors of clothing often worn by elderly people	commonness taste elegance warmth	commonness darkness

showed relatively poor color discriminating ability of elderly women in Korea, supporting the previous findings concerning visual characteristics, color discrimination, uncomfortable glare, etc., of elderly people (Yano *et al.*, 1991, 1993; Yoshida *et al.*, 1989, 1990, 1992, 1993). This finding indicates the necessity of paying special care to elderly people whose color discriminating ability is relatively low. For example, it seems necessary that fashion advisers give advice to elderly people when they buy clothing.

When elderly women and female students evaluated various colors of clothing worn by an elderly woman model, using computer graphic pictures, the ratings for many colors differed significantly between the two groups, although the rating was similar for some colors. Elderly women tended to rate the colors more positively than female students. This indicates that the color taste of elderly women is more diverse than that of female students and the normative consciousness that people should dress to look their age has been fading.

Table 14 summarizes the results of this investigation concerning ideal clothing colors and colors often worn by elderly women. When selecting ideal clothing colors, elderly women attached importance to functionality, individuality, elegance and softness. When selecting clothing colors to be worn actually, they attached importance to commonness, taste, elegance and comfort. Elegance was a common factor for the ideal clothing colors chosen by elderly women and the clothing colors actually worn by elderly women. This indicates that Korean elderly women attach importance to elegance. To compare the image profiles for elderly women shown in Fig. 12 and 15, it is noticeable that the image held by elderly women concerning ideal clothing colors was approximately consistent with that concerning the actually worn clothing colors. Table 14, however, indicates that Korean elderly women attach importance to functionality and individuality when selecting ideal clothing colors, despite the fact that they attach importance to commonness when select-

ing clothing colors to be worn actually. This means that Korean elderly women have a strong desire to be mentally and physically active. On the other hand, Korean female students attached importance to commonness and inactivity when selecting ideal clothing colors for elderly women. These results indicate that the functionality emphasized by elderly women when selecting ideal clothing colors contradicts the inactivity emphasized by female students when selecting ideal clothing colors for elderly women. This represents a large inter-generation difference. The image Korean female students held concerning the color often worn by Korean elderly women pertained closely to commonness. Commonness also pertained closely to the image held by elderly women themselves. Thus, commonness was an image common for both the student group and the elderly woman group. However, as shown in Fig. 15, the image profiles concerning the clothing color often worn by elderly people differed between the elderly woman group and the female student group. Although Table 14 shows that the image held by female students concerning the ideal clothing color for elderly women was commonness, similar to the image held by them concerning the clothing color often worn by elderly women, we note some differences between the image profiles in Fig. 12 and those in Fig. 15. It is noteworthy that the images "don't want to wear", "old", "heavy" and "plain" held by female students were stronger for the clothing colors often worn by elderly women than for the ideal clothing colors for elderly women.

In the present study, the evaluation of the clothing colors for elderly women differed between the elderly woman group and the female student group. At present, in product planning of ready-made clothes, young designers rather than elderly designers design clothes. Assuming that the viewpoint of colors differs between the designers and consumers (elderly women), it is doubtful whether enterprises are supplying clothes elderly consumers need. The diversity in the evaluation of clothing colors by elderly women indicates that diverse needs should be considered during product planning in apparel industry.

Korean students attached more importance to commonness and inactivity when selecting the ideal clothing color for elderly women than did elderly women. This finding seems to be primarily associated with the fact that the Korean society has not yet become elderly-oriented or elderly-dominated. It is estimated that the Korean society will become elderly-oriented in the near future and then rapidly become elderly-dominated, resembling the course

followed by Japan and unlike the course followed by European countries where elderly-oriented society slowly advanced into elderly-dominated society. As such a change occurs in Korea, young generations will become more concerned with aging of the society, and the image they hold concerning ideal clothing colors for elderly people will also change.

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