Studies on the Darkness of the Face Skin by the influence of External Environments

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Key words

The darkness, facial color, external environment factor

ABSTRACT

The facial color is affected by age increase, health condition, internal and/or external environment factors and so on. Especially, The external environment factors in accordance with the influence of environment pollution that is air pollution, exert a bad influence of skin. The object of this study shall be quantified the facial color change in accordance with age increase, external environment factors. Therefore We have make the measurement about the facial color change of Korean women by regional groups.

We've quantified through correlation equation, the rate of the many external environment factors which influence the facial color change (air pollution , climate condition , season etc.) As the result of the study, We have reach to know that CO, O_3, NO_2 has high relation with hue, value , chrome change. The facial color change is proved to be influenced atmospheric environment condition. Besides in hue and value in relation with meteorology demonstrates its link with the temperature, the evaporation quantity, the duration of sunshine of each region. Therefore We have instill cognition of the environmental pollution in accordance with external environment factor that was quantified. And We have reach to know this study affects cosmetics development of new concept.

1. INTRODUCTION

The facial color of human varies in accordance with natural aging. Also it is affected in accordance with internal stress of body, external environment factor.[1][2] Especially, The influence of environment in accordance with air pollution, the destruction of an ozone layer is highly embossed. Accordingly, We have to study how to cope with the situation.

A sulfide and a fluoride in the atmosphere exert a bad influence upon the skin. And is accompany by secondary infection. But individually, We find it very difficult to express an effect of air pollution. A smog in accordance with air pollution is included in sulfur and ozone of high concentration. Accordingly, It makes a dry skin, cause skin, and makes a sensitive skin to external stimulation. Besides, A great many of paper have been announced to a serious damage of skin in accordance with exposure to the sun, ultraviolet. And There is indication of the academic word that a skin of a resident in Los Angeles that is high concentration polluted air turn sensitive, or get ill with allergy.[3]

Therefore, The facial color measurement has been done with " MINOLTA CR200 CHROMAMETER " to calculate correlation between the facial color change and external environment factors. And the result of measurement is represented by "MUNSELL RENOTATION SYSTEM". The data of external environment factor was based on the ENVIRONMENTAL AGENCY and the CENTRAL METEOROLOGICAL OFFICE OF THE REPUBLIC OF KOREA. [4] [5]

For the result of this study we get to comprehend the wide change of facial color in Korean women. We hope to offer by this study usefulness information to make possible the development of a fractionated make up product.

2. EXPERIMENTS

2-1. SUBJECTS & INSTRUMENT

2-1-1. SUBJECTS

- 418 Korean women resident in Seoul, Pusan, Taejeon.
  (The 3 largest cities in Korea)
- Age distribution : from 18 to 67
- average age : 30.2

The age distribution of the subjects is shown in Table I.

- Measurement time was checked twice.

(Spring and Autumn)

Spring : March to May

Autumn : October to December

AGE GROUP	AVERAGE AGE	AREA		SEASON		
		SEOUL	PUSAN	SPRING	FALL	TOTAL NUMBER
19 ~ 24	22.3	75	38	73	40	113
25 ~ 29	26.7	99	28	78	49	127
30 ~34	32.1	32	29	24	37	61
35 ~ 39	36.6	37	34	34	37	71
40 ~ 44	41.5	9	12	10	11	21
45 ~	51.4	13	12	11	14	25
Total / Avg.	/30.2	265	153	230	188	418

Table I : Distribution of subjects participated in investigation

2-1-2. INSTRUMENTS

- MINOLTA CR-200 CHROMAMETER
- PARAMETERS (Munsell renotation system Hue , Value , Chroma)

2-2. MEASUREMENTS

2-2-1. MEASUREMENT SITES

- Facial sites : the forehead , below eye , the temples of the head , cheeks

2-2-2. MEASUREMENT CONDITIONS

- At 30 minutes after cleansing , when the face skin turned calm.
- 3 times per area at normal temperature
- Room temperature : spring (23 ± 2°C)

  autumn (23 ± 2°C)

- Relative humidity : spring (60 ± 5 %)

  autumn (45 ± 5 %)

The measurements were enforced at THE COREANA BEAUTY CENTER and at THE BEAUTY SERVICE CENTER of Coréana cosmetics Co., Ltd.

2-3. AN INVESTIGATION OF QUESTIONNAIRE

We have enforced the facial color change measurement and the questionnaire at the same time.

2-3-1. An investigation of the facial color change.

What's factor affects the most in the facial color change ?

What's facial site changes the most by aging or by pigmentation ?

2-4. An investigation of statistical data

2-4-1. The statistical data of the environmental agency.

Meteorology data (1961 - 1992)

2-4-2. The statistical data of the central meteorological office.

Air quality data (1985 - 1992)

3 . RESULTS & DISCUSSION

3-1. QUESTIONNAIRE

We have examined the different factors of the facial color change in Korean women through the questionnaire. A wide investigation of questionnaire was done to the subjects. This only a part, which concord with the purpose of this paper of the total investigation are written. Among the answer of the facial color change in Korean women have demonstrated the main factor is age increase for 45.7 % other factors that Korean women think it affects the facial color change are external environment stress (31.1%) internal stress, health condition, dietary life and so on. (See Table II)

FACTOR	AGING	INTERNAL STRESS	EXTERNAL STRESS	ETC.	TOTAL
CASE	191	95	130	2	418

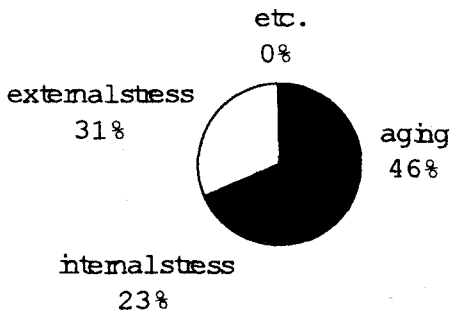


Table II and Figure 1. The factors of facial color change in KOREAN WOMEN based on the questionnaire.

3-2. The relation between the facial color change and age increase.

Figure 2,3,4 shows the results of hue, value, and chroma obtained by measuring the facial color change in 4 sites of the subjects in relation with age increase. Face shows decreasing tendency in the value when in the hue it shows the tendency to go to yellowish making the face complexion dark. The width of variation rises sharply between 30's ~ 40's. At the end of 30's the facial color change areas become suddenly narrow and uniform. We have considered this is due to the loss of water volume in the skin, the

growing thickness of skin layer, hardening of horny layer, atrophy of the epidermis , structure change of dermis, pigmentation , etc.[6] Which has coincide with skin aging trend.[7]~[10] Also the results we have considered have coincide with the paper of G. Pauly .et. al.[11] The facial color change of the hue and value in relation with aging increase is shown in Table III.

This result makes possible the estimation of the facial color change according to age but the correlation coefficient (R) value has appeared lower which is the result of differences of sex and individual deviation. Table IV shows the correlation questionnaire and measurement data in the facial sites which variation appear intense. As found in the questionnaire, the eye areas show the most variation and also the measurement data shows, without discrimination, too.

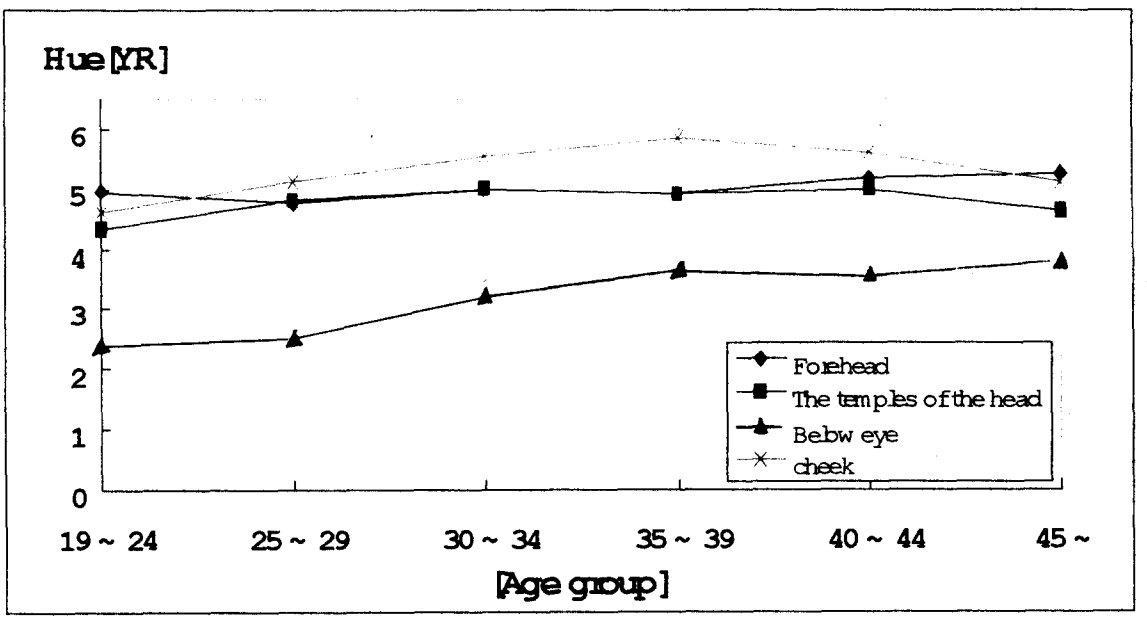


Figure 2. The variation of Hue of facial sites on age group.

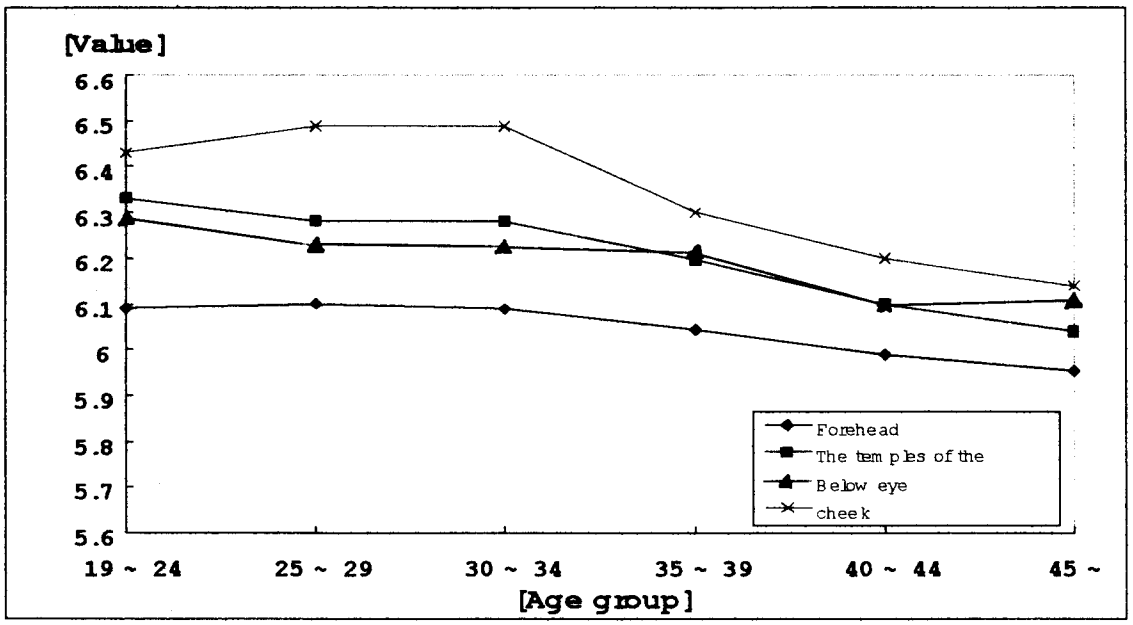


Figure 3. The variation of Value of facial sites on age group.

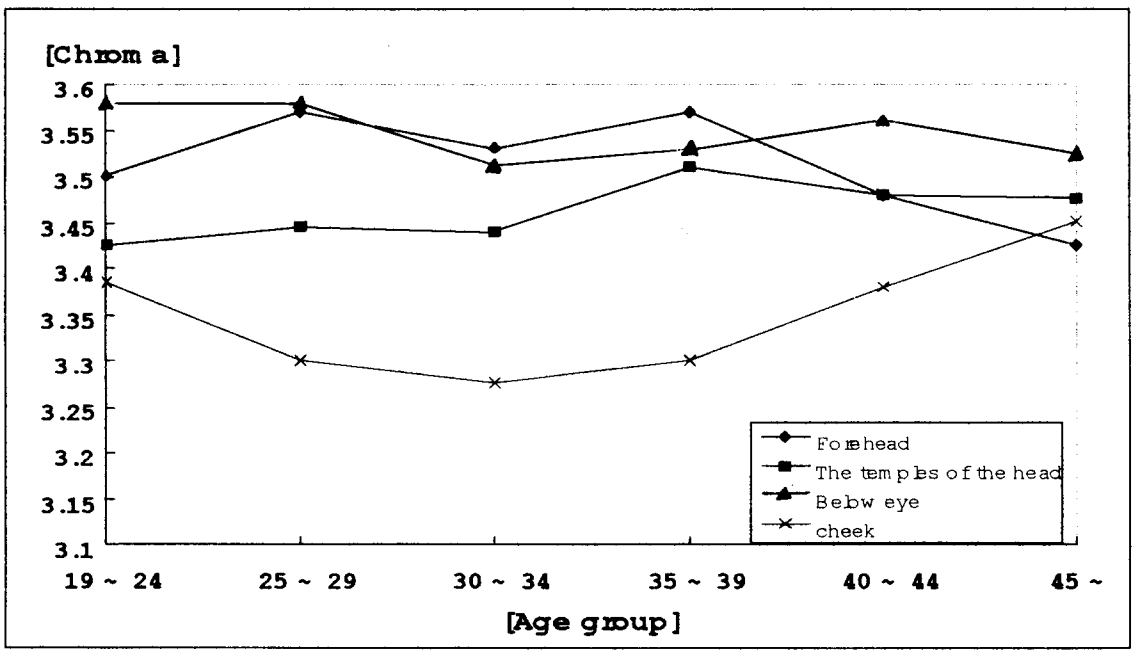


Figure 4. The variation of Chroma of facial sites on age group.

PARAMETER	CORRELATION EQUATION	COEFFICIENT
H (Hue)	H = 0.0338 X + 3.5289	γ = 0.1740
V (Value)	V = -0.0087 X + 6.5373	γ = 0.3228

X = Age

Table III. The correlation equation of parameter according to age.

		FOREHEAD	SIDE OF EYE	CHEEKS	ETC.
Practice questions		16	297	85	20
418 / %		3.79	71.03	20.37	4.81
Measure-ment	ΔH	0.35	0.78	0.51	
	ΔV	0.14	0.30	0.26	
	ΔC	0.08	0.06	0.11	

ΔH=H ave. (over 45 age) - H ave. (19 ~ 24 age)

ΔV=V ave. (over 45 age) - V ave. (19 ~ 24 age)

ΔC=C ave. (over 45 age) - C ave. (19 ~ 24 age)

TableIV. The site of the appeared facial color change by aging and pigmentation.

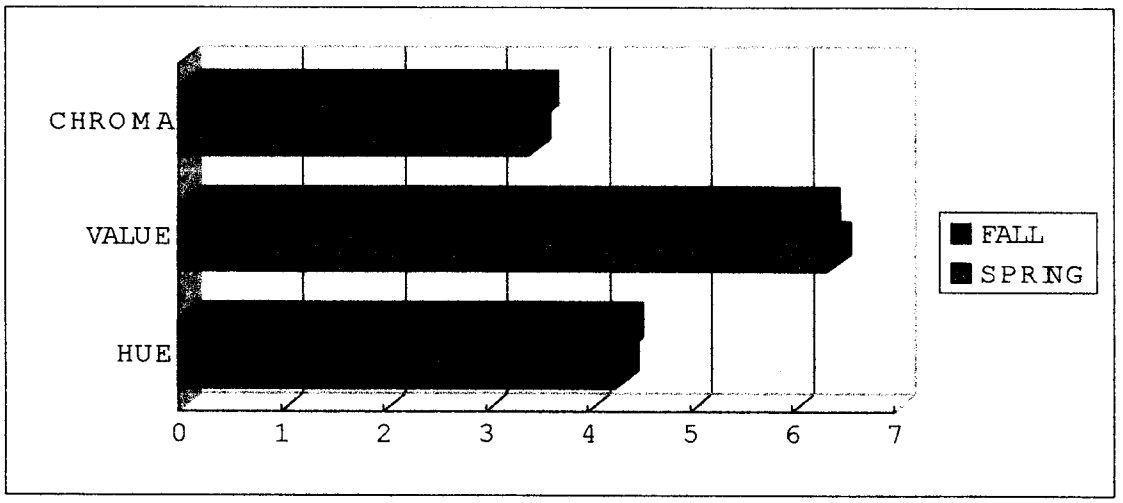
3-3. The relation between the facial color change and the environmental factors

Table II. Shows that 30 ~ 35 % subjects think the facial color change factors are due to external environment and life pattern. As a result We have investigated the deviation of the facial color change in relation to climate condition , atmospheric environment , and seasonal change. We have reach to guess that the differences has something to do with tanning.

3-3-1 . The relation between the facial color change according to seasonal change.

Table V and Figure. 5 shows the deviation of the facial color change before and after the ultraviolet ray are intense. We have chosen as a before data the months of March to May and as an after data the months of October to December. The late 3 months

present the lowest ratio of ultraviolet ray. It shows a little change in the deviation of hue and value, which progress in the similar way as natural aging tendency.



period / subjects	SPRING (3 ~ 5)		FALL (10 ~ 12)	
	4 site average	S/D	4 site average	S/D
H (Hue)	4.268	2.215	4.303	2.387
V (Value)	6.346	0.302	6.248	0.415
C (Chroma)	3.411	0.347	3.490	0.354

Table V and Figure 5. The variation of facial color by season change.

3-3-2. The relation between the facial color change and the regional characteristics.

We have analyzed the relation climate condition and air pollution affects to the facial color change. We have expressed the correlation based on the data of the environmental agency, the meteorological observatory and facial color, measurement of the subjects in Seoul, Pusan and Taejeon, the 3 largest cities in Korea.

Table VI. Shows the hue, value, chroma of the average facial color on the eyes areas, the of the environmental agency and that of the meteorological observatory according to regional characteristics.

Table VII and Figure 6,7. Shows the correlation data of the facial color change according to air quality or meteorology. Comparing Seoul and Pusan , the facial color value in Pusan (seashore city) is darker than that of Seoul. Also it has a little variation of color, too. In regard to atmospherically environment condition Seoul which shows much air pollution than Pusan displays from the data of the environmental agency we get to know the facial color change, especially in hue and value in relation with air quality demonstrates its link with the temperature , the evaporation quantity , the solar radiation quantity of each region. From the meteorological observatory data we have reach to know that CO , O_3 , NO_2 has high relation with hue , value , chroma change. And SO_2 has high relation with chroma. Especially the Korean women resident in Seoul , has display in hue, a progressive turn to yellow color. In value it has display a higher price than the seashore city. In regional characteristics, we have reach to know climatically characteristics affects much in facial color change than environmental characteristics.

AREA	AIR QUALITY (Aver. / 8 years)				METEOROLOGY (Aver. / 32 years)				Aver. Facial color of the eyes areas		
	SO_2 (PPM)	NO_2 (PPM)	CO (PPM)	O_3 (PPM)	temp. (°C)	evap. (mm)	suns-hine (hr)	solar radia	hue	value	chro-ma
Seoul	0.052	0.032	2.742	0.011	11.84	1087	2113	1149	5.076	6.300	3.412
Pusan	0.041	0.026	1.638	0.014	14.13	1226	2315	1303	3.960	6.186	3.507
Taejeon	0.027	0.026	2.390	0.012	12.14	1090	2184	1130	4.300	6.272	3.516

TableVI. Various environment conditions and average facial color.

PARAMETER		CORRELATION EQUATION		
		H	V	C
Air Quality	Temp.	H=-0.373y+9.18	V=-0.047y+6.86	C=0.025y+3.16
	Evap.	H=-0.005y+10.53	V=-7.3E-4y+7.08	C=3.24E-4y+3.11
	Solar rad.	H=-4.0E-3y+9.22	V=-5.91E-4+7.52	C=2.05E-4y+3.23
	Sunshine	H=-515E-3y+15.8	V=-5.75E-4y+7.52	C=4.02E-4y+2.59
METEORO-LOGY	SO_2	H=28.5y+3.30	V=0.796y+6.22	C=-4.0y+3.64
	NO_2	H=157y-0.031	V=11.8y+5.92	C=-16.6y+3.94
	CO	H=0.923y+2.36	V=0.11y+6.02	C=-0.071y+3.64
	O_3	H=-343y+8.68	V=-38.7y+6.73	C=26.5y+3.15

Table VII. The Correlation Equation of Meteorology condition with facial color.

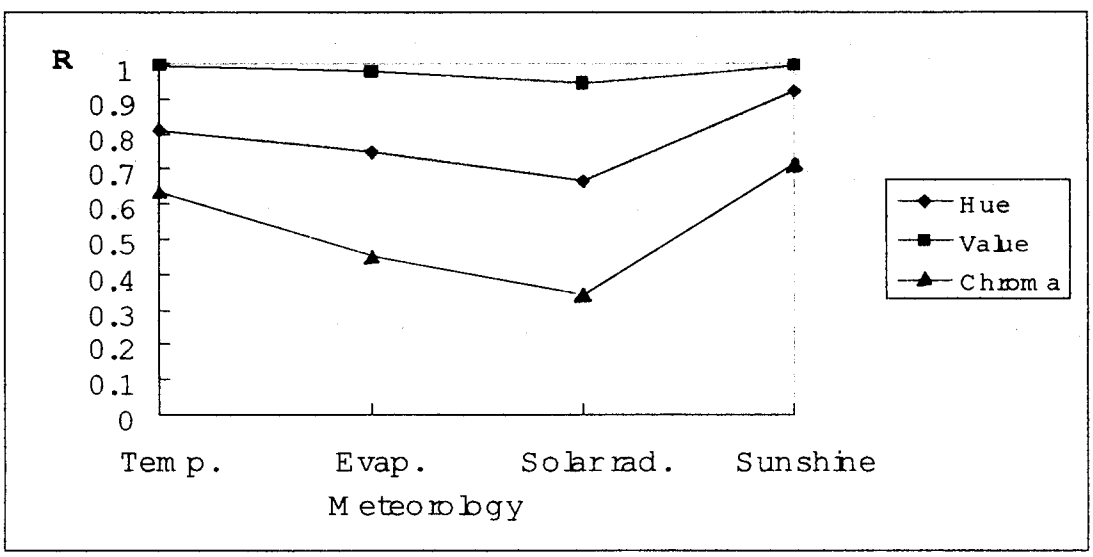


Figure.6 The correlation Coefficient(R) of Meteorology condition with facial color.

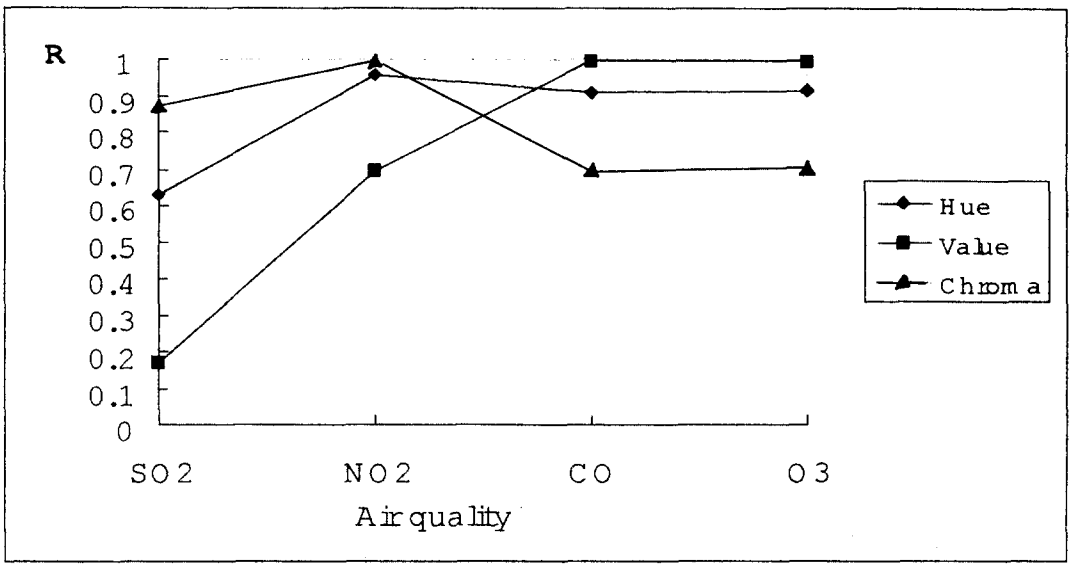


Figure.7 The correlation Coefficient(R) of Air quality condition with ***facial color.***

4. Conclusion

These are the main conclusion we have obtained from the research of the facial color change in Korean women.

1) The main factor of the facial color change was the age.

2) As ages grow older, Hue price is increased whereas Value and Chroma are decreased in the facial color change. The Korean women of 30 ~ 40's altered fast.

3) The facial color change is proved to be influenced by external environmental condition, such as regional characteristics(climate, temperature, evaporation quantity, solar radiation quantity, sunshine quantity, etc.), atmospherical environ ment and seasonal condition.

Age increase , external environment give a wide variation of the facial color change from 30's to 40's. This makes the use of make-up product. The development of a more fragmented is required make up product for the protection of skin. Through this paper we have quantify a standard data of Korean women facial color control data and color variation data , with the hope to give a usefulness information for the development of cosmetics product.

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