CHROMA MEMORY AND AGE

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INTRODUCTION

√ Although the spectral saturation discrimination function has been well documented for young observers [1,2], it has not been systematically investigated as a function of age. Kraft and Werner[3] demonstrates significant age-related losses in colorimetric purity discrimination sensitivity. The differences between discrimination at 10 and 250 td was relatively small for the younger group but larger for the older group, indicating a selective performance decrement for older observers at low light levels.

√ We talk about *simultaneous color matching* when this takes place between juxtaposed color samples and the gap time is zero. *Successive, or memory, color matching* takes place when we make comparisons between color stimuli separated by time, trying to match a present color to a memorized one, which obliges us to use memory. There is a lot of research related to color in memory[4,5].

√ The aim of this work is to study the effect of age changes on chroma of 5 reference tests, using the methods of simultaneous and memory color matching.

METHOD

√ We selected five *reference tests* from a Munsell Book of Color (glossy). The reference tests names were: violet (10PB 5/4), bluish green (10G 5/8), pink (10RP 5/6), yellow green verde(5GY 5/6) and orange(5YR 5/8)

√ For the study of each reference test, we used 20 *comparison color chips, from another* Munsell Book of Color (glossy), arranged in a ring on a gray card board circular panel of 30 cm of diameter.

√ The observation took place inside a Macbeth cabinet under a illuminant D_{65} simulator, where the gray panel luminance is approximately 300 cd/m^2.

√ 75 normal trichromat men [25 preadolescents (mean age = 10.1 years), 25 young adults (mean age = 24.3 years), and 25 old adults (mean age = 10.1 years)], take part in the experiment. All observers have a normal color vision (Ishihara test)

√ Measurement procedure: 1) the observer looks at the reference test for 5 s in order to memorize it; 2) 15 s later, the observer choose by memory one of the 20 comparison chips from the corresponding panel; 3) the observer repeats the experience after 15 min and 24 h; 4) for simultaneous matching the observer choose the comparison chip which most resemble the reference test, putting the reference test near to comparison ones.

RESULTS

√ In TABLES I, II and III we show the experimental results of mean CIELAB chroma difference, ΔC^*_{ab}, for preadolescents, young aduls and old adults, respectively.

TABLE I: Variation of mean CIELAB chroma difference, ΔC^*_{ab}, between the mean selected chip by simultaneous matching/memory matching and the reference test, for each color and delay time. Mean values and standard deviations for PREADOLESCENTS observers.

	Simult.		By memory					
Preadolescents	**0 s**	**±sd**	**15 s**	**±sd**	**15 m**	**±sd**	**24 h**	**±sd**
Violet	0,4	1,6	4,9	4,0	5,1	3,9	5,5	3,6
Bluish green	-0,8	4,7	5,4	5,8	5,9	5,9	4,6	6,6
Yellow green	2,0	4,6	1,2	9,8	2,3	7,9	2,8	8,4
Pink	0,4	1,8	4,9	5,5	5,7	5,5	4,4	5,6
Orange	0,3	4,9	12,8	7,7	6,3	11,3	11,9	8,4

TABLE II: As Table I, but with YOUNG ADULTS observers.

	Simult.		By memory					
Young adults	**0 s**	**±sd**	**15 s**	**±sd**	**15 m**	**±sd**	**24 h**	**±sd**
Violet	0.0	0.0	5.4	4.2	3.9	5.2	3.0	5.8
Bluish green	-0.7	2.4	1.8	9.2	0.8	9.4	0.6	9.0
Yellow green	0.1	0.1	3.0	6.9	2.5	5.2	4.2	6.7
Pink	1.0	3.4	3.2	10.0	3.7	9.3	3.0	9.0
Orange	0.0	0.0	9.5	8.3	6.1	9.0	3.7	8.7

TABLE III: As Table I, but with OLD ADULTS observers.

	Simult.		By memory					
Old adults	**0 s**	**±sd**	**15 s**	**±sd**	**15 m**	**±sd**	**24 h**	**±sd**
Violet	0.3	1.6	5.8	4.1	4.4	5.0	5.3	4.1
Bluish green	3.4	5.0	3.8	6.6	2.0	9.3	4.7	6.7
Yellow green	0.1	0.3	6.4	4.7	5.8	7.1	4.2	6.6
Pink	4.7	6.0	1.6	7.8	3.1	8.4	2.2	8.0
Orange	1.3	5.3	5.8	10.1	7.4	9.4	5.9	9.9

CONCLUSIONS

With simultaneous matching

√ For bluish green and yellow green, old adults match the original test more chromatic than preadolescents and young adults ($p<0.05$). See FIGs. 1 and 2.

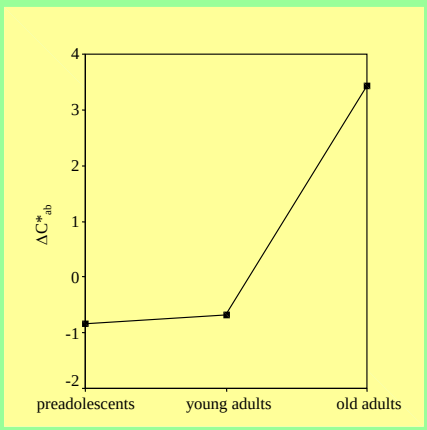

FIG. 1: Variation of mean CIELAB chroma difference, ΔC^*_{ab}, for simultaneous matching and BLUISH GREEN

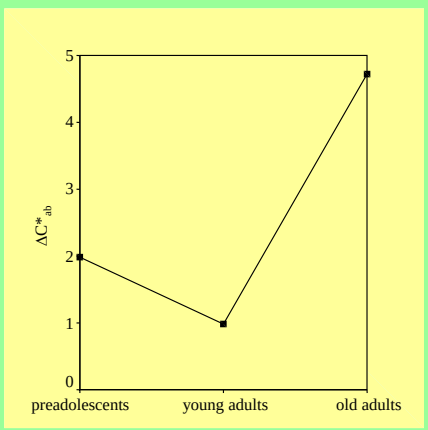

FIG. 2: Variation of mean CIELAB chroma difference, ΔC^*_{ab}, for simultaneous matching and YELLOW GREEN

By memory

√ All groups of observers remember violet and yellow green more chromatic, but differences between them are not significants.

√ For bluish green, preadolescents and old adults remember the reference test more chromatic than young observers. There is a significant difference between preadolescents and young adult observers ($p=0.013$).

√ For pink, young observers remember better than the rest of populations ($p<0.05$). The highest difference ($p=0.04$) appears at 15 seconds between young adults ($\Delta C_{ab}^*=3.0\pm6.9$) and the elderly ($\Delta C_{ab}^*=6.4\pm4.7$). See FIG 3.

√ For orange, at 15 seconds and 24 hours preadolescents remember the original test worse tan the rest of groups ($p<0.05$). The most noticeable difference appears at 24 hours (the mean value for preadolescents is $\Delta C_{ab}^*=11.9\pm8.4$, for young adults $\Delta C_{ab}^*=3.7\pm8.7$ with $p=0.002$, and for old observers $\Delta C_{ab}^*=5.9\pm9.9$ with $p=0.02$). See FIG 4.

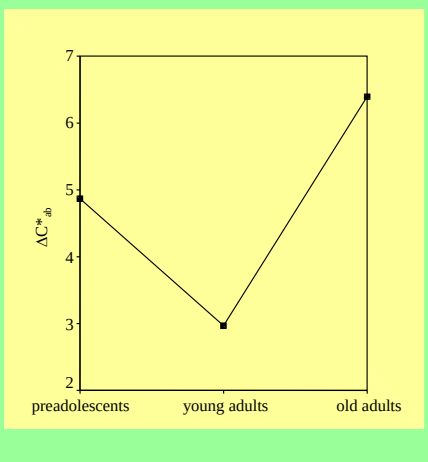

FIG. 3: Variation of mean CIELAB chroma difference, ΔC^*_{ab}, for PINK at 15 seconds.

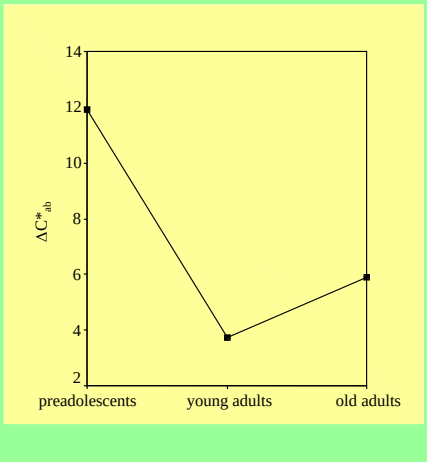

FIG. 4: Variation of mean CIELAB chroma difference, ΔC^*_{ab}, for ORANGE at 24 hours.

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