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In vivo Measurement of Color Relationships between the Maxillary Central Incisor and Canine as a Function of Age

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Master of Dental Science Thesis

In vivo Measurement of Color Relationships between the Maxillary Central Incisor and Canine as a Function of Age

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I. Introduction

Matching colors of the oral tissues, both hard and soft, has tested our capabilities as clinicians and technicians for decades. In 1931 Clark[1] stated, "Color, like form, has three dimensions, but they are not in general use. Many of us have not been taught their names, nor the scales of their measurement. In other words, we as dentists are not educationally equipped to approach a color problem." Over seventy years have passed and this statement still stands true.

This is not to say that our abilities and skills have not improved over time. We have come a long way as a profession, driven in part by better application of color science and in part by the availability of increasingly esthetic materials. Our desire to gain more knowledge regarding shade matching and color appearance continues to grow. Color perception, however, is a complex subject since it includes both physical and psychological aspects.

Color matching in dentistry can benefit from applying color science in order to more correctly specify "colors" needed in the dental shade guides and to manufacture materials used with these guides.[2] In order to most effectively use these shade guides, we truly must have an understanding of the three dimensions of color. The two main color systems used today are the Munsell Color Order System and the CIE System (International Commission on Illumination). The Munsell System is based on three color coordinates: value (lightness), hue (color) and chroma (color saturation). The CIE system is based on tristimulus values (i.e. three spectral stimuli as perceived by a standardized observer) and was further edited in 1976 to become the CIE L*a*b*, which has more inter-convertability with the Munsell System.[3]

Many authors have described the color and appearance of natural teeth.[4-6] Goodkind et al[4] reported trends seen in 2830 anterior teeth studied with a colorimeter. They found that color was best represented by its middle third; women's teeth in general were lighter, less chromatic and less reddish-colored than men's; aging produced darker and more reddish teeth; cuspid teeth were darker than central and lateral incisors; and that central incisors had the highest value.

Although trends have been reported in vitro, there is a lack of in vivo information available on the color relationships among or between teeth. For example, it has long been taught that the basic shade (hue) of the patient can be taken from the canine (i.e. that tooth having the highest chroma of a particular hue) and then that hue can be applied to other anterior teeth at a lower chroma. However, this concept does not appear to derive from published measurements or observations. The purpose of this study was to document the color relationship between *in vivo* maxillary central incisors and canines, including: (1) whether they share the same hue, but have different chromas (as commonly taught); and, (2) whether color differences (ΔE values) change as a function of age.

II. Rationale

Quantitative data regarding the color relationship between the maxillary central incisors and canines in individual patients and across different age groups will help guide clinicians in creating natural and esthetic restorations.

III. Literature Review

Color perception is a complex topic including both *physical properties* and *psychological phenomena*. Combined they form a *psychophysical* sensation that results when the human visual system responds to the light reflected from objects in a scene. Color is simply one attribute of this sensation of vision. The human eye is only capable of sensing a narrow range of wavelengths (360 nm – 780 nm) and has a range of sensitivities over that distribution (hence the need for a "standard observer" in color science). [3]

There are many important secondary phenomena in human vision, including one very important to dentistry, metamerism. Metamerism is a phenomenon in which spectrally different stimuli appear as a "match" to a given observer. A *metameric pair* is a pair of objects having different spectral absorption curves but the same reflected color coordinates for one set of illuminant conditions. [7] Therefore, an object could be the same color under one illuminant, yet appear different under different illuminants. A s*pectral match* is when two specimens have identical spectral absorption and reflectance (or scattering) behavior (spectra). Such pairs will match under all illumination conditions and for all observers. [7]

Color perception has been known as a three dimensional entity since as early as 1611. [2] Color matching in dentistry today can involve both an instrumented color analysis (such as colorimetry or spectrophotometry) and standardized human observer measurements in order to correctly specify colors needed in the dental shade guides and to manufacture materials used with these guides.[2] One important benefit of the CIE L*a*b* system is that it represents a quantitative system. Thus the system is supportive of instrumented analysis and quantitative comparisons. One often used quantitative comparison is a mathematical statement of the color difference between two objects (ΔE) expressed as a square root of the sum of squared differences in all L*a*b* coordinates, as shown in Eq.1 below.

$$\Delta E_{(L^*a^*b^*)} = \{(L^*_1-L^*_2)^2 + (a^*_1-a^*_2)^2 + (b^*_1-b^*_2)^2\}^{1/2} \qquad \text{Eq. 1}$$

This equation enables the quantitative comparison of color differences among teeth, shade tabs, and restorative materials. Multiple research studies have focused on the clinical significance of ΔE in terms of both "perceptibility" and "acceptability". Kuehni et al[9] found that under *controlled* conditions, a ΔE value of 1 or higher could be perceived by the human eye. Another study found that under *clinical* conditions, ΔE has to approach 3.3 or higher before the human eye can detect a color difference.[10] Johnston et al[11] observed a ΔE of 3.7 to be the average color difference reported between teeth and shade tabs matched intraorally.

In dentistry, a tooth shade guide has been used conventionally to match a tooth's color to the restorative material that will replace it. Sproull[2] has described the requirements for any shade guide: 1) a logical arrangement in color space and 2) an adequate distribution in color space. He also stated that in order for a shade guide to be acceptable it must include the color coordinates established by natural teeth and be logically arranged. Unfortunately, all but one commercially available shade guides do not satisfy these requirements and therefore create problems for both the clinician and technician.[8]

Many additional color measuring devices have been manufactured. These include, but are not limited to, tristimulus colorimeters, spectroradiometers, spectrophotometers, and digital cameras. The VITA Easyshade Compact is a spectrophotometer and was used in this study. Multiple studies have compared the repeatability and reliability among different instruments.[12-13] Kim-Pusateri et al,[13] found that the VITA Easyshade® was the only color measurement instrument tested to produce both a reliability and an accuracy greater than 90%.

The use of advanced color measurement devices in dentistry has enabled practitioners to detect even minor color differences among teeth, shade guide tabs and restorative materials. Goodkind et al[4], reported trends seen in 2830 anterior teeth studied with a colorimeter. Using a colorimeter enabled them, as mentioned above, to find that color was best represented by its middle third; women's teeth in general were lighter, less chromatic and less reddish-colored than men's; aging produced darker and more reddish teeth; cuspid teeth were darker than central and lateral incisors; and that central incisors had the highest value.

O'Brien et al[5], using a spectrophotometer, found that the mean ΔE between the gingival and incisal regions of 95 extracted human teeth showed a clinically significant difference of 8.2. Dozic et al[14], used digital photography to establish the relation in color between the maxillary anterior teeth. They found that the relation in color between maxillary incisors and canines was strongest in the cervical region. Contrary to the conclusions by Goodkind et al[4], Dozic et al[14] concluded that this area (the cervical of the tooth) should be used to predict the most reliable color of a tooth.

Wetter et al[6] performed a clinical trial that compared the average lightness difference between maxillary central incisors and canines before and after three different bleaching treatments. They found that the average difference in lightness

(ΔL) before treatment to be 8.49 and after treatment 6.89. This showed that there is a difference in lightness between incisors and canines and that bleaching may decrease this difference thereby making the color difference of teeth more homogenous.

It is evident that color difference and shade selection are important aspects of dentistry. Limited *in vivo* information is available comparing color difference between maxillary anterior teeth and the possible affect age may have on this difference.

IV. Hypothesis

Null hypotheses to be tested:

1. There is no difference between the hue of the maxillary central incisor and the canine (ΔE derives solely from value and chroma).
2. There is no difference in the average ΔE in an older age group between the maxillary central incisor and canine versus a younger population.

V. Specific Aims

1. To measure the ΔE values (as a function of L*a*b*) in the middle third of *in vivo* maxillary central incisors and canines
2. To compare the ΔE between *in vivo* maxillary central incisors and canines as a function of age.
3. To determine whether the intra-subject ΔE (central incisor to canine) is only a function of chroma or whether it also involves a shift in hue.

VI. Materials and Methods

A total of 62 subjects were enrolled, 25 women and 37 men. Their ages ranged from 20 to 79 years distributed as per Figure 1. In accordance with university research regulations, necessary approval was received from the Institutional Research Board (IRB) at the University of Connecticut Health Center to perform research involving human subjects. Students, faculty, employees and patients of UConn Health Center were eligible for enrollment. Verbal informed consent was obtained prior to clinical exam (written consent was waived by IRB).

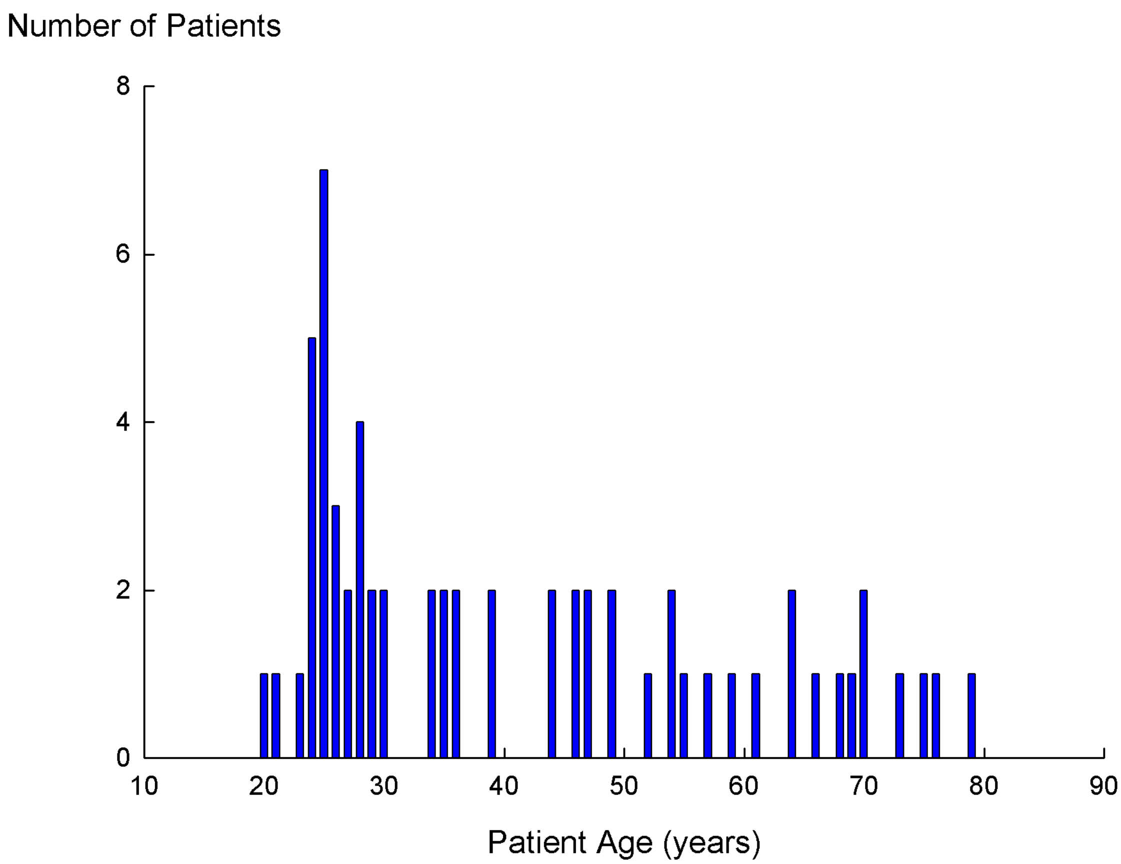

Figure 1. Age distribution

Once patients voluntarily agreed to be a part of the research study, a clinical exam was performed to gather information on the integrity of a maxillary central incisor and canine on the same side. The following exclusion criteria were used in order to assess patient's entrance into the study: 1) history of tooth whitening; 2) restorations including facial composites, veneers, crowns or dentures; 3) intrinsic staining; 4) visible caries or excessive erosion/wear. All subjects received a tooth-polishing of the two teeth being examined using a commercially available prophy paste on the facial of each tooth to remove any extrinsic stains. The teeth in question were then rinsed and the lip was retracted.

Three consecutive measurements of each tooth were made using a calibrated spectrophotometer (VITA Easyshade® Compact (Vident, Brea, Cali)) (Figure 2). All measurements were taken by the same evaluator. The Easyshade® was positioned perpendicular on the middle third of each tooth and was in contact with the tooth as shown in Figure 3. Three consecutive measurements were first taken on the central incisor followed by three consecutive measurements of the canine. Care was taken to remain still during each measurement. After the measurements were taken, the data was taken from the Easyshade® and entered on a data sheet as seen in Figure 4.

Figure 2. VITA Easyshade® Compact

Figure 3. Color measurement of the central incisor

Patient measurements (L*a*b* C and h) and calculations based on Berns Principles of Color Technology

Patient number = 0 | Patient age = | Patient gender =

Central Incisor	Test 1	Test 2	Test 3	mean	SD
L* =				#DIV/0!	#DIV/0!
a* =				#DIV/0!	#DIV/0!
b* =				#DIV/0!	#DIV/0!
C =				#DIV/0!	#DIV/0!
h =				#DIV/0!	#DIV/0!
CLASSIC					

Canine	Test 1	Test 2	Test 3	mean	SD
L* =				#DIV/0!	#DIV/0!
a* =				#DIV/0!	#DIV/0!
b* =				#DIV/0!	#DIV/0!
C =				#DIV/0!	#DIV/0!
h =				#DIV/0!	#DIV/0!
CLASSIC					

		t-test comparisons	p =
ΔE^*_{ab} =	#DIV/0!		
ΔL^* =	#DIV/0!	chroma	#DIV/0!
ΔC^*_{ab} =	#DIV/0!	hue	#DIV/0!
ΔH^*_{ab} =	#DIV/0!	lightness	#DIV/0!

Figure 4. Data collection sheet

Patient measurements (L*a*b*C and h) were used to calculate the following color differences based on Berns Principles of Color Technology:

$$\Delta E_{(L^*a^*b^*)} = \{(L^*_1-L^*_2)^2+ (a^*_1-a^*_2)^2+ (b^*_1-b^*_2)^2 \}^{1/2} \quad \text{Eq. 1}$$

$$\Delta L^* = L^*_{canine} - L^*_{central\ incisor} \quad \text{Eq. 2}$$

$$\Delta C^*_{ab} = C^*_{ab} - C^*_{ab} = (a^{*2}_{canine} + b^{*2}_{canine})^{1/2} - (a^{*2}_{central} + b^{*2}_{central})^{1/2} \quad \text{Eq. 3}$$

$$\Delta H^*_{ab} = [(\Delta E_{(a^*b^*)})^2 - (\Delta L^*)^2 - (\Delta C^*_{ab})^2]^{½} \quad \text{Eq. 4}$$

The statistical software used for data analysis was SPSS version 16.0 for Windows (SPSS, Inc., Chicago, IL) and plotting analyses were accomplished with SigmaPlot 9.01 (SysStat Software, Inc., Point Richmond, CA).

Partway into data collection an observation was made that the Vita Classic Shade (also output by the Easyshade) of the central and canine were often not in the same family (A, B, C, D). Since this further tested hypothesis 1, beyond CIEL*a*b* color space, the Vita Classic Shade of each tooth was recorded for the remainder of the patients.

VII. Results

Patients were found to be distributed relatively evenly by age (Figure 1). Regression analysis did indicate a very slight linear decrease in patient numbers with age, demonstrating that the available population tended to be younger (r2 = 0.25, p = 0.003). The slope of this relationship was very shallow, from approximately 2.5 patients to 1.0 patient per age (year) between years 20 to 80 (Figure 5).

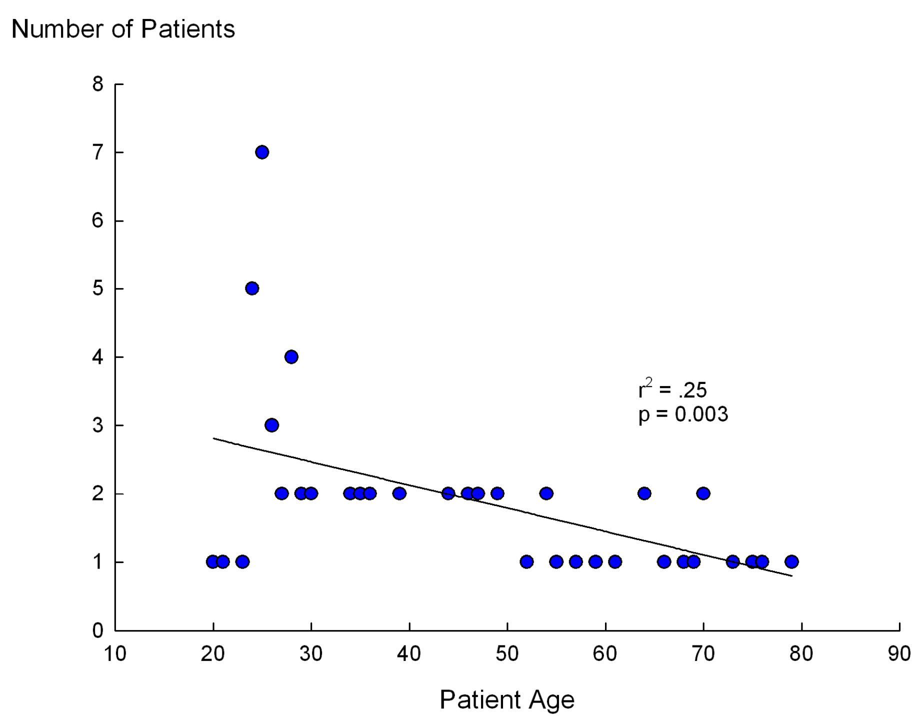

Figure 5. Linear regression between number of patients and age (years)

Regarding potential operator variation and the lack of any orientation guide (see Discussion), after all measurements were taken, the coefficients of variation (standard deviation/mean) were calculated to be 0.001 or less.

A. Delta E

Delta E does exist between the central incisor and canine. Linear regression analysis with a 95% confidence demonstrated a significant linear relationship between ΔE and Age (Figure 6). ΔE decreases with age (p=0.056).

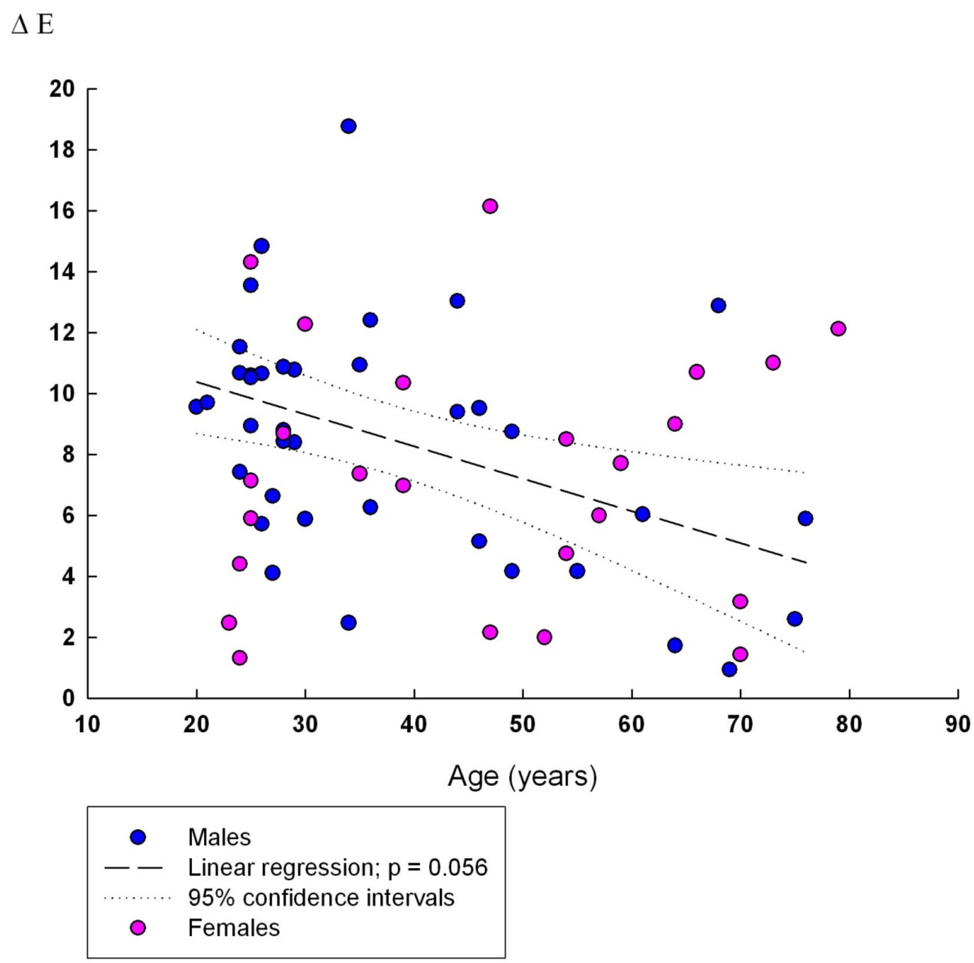

Figure 6. Relationship between ΔE and age (years)

A t-test illustrated that there was a significant difference (p=.019) for the ΔE value between the central incisor and canine for those patients whose ΔE was greater than 3.3 (Clinically different, Average age = 38.8) compared to patients with a ΔE less than 3.3(Clinically the same; Average age = 58.8) (Figure 7).

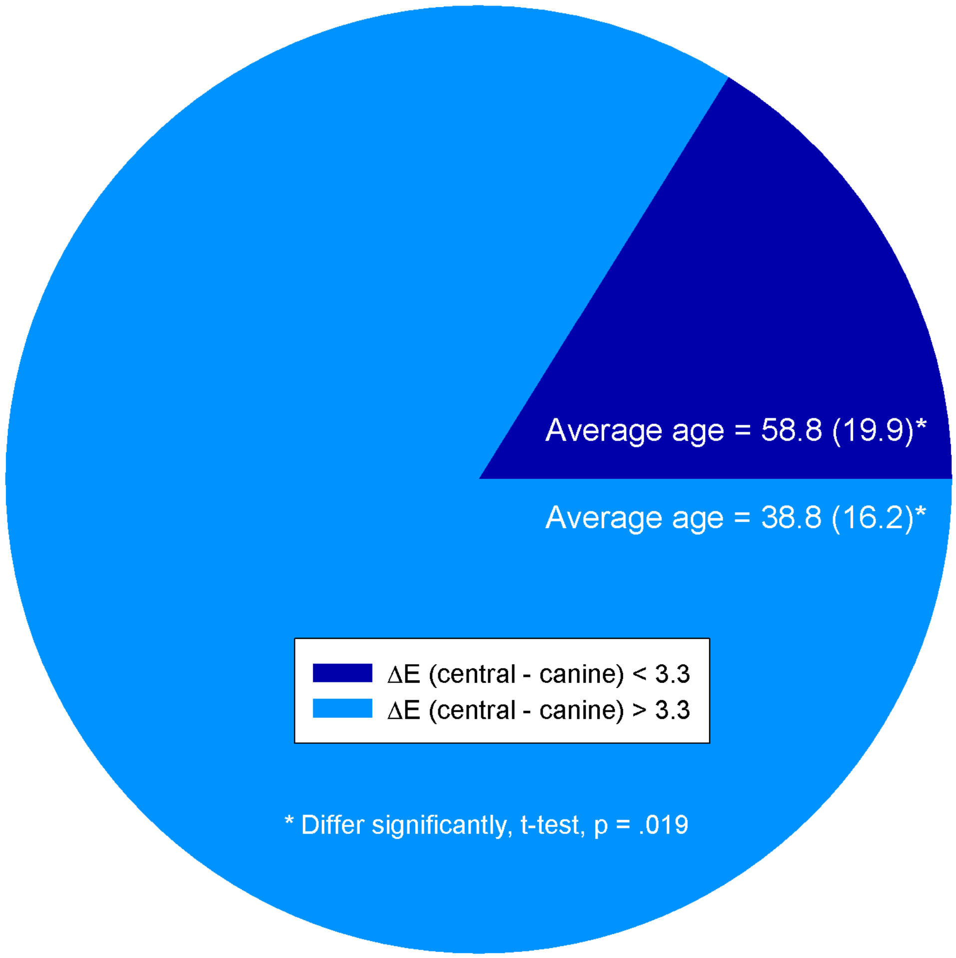

Figure 7. Comparison of ΔE < or > 3.3
(3.3 has been determined to be clinically different[10])

B. Delta C

Delta E is a compilation of measurements based on chroma, value and hue. As a patient ages, the color difference between the central incisor and canine decreases. The main reason behind this finding appears to be that the central incisor is changing within the three dimensional color spectrum and the canine is generally remaining the same. Regression analysis with a 95% confidence demonstrated an indirect linear relationship between ΔC and Age (Figure 8). ΔC decreases significantly with age ($p<0.001$). A regression analysis also demonstrated that as a patient ages, the chroma of the central incisor is increasing significantly ($p<0.001$), whereas the canine is remaining the same ($p=.87$) (Figure 9).

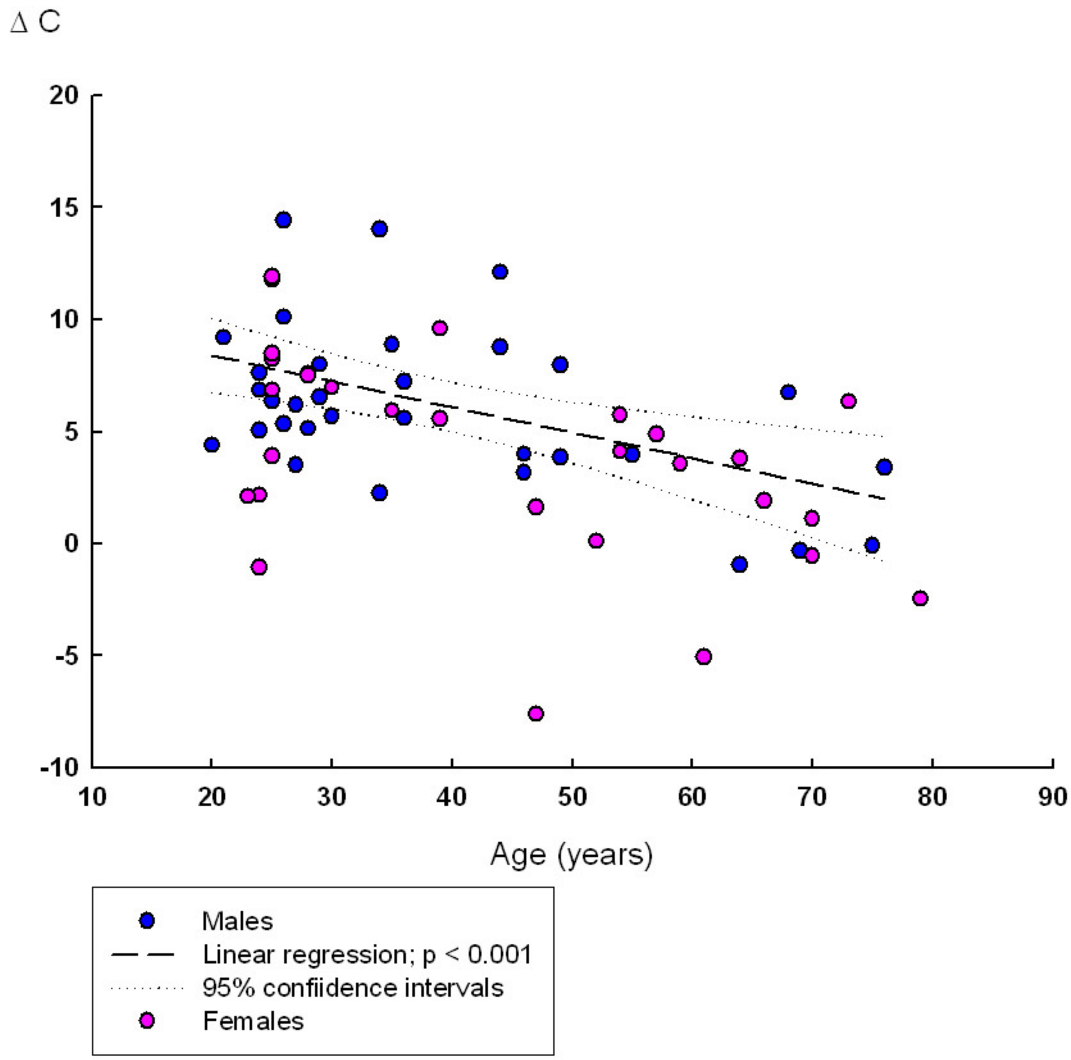

Figure 8. Relationship between ΔC and age (years)

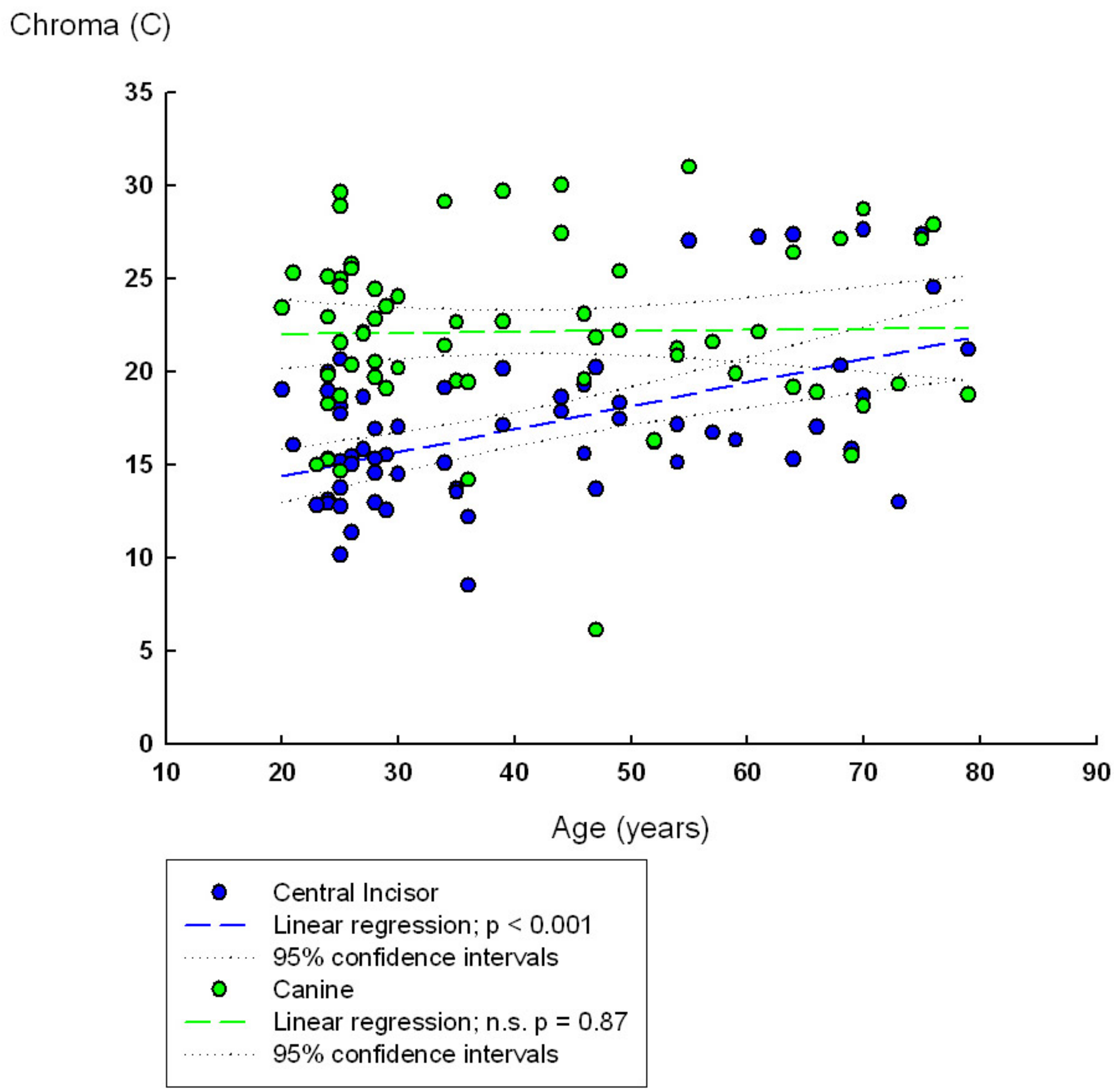

Figure 9. Relationship between Chroma and age (years) comparing central incisors to canines

C. Delta H

A regression analysis of ΔH demonstrated a trend to decrease as a patient ages ($p=0.2$) (Figure 10). The same analysis illustrated that the hue for the central incisor decreases significantly with age ($p<0.001$) and that the canine remains the same (Figure 11).

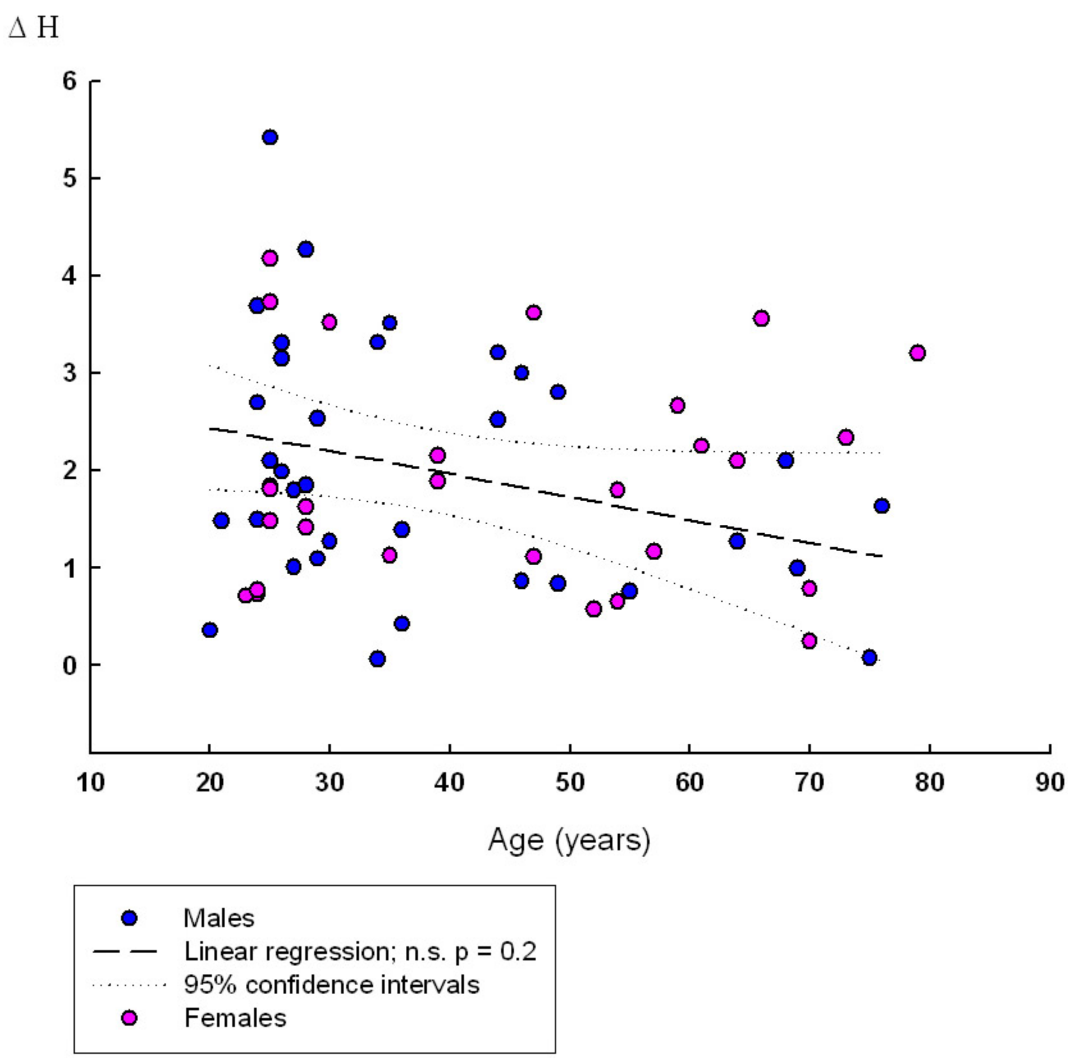

Figure 10. Relationship between ΔH and age (years)

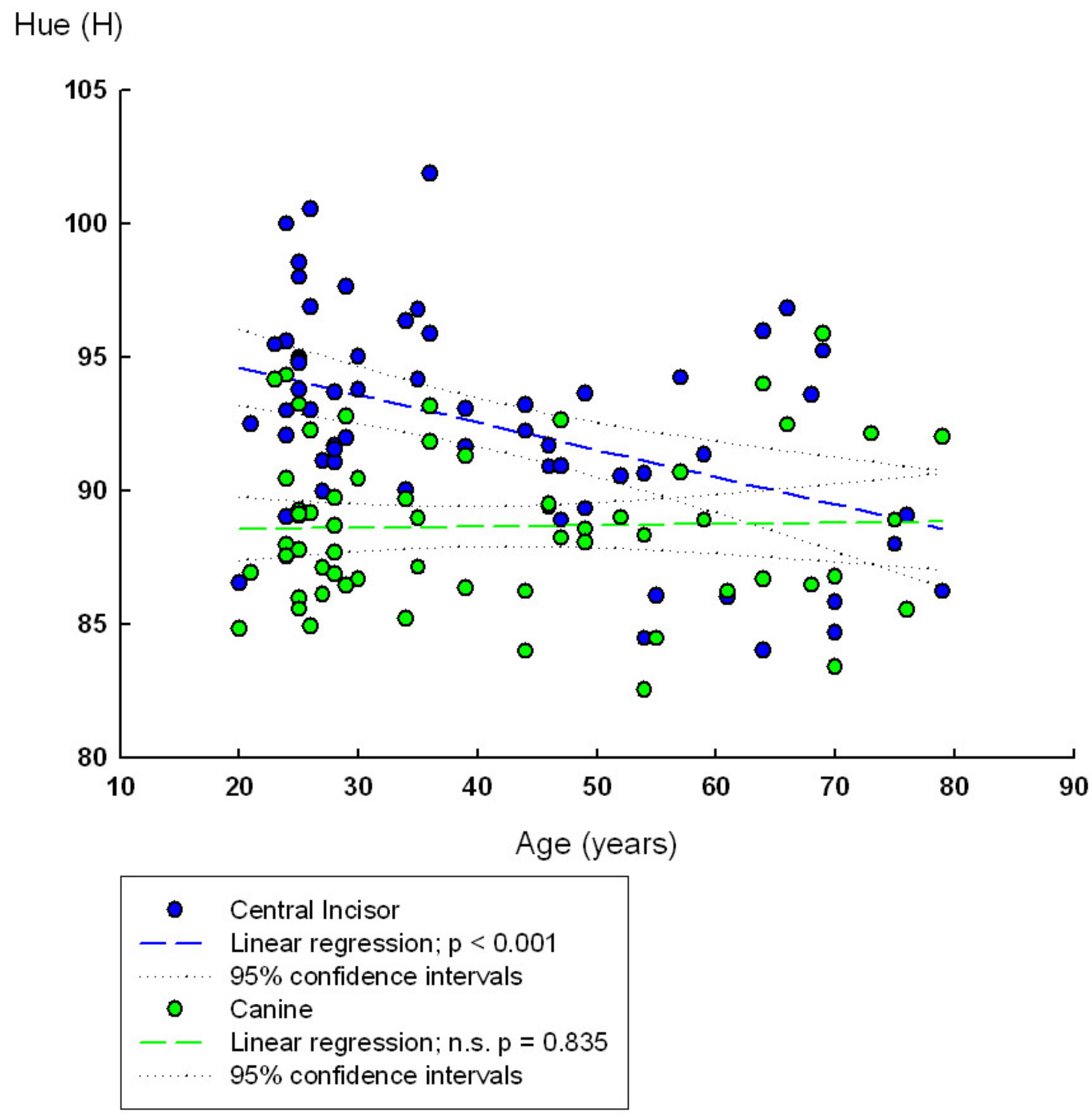

Figure 11. Relationship between Hue and age (years) comparing central incisors to canines

Delta L

A regression analysis of ΔL showed it to remain the same as age increases (Figure 12). However, a regression analysis demonstrated that both the central incisor (p<0.001) and canine (p<0.01) decrease significantly with age (Figure 13).

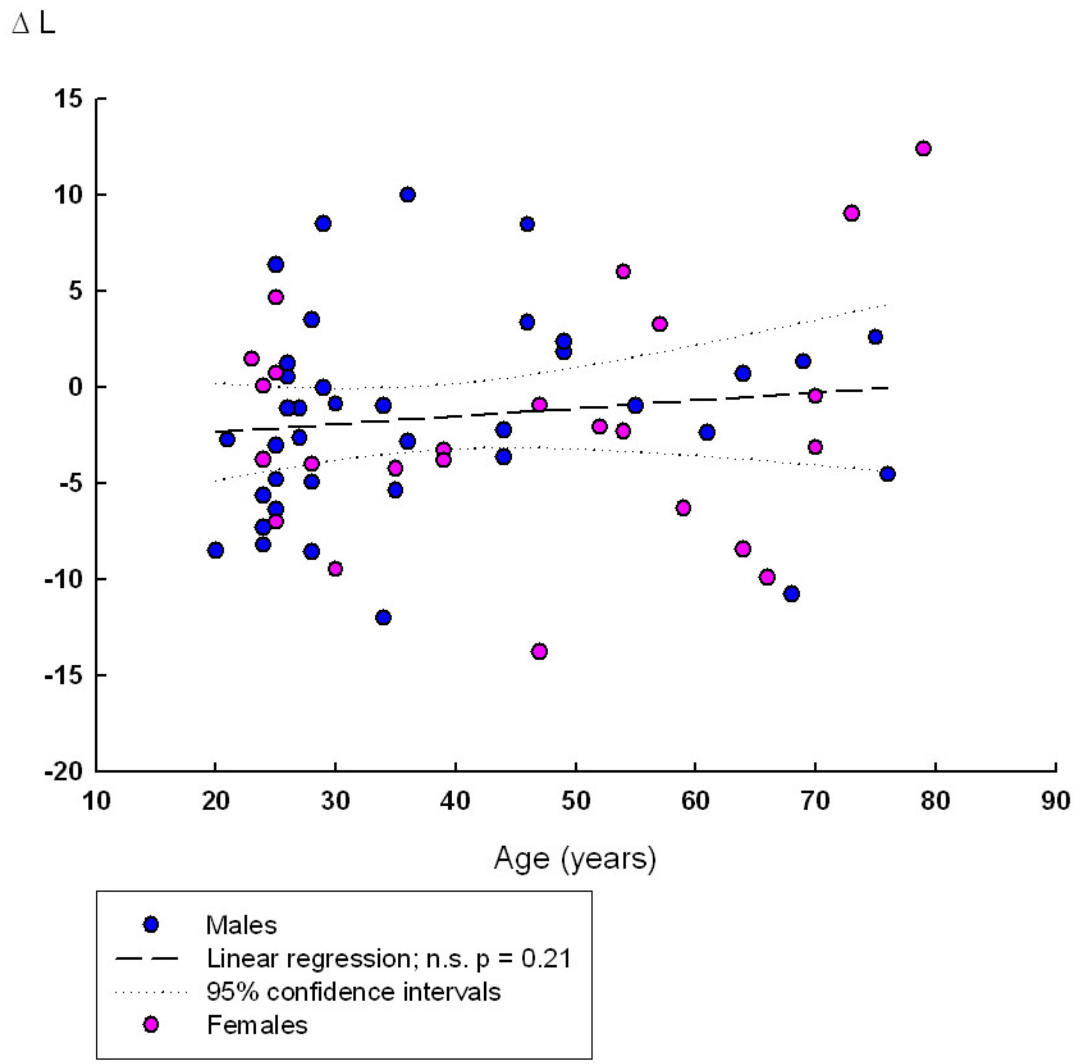

Figure 12. Relationship between ΔL and age (years)

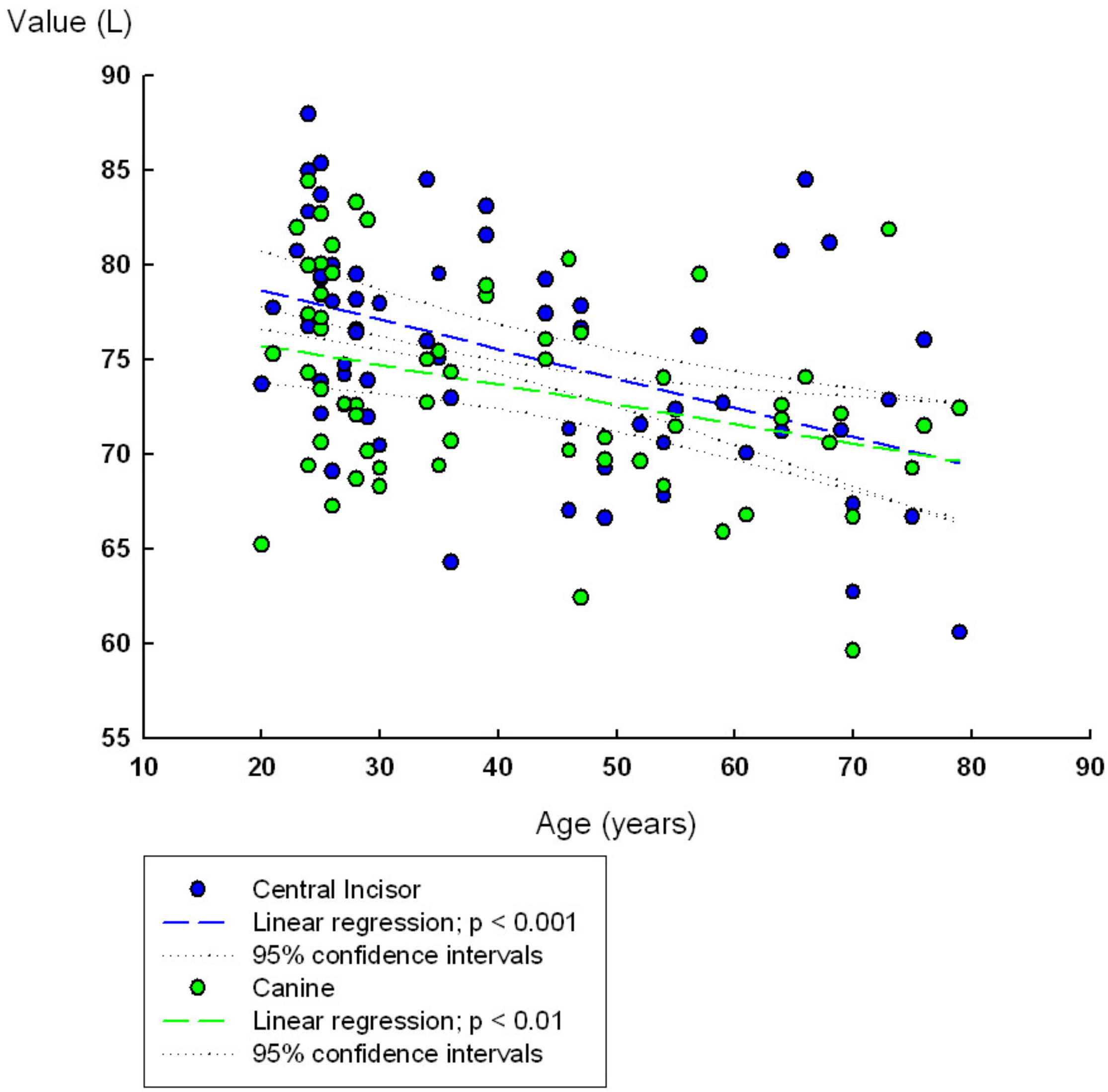

Figure 13. Relationship between value and age (years) comparing central incisors to canines

D. Shade Families

A t-test illustrated that there was a significant difference ($p=.013$) in patients' central incisor and canine based on the Vita Classic Shade guide. The average age for those seen in "same shade family" (i.e. both A, perhaps A2 for the central and A3 for the canine) was 51.9 years and for "different shade family" was 36.7 years (Figure 14). The general breakdown also illustrates the hue difference between central and canine by patient (Figure 15) and in relation to the Classic Shade guide (Figure 16).

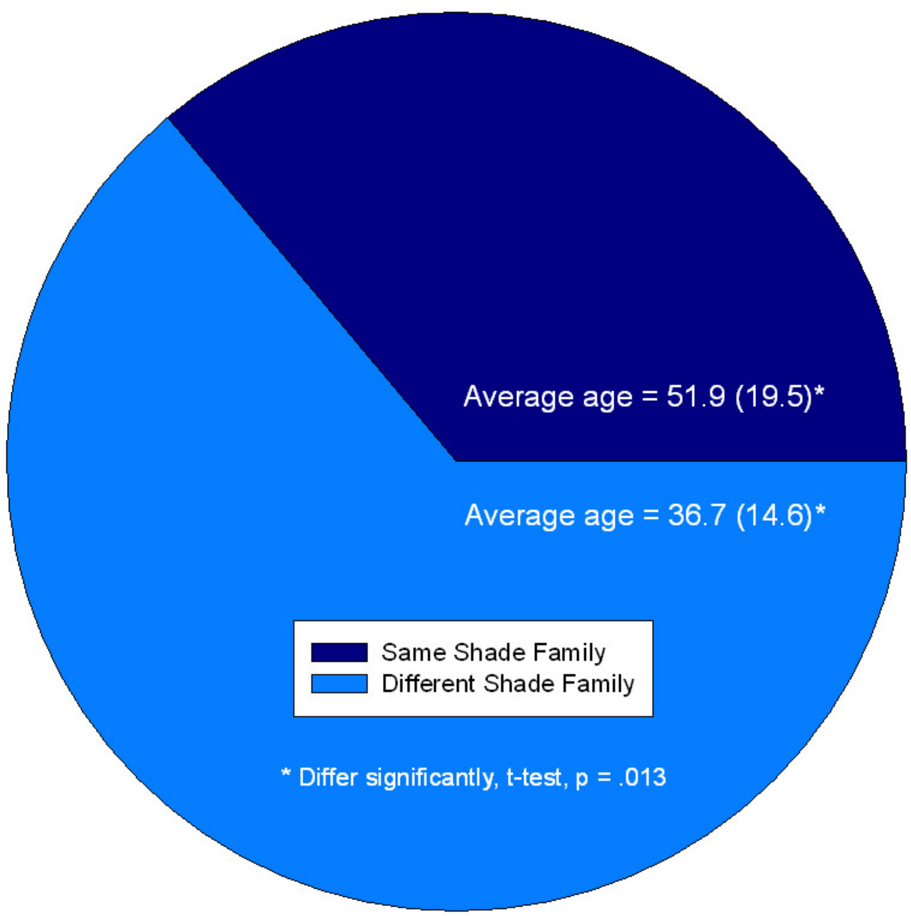

Figure 14. Same or different Vita Classic Shade Family compared to age of patient

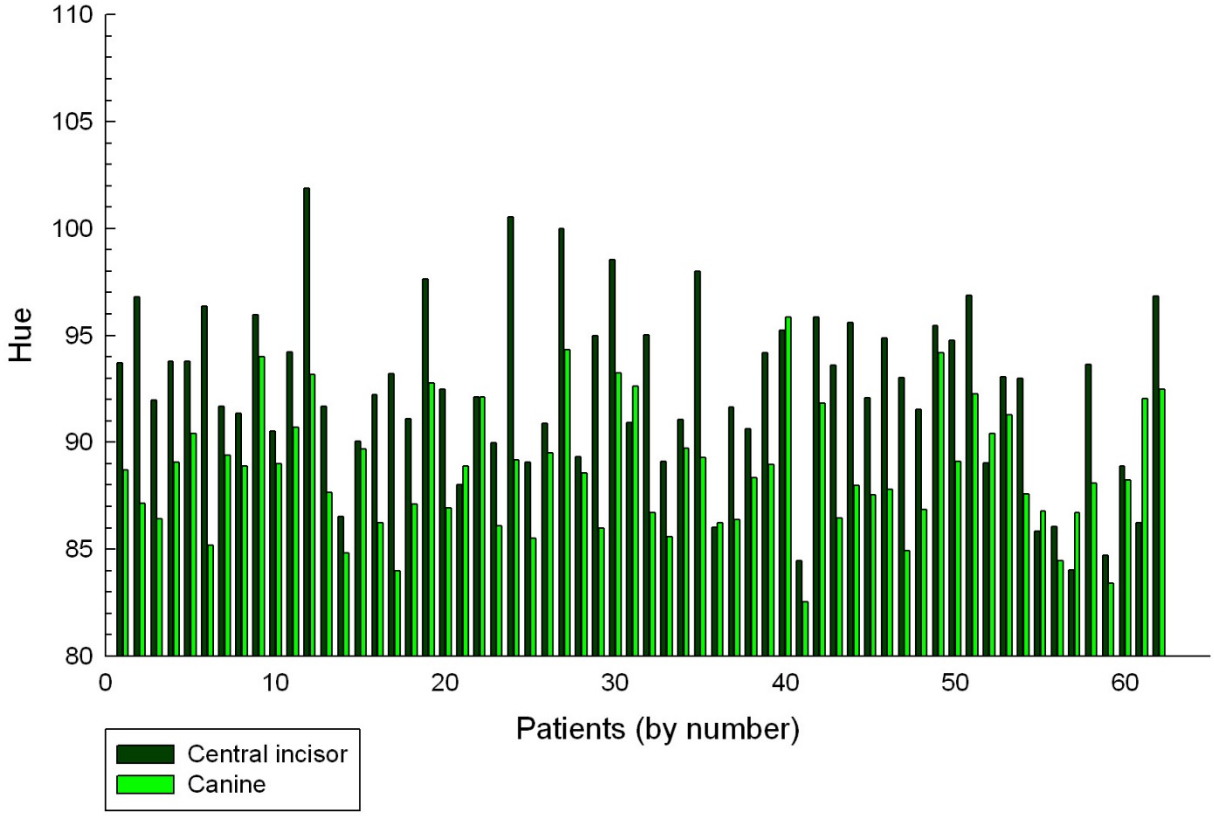

Figure 15. Hue differences by patient

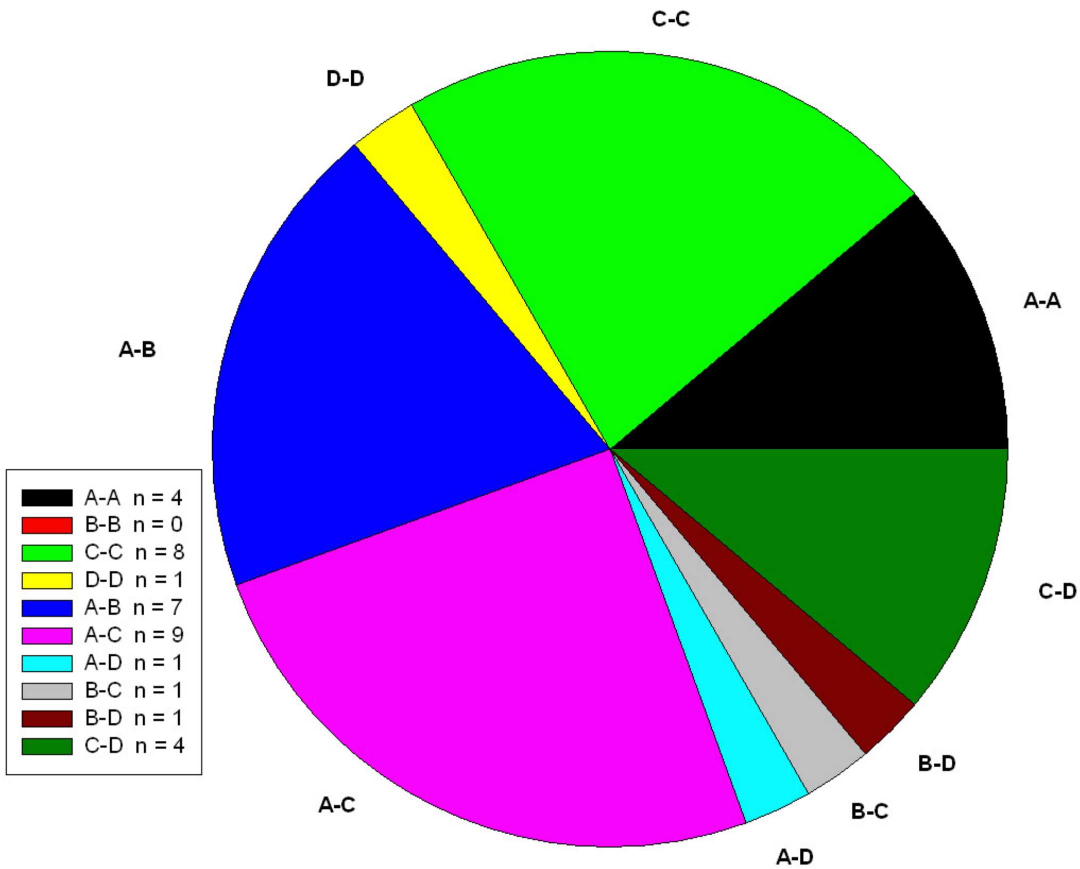

Figure 16. Hue differences breakdown by Patient in relation to the Vita Classic Shade guide

VIII. Discussion

It is commonly taught that when fabricating a three unit fixed dental prostheses from central incisor to canine, or any anterior prosthesis, the shade should taken from the canine (i.e. A3) and make the corresponding central incisor one to two shades lighter, but within the same family (i.e. A1). Although this is regularly taught at the very start of our dental school education, it appears from this research that in general this is not what is occurring in nature. Results from this study show this to be dogma and demonstrate what the natural situation really is and how it changes with age.

Eighty four percent of the patients were found to have a ΔE greater than the 3.3 that is known to be clinically detectable as a difference of color and the younger population tends to have a greater difference in color between their central incisor and canine than do those of older populations. For the 16% of patients with a ΔE less than 3.3 (i.e. more homogenous teeth), the average age was 58.8 years as compared to a ΔE greater than 3.3 (average age = 38.8 years). The shades of teeth merge with age, on all three CIEL*a*b* scales. The major change, however, is seen in the central incisor. For both chroma and hue changes, the central changed significantly with age and the canine remained the same. The value scale for both the canine and central decreased with age.

Biologic Rationale

These changes seen in the central incisor, but not the canine, may be able to be explained by a simple difference in tooth anatomy. Shilling burg and Grace[15] showed the distribution of enamel and dentin thicknesses in the cervical, middle and incisal tooth segments. It is evident that the enamel thickness at the incisal is larger in canines (average 1.12mm) as compared to central incisors (average 0.86mm) and the amount of dentin at the labial middle third is also larger in the canine (1.95mm vs. 1.73mm). Thus, assuming equal enamel wear rates, dentin can be expected to become more dominant in determining appearance of the centrals with age, thereby creating a more chromatic tooth with a shifting hue.

Dozic et al[14] found that the L*, a* and b* measurements all decreased toward the incisal. As you move from the middle third of the tooth toward the incisal, dentin becomes thinner or disappears increasing transmission and decreasing reflection; in essence then the darkness of the oral cavity begins to influence the "color". It is well accepted that the chroma and hue of teeth are determined by dentin. The a* value decrease is attributed to being further away from the red gingival tissue and the b* decrease can be explained because the dentin disappears toward the incisal and therefore there is less yellowness.

Goodkind et al[4] studied anterior teeth (both maxillary and mandibular) at the cervical, middle and incisal areas with a colorimeter. It was shown that for all the anterior teeth, there is a general darkening of a patient's teeth after the age of approximately 35 years. They showed that in general teeth decrease in hue and value, but increase in chroma. This is not consistent with the findings of this present study. The aforementioned paper, grouped all anterior teeth together without separating them to decipher why these differences for age existed. They found that in general, the canines have lower value than neighboring incisors;

however, they did not perform an “intra-patient” evaluation to see what was occurring in each patient. Our findings clearly demonstrate that when comparing the maxillary central incisor to the maxillary canine (ΔE) in each individual patient, there is an overall difference for chroma, hue and value and as patients age the majority of the change is coming from changes in the central incisor. As people age and their teeth wear, secondary dentin is formed. By nature, dentin is darker than enamel and therefore will reduce the overall value with age and increase the chromaticity. The present study showed that the central incisor is responsible for the diminished color difference (ΔE) as compared to the canine. This can be explained by the fact that the canine has a greater amount of facial enamel and is less likely as a percentage to decrease over time. As the central wears and secondary dentin is formed, the central incisor increases in chroma, decreases in hue and value, therefore creating a more homogenous tooth shade between the central incisor and canine.

Clinical Implications

Because of the differences that were found among patients and as patients age, clinicians should take these changes into consideration when choosing a shade for their patients’ restorations. It is clear that as age increases, the ΔE between the canine and central decreases. This information will aid dentists in choosing a natural and “age-appropriate” shade for their patients. It can also help to education patients on what is natural for their age and what they can expect as they age. For example, media has played a very large role in influencing patient demands over the last few decades. “Brighter and whiter” is what many patients walking in the door are expecting. If we were to fabricate six "bright and white" veneers on a 35 year old patient now, we need to be able to explain what the implications will be for future maintenance and upkeep. Patients need to be educated on what occurs in nature and how their smiles may be impacted by age.

When patients bleach their teeth, changes can be noted for value, hue and chroma. Wetter et al., [6] performed a study where they evaluated the color changes before and after whitening. They compared incisors with canines as well. They noted that after bleaching, there was an equalization of value, hue and chroma. A significantly stronger overall increase in value was observed for the canines after treatment when compared to the incisors. This resulted in a more homogenous appearance. Now, the question stands: since teeth naturally become more homogenous with age (darker), is a bleached smile perceived as an "old smile" or do we ignore the homogeneity and associate lightness with youth?

In regards to shade guide selection, many practitioners are still using the Vita Classical Shade guide with the A-D shade families (Vita confirmed that in 2010, they sold two times more Classical Shade guides than the 3D Master Shade guide (including the Linear Shade guide). Hall[16] published on the tooth color space of natural teeth within the L*a*b* color space. For the Classical Shade guide, it was shown that most shades that appear within nature are not represented accurately using this shade guide and a few of the shade tabs actually fell outside what is seen in nature. The Vita 3D Master Shade guide offers a more consistent, even distribution of shades. It also helps to make determination of intermediate shades easier since it is more evenly distributed. (Figure 17).

a. b.

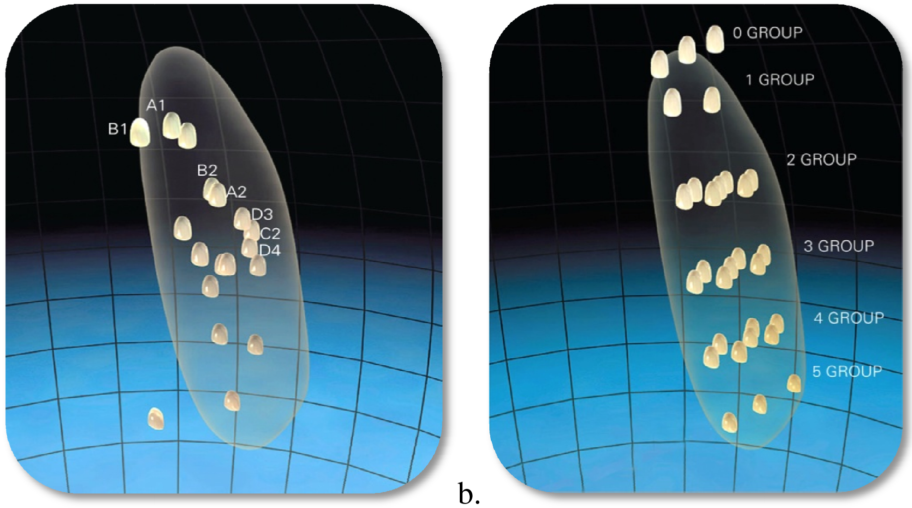

Figure 17. Vita Shade guide comparing a. Classical Shade guide and b. 3D Master Shade guide (both shown within envelope of natural tooth colors)

Since many dentists are still using the Classical Shade guide, this study used the Classical Shade families to drive home the point that if you are still using the Classical Shade guide, you cannot assume that all teeth within a single patient have the same Classical Shade family (more than 64% of the time they are not in the same family). Since many of the Classical shade tabs fall outside what natural teeth shades are, the 3D system is more versatile and follows the color science involved with “shade” prescription more accurately.

Limitations of the Study

The population of the study participants was driven by the demographics of the hospital, students, staff and patients. Also, many of the subjects were dental students which may have decreased the average age of the study population. The racial makeup of the population in this particular setting is predominantly white. Although ethnicity and race were not recorded in this study, a future study may try and include a racial breakdown to see if there are any significant differences for different racial backgrounds.

Although some studies[6] used a positioning cylinder to stabilize the shade taking device on the tooth or used a neutral background held against the lingual aspects of the teeth to reduce background influences, neither of these approaches were used in this study. The same evaluator was used for each measurement and the measurements on each tooth were taken consecutively without removal of the device from the tooth. If movement was detected by the evaluator, all three measurements were retaken. Overall, for any of the measurements taken the coefficients of variation (standard deviation/mean) were 0.001 or less. Thus it would seem that no positioning aid was at all necessary. Also, since the middle third of the tooth was used for measurement purposes, there was no need for a neutral background at the incisal.

Future Research

Although this study clearly demonstrated the relationship of age in regards to ΔE, a future study could include a greater study population with a more balanced age distribution. While it may be difficult, a useful study would be to evaluate the thickness of enamel and dentin in extracted teeth (maxillary central incisor and canine) and do an intra-subject and inter-subject comparison of the teeth over a large range of ages. A prospective study analyzing tooth shade changes as patient's age that can record amount of wear may also provide us with a better understanding of the relationship between shade and age.

IX. Conclusion

It was found that ΔE does significantly decrease as a function of age. This change, however, is due mostly to a change in chroma (ΔC) between the central and the canine as patients age. It is not significantly influenced by the change in hue or lightness. The majority of changes for all three color coordinates are due to alterations in the central incisor. The canine's color coordinates remain rather stable over time.

In addition, the common teaching that the hue can be derived from the canine and then made less chromatic (less saturated hue) for the central when restoring anterior teeth has been proven incorrect. The majority of the patients in this study were found to have a different shade family for the central incisor and canine.

Shade taking for anterior esthetic restorations is a challenging and complex procedure. Knowledge of natural color differences, along with careful observation, is necessary to achieve lifelike esthetic results.

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XI. Appendix

Patient measurements (L*a*b* C and h) and calculations based on Berns Principles of Color Technology

Patient number = 0 **Patient age =** **Patient gender =**

	Central Incisor						*Canine*				
	Test 1	**Test 2**	**Test 3**	**mean**	**SD**		**Test 1**	**Test 2**	**Test 3**	**mean**	**SD**
L* =				#DIV/0!	#DIV/0!	**L* =**				#DIV/0!	#DIV/0!
a* =				#DIV/0!	#DIV/0!	**a* =**				#DIV/0!	#DIV/0!
b* =				#DIV/0!	#DIV/0!	**b* =**				#DIV/0!	#DIV/0!
C =				#DIV/0!	#DIV/0!	**C =**				#DIV/0!	#DIV/0!
h =				#DIV/0!	#DIV/0!	**h =**				#DIV/0!	#DIV/0!
CLASSIC						**CLASSIC**					

ΔE^*_{ab} =	#DIV/0!	**t-test comparisons**	*p* =
ΔL^* =	#DIV/0!	**chroma**	#DIV/0!
ΔC^*_{ab} =	#DIV/0!	**hue**	#DIV/0!
ΔH^*_{ab} =	#DIV/0!	**lightness**	#DIV/0!

Patient number = 1 **Patient age = 28** **Patient gender = F**

	Central Incisor						*Canine*				
	Test 1	**Test 2**	**Test 3**	**mean**	**SD**		**Test 1**	**Test 2**	**Test 3**	**mean**	**SD**
L* =	76.6	76.6	76.6	76.60	0.00	**L* =**	72.6	72.6	72.6	72.60	0.00
a* =	-1.0	-0.9	-0.6	-0.83	0.21	**a* =**	0.4	0.5	0.5	0.47	0.06
b* =	12.9	12.8	13.0	12.90	0.10	**b* =**	20.6	20.7	20.2	20.50	0.26
C =	13.0	12.9	13.0	12.97	0.06	**C =**	20.6	20.8	20.2	20.53	0.31
h =	94.2	94.1	92.8	93.70	0.78	**h =**	88.9	88.7	88.5	88.70	0.20

ΔE^*_{ab} =	8.69	**t-test comparisons**	*p* =
ΔL^* =	-4.00	**chroma**	0.001
ΔC^*_{ab} =	7.58	**hue**	0.005
ΔH^*_{ab} =	1.420	**lightness**	#DIV/0!

Patient number = 2 **Patient age = 35** **Patient gender = M**

	Central Incisor						*Canine*				
	Test 1	**Test 2**	**Test 3**	**mean**	**SD**		**Test 1**	**Test 2**	**Test 3**	**mean**	**SD**
L* =	74.5	75.6	75.1	75.07	0.55	**L* =**	69.6	68.9	69.7	69.40	0.44
a* =	-1.7	-1.6	-1.6	-1.63	0.06	**a* =**	1.2	1.1	1.2	1.17	0.06
b* =	13.0	14.4	13.7	13.70	0.70	**b* =**	23.1	22.1	22.7	22.63	0.50
C =	13.1	14.4	13.8	13.77	0.65	**C =**	23.2	22.1	22.7	22.67	0.55
h =	97.5	96.2	96.7	96.80	0.66	**h =**	87.1	87.2	87.1	87.13	0.06

ΔE^*_{ab} =	10.94	**t-test comparisons**	*p* =
ΔL^* =	-5.37	**chroma**	0.006
ΔC^*_{ab} =	8.87	**hue**	0.002
ΔH^*_{ab} =	3.513	**lightness**	0.009

Patient number = 3 **Patient age = 29** **Patient gender = M**

	Central Incisor						*Canine*				
	Test 1	**Test 2**	**Test 3**	**mean**	**SD**		**Test 1**	**Test 2**	**Test 3**	**mean**	**SD**
L* =	72.6	72.0	71.2	71.93	0.70	**L* =**	68.9	69.7	71.9	70.17	1.55
a* =	-0.6	-0.5	-0.5	-0.53	0.06	**a* =**	1.4	1.4	1.5	1.43	0.06
b* =	15.9	15.5	15.2	15.53	0.35	**b* =**	23.1	23.2	24.2	23.50	0.61
C =	15.9	15.5	15.2	15.53	0.35	**C =**	23.1	23.2	24.2	23.50	0.61
h =	92.0	91.9	92.0	91.97	0.06	**h =**	86.5	86.4	86.4	86.43	0.06

ΔE^*_{ab} =	8.39	**t-test comparisons**	*p* =
ΔL^* =	-0.03	**chroma**	0.005
ΔC^*_{ab} =	8.00	**hue**	0.000
ΔH^*_{ab} =	2.537	**lightness**	0.307

Patient number = 4 **Patient age = 25** **Patient gender = F**

	Central Incisor						*Canine*				
	Test 1	**Test 2**	**Test 3**	**mean**	**SD**		**Test 1**	**Test 2**	**Test 3**	**mean**	**SD**
L* =	78.6	79.5	79.7	79.27	0.59	**L* =**	80.0	80.2	80.0	80.07	0.12
a* =	-1.3	-1.2	-1.2	-1.23	0.06	**a* =**	0.4	0.5	0.4	0.43	0.06
b* =	17.8	18.3	18.1	18.07	0.25	**b* =**	24.9	25.3	24.7	24.97	0.31
C =	17.9	18.3	18.2	18.13	0.21	**C =**	24.9	25.3	24.7	24.97	0.31
h =	94.0	93.7	93.7	93.80	0.17	**h =**	89.1	88.9	89.2	89.07	0.15

ΔE^*_{ab} =	7.14	**t-test comparisons**	*p* =
ΔL^* =	0.73	**chroma**	0.001
ΔC^*_{ab} =	6.86	**hue**	0.001
ΔH^*_{ab} =	1.846	**lightness**	0.131

Patient number = 5 **Patient age = 30** **Patient gender = M**

	Central Incisor						*Canine*				
	Test 1	**Test 2**	**Test 3**	**mean**	**SD**		**Test 1**	**Test 2**	**Test 3**	**mean**	**SD**
L* =	70.0	70.4	71.0	70.47	0.50	**L* =**	69.3	68.9	69.6	69.27	0.35
a* =	-1.0	-0.9	-0.9	-0.93	0.06	**a* =**	-0.1	-0.2	-0.2	-0.17	0.06
b* =	14.2	14.4	14.9	14.50	0.36	**b* =**	20.4	20.0	20.2	20.20	0.20
C =	14.2	14.4	14.9	14.50	0.36	**C =**	20.4	20.0	20.2	20.20	0.20
h =	94.1	93.7	93.5	93.77	0.31	**h =**	90.3	90.5	90.5	90.43	0.12

ΔE^*_{ab} =	5.88	**t-test comparisons**	*p* =
ΔL^* =	-0.87	**chroma**	0.002
ΔC^*_{ab} =	5.67	**hue**	0.005
ΔH^*_{ab} =	1.269	**lightness**	0.041

Patient number = 6 | Patient age = 34 | Patient gender = M

	Central Incisor						*Canine*				
	Test 1	Test 2	Test 3	mean	SD		Test 1	Test 2	Test 3	mean	SD
L* =	84.3	84.8	84.4	84.50	0.26	L* =	73.2	72.5	72.5	72.73	0.40
a* =	-1.7	-1.6	-1.7	-1.67	0.06	a* =	2.6	2.4	2.3	2.43	0.15
b* =	14.7	15.2	15.1	15.00	0.26	b* =	29.5	28.9	28.7	29.03	0.42
C =	14.8	15.3	15.2	15.10	0.26	C =	29.6	29.0	28.8	29.13	0.42
h =	96.5	96.2	96.4	96.37	0.15	h =	85.0	85.2	85.4	85.20	0.20

		t-test comparisons	*p* =
ΔE^*_{ab} =	18.77		
ΔL^* =	-12.00	chroma	0.001
ΔC^*_{ab} =	14.04	hue	0.000
ΔH^*_{ab} =	3.316	lightness	0.001

Patient number = 7 | Patient age =46 | Patient gender = M

	Central Incisor						*Canine*				
	Test 1	Test 2	Test 3	mean	SD		Test 1	Test 2	Test 3	mean	SD
L* =	67.7	66.8	66.6	67.03	0.59	L* =	69.9	70.3	70.4	70.20	0.26
a* =	-0.3	-0.6	-0.5	-0.47	0.15	a* =	0.1	0.2	0.3	0.20	0.10
b* =	15.9	15.3	15.6	15.60	0.30	b* =	19.1	19.7	20.0	19.60	0.46
C =	15.9	15.3	15.6	15.60	0.30	C =	19.1	19.7	20.0	19.60	0.46
h =	91.1	92.2	91.8	91.70	0.56	h =	89.7	89.4	89.1	89.40	0.30

		t-test comparisons	*p* =
ΔE^*_{ab} =	5.15		
ΔL^* =	3.37	chroma	0.010
ΔC^*_{ab} =	3.99	hue	0.036
ΔH^*_{ab} =	#NUM!	lightness	0.023

Patient number = 8 | Patient age = 59 | Patient gender = F

	Central Incisor						*Canine*				
	Test 1	Test 2	Test 3	mean	SD		Test 1	Test 2	Test 3	mean	SD
L* =	72.7	72.5	72.9	72.70	0.20	L* =	65.4	65.9	66.4	65.90	0.50
a* =	-0.4	-0.3	-0.4	-0.37	0.06	a* =	0.4	0.3	0.4	0.37	0.06
b* =	16.2	16.4	16.4	16.33	0.12	b* =	20.0	19.8	19.9	19.90	0.10
C =	16.2	16.4	16.4	16.33	0.12	C =	20.0	19.8	19.9	19.90	0.10
h =	91.4	91.2	91.5	91.37	0.15	h =	88.8	89.0	88.9	88.90	0.10

		t-test comparisons	*p* =
ΔE^*_{ab} =	7.71		
ΔL^* =	-6.30	chroma	0.001
ΔC^*_{ab} =	3.57	hue	0.003
ΔH^*_{ab} =	2.663	lightness	0.001

Patient number = 9 | Patient age = 64 | Patient gender = F

	Central Incisor						*Canine*				
	Test 1	Test 2	Test 3	mean	SD		Test 1	Test 2	Test 3	mean	SD
L* =	80.5	80.4	81.3	80.73	0.49	L* =	72.1	73.4	72.3	72.60	0.70
a* =	-1.6	-1.7	-1.7	-1.67	0.06	a* =	-1.3	-1.5	-1.3	-1.37	0.12
b* =	15.5	15.0	15.2	15.23	0.25	b* =	19.3	18.5	19.4	19.07	0.49
C =	15.5	15.1	15.3	15.30	0.20	C =	19.4	18.6	19.5	19.17	0.49
h =	95.2	96.3	96.4	95.97	0.67	h =	93.7	94.6	93.7	94.00	0.52

		t-test comparisons	*p* =
ΔE^*_{ab} =	9.00		
ΔL^* =	-8.43	chroma	0.003
ΔC^*_{ab} =	3.79	hue	0.034
ΔH^*_{ab} =	#NUM!	lightness	0.005

Patient number = 10 | Patient age = 52 | Patient gender = F

	Central Incisor						*Canine*				
	Test 1	Test 2	Test 3	mean	SD		Test 1	Test 2	Test 3	mean	SD
L* =	71.7	71.6	71.4	71.57	0.15	L* =	69.8	69.6	69.5	69.63	0.15
a* =	-0.1	-0.2	-0.2	-0.17	0.06	a* =	0.3	0.3	0.3	0.30	0.00
b* =	16.3	16.1	16.2	16.20	0.10	b* =	16.2	16.3	16.4	16.30	0.10
C =	16.3	16.1	16.2	16.20	0.10	C =	16.2	16.3	16.4	16.30	0.10
h =	90.2	90.8	90.6	90.53	0.31	h =	88.9	89.0	89.1	89.00	0.10

		t-test comparisons	*p* =
ΔE^*_{ab} =	1.99		
ΔL^* =	-2.07	chroma	0.423
ΔC^*_{ab} =	0.10	hue	0.009
ΔH^*_{ab} =	#NUM!	lightness	0.000

Patient number = 11 | Patient age = 57 | Patient gender = F

	Central Incisor						*Canine*				
	Test 1	Test 2	Test 3	mean	SD		Test 1	Test 2	Test 3	mean	SD
L* =	75.7	76.4	76.6	76.23	0.47	L* =	79.3	79.7	79.5	79.50	0.20
a* =	-1.3	-1.2	-1.2	-1.23	0.06	a* =	-0.4	-0.2	-0.2	-0.27	0.12
b* =	16.5	16.7	16.8	16.67	0.15	b* =	21.1	22.0	21.7	21.60	0.46
C =	16.6	16.8	16.8	16.73	0.12	C =	21.1	22.0	21.7	21.60	0.46
h =	94.3	94.2	94.2	94.23	0.06	h =	91.1	90.4	90.6	90.70	0.36

		t-test comparisons	*p* =
ΔE^*_{ab} =	6.00		
ΔL^* =	3.27	chroma	0.002
ΔC^*_{ab} =	4.89	hue	0.002
ΔH^*_{ab} =	1.169	lightness	0.004

Patient number = 12 | Patient age = 36 | Patient gender = M

	Central Incisor						*Canine*				
	Test 1	**Test 2**	**Test 3**	**mean**	**SD**		**Test 1**	**Test 2**	**Test 3**	**mean**	**SD**
L* =	73.2	72.7	72.9	72.93	0.25	**L* =**	71.6	70.4	70.1	70.70	0.79
a* =	-1.8	-1.8	-1.7	-1.77	0.06	**a* =**	-0.8	-0.7	-0.8	-0.77	0.06
b* =	8.2	8.4	8.6	8.40	0.20	**b* =**	14.2	14.3	14.0	14.17	0.15
C =	8.4	8.4	8.8	8.53	0.23	**C =**	14.2	14.4	14.0	14.20	0.20
h =	102.5	102.0	101.1	101.87	0.71	**h =**	93.3	92.9	93.3	93.17	0.23

		t-test comparisons	*p* =
ΔE^*_{ab} =	6.26		
ΔL^* =	-2.83	**chroma**	0.002
ΔC^*_{ab} =	5.60	**hue**	0.003
ΔH^*_{ab} =	#NUM!	**lightness**	0.023

Patient number = 13 | Patient age = 28 | Patient gender = M

	Central Incisor						*Canine*				
	Test 1	**Test 2**	**Test 3**	**mean**	**SD**		**Test 1**	**Test 2**	**Test 3**	**mean**	**SD**
L* =	76.6	76.1	76.6	76.43	0.29	**L* =**	73.0	71.7	71.5	72.07	0.81
a* =	-0.5	-0.4	-0.4	-0.43	0.06	**a* =**	0.9	1.0	0.9	0.93	0.06
b* =	15.2	15.3	15.5	15.33	0.15	**b* =**	22.9	22.9	22.7	22.83	0.12
C =	15.2	15.3	15.5	15.33	0.15	**C =**	22.9	22.9	22.7	22.83	0.12
h =	91.8	91.7	91.6	91.70	0.10	**h =**	87.8	87.5	87.7	87.67	0.15

		t-test comparisons	*p* =
ΔE^*_{ab} =	8.79		
ΔL^* =	-4.93	**chroma**	0.000
ΔC^*_{ab} =	7.51	**hue**	0.000
ΔH^*_{ab} =	#NUM!	**lightness**	0.010

Patient number = 14 | Patient age = 20 | Patient gender = M

	Central Incisor						*Canine*				
	Test 1	**Test 2**	**Test 3**	**mean**	**SD**		**Test 1**	**Test 2**	**Test 3**	**mean**	**SD**
L* =	73.0	73.9	74.2	73.70	0.62	**L* =**	64.9	65.6	65.2	65.23	0.35
a* =	1.1	1.1	1.2	1.13	0.06	**a* =**	2.1	2.1	2.1	2.10	0.00
b* =	18.7	19.1	19.2	19.00	0.26	**b* =**	22.8	23.6	23.6	23.33	0.46
C =	18.8	19.1	19.2	19.03	0.21	**C =**	22.9	23.7	23.7	23.43	0.46
h =	86.5	86.6	86.5	86.53	0.06	**h =**	84.8	84.9	84.8	84.83	0.06

		t-test comparisons	*p* =
ΔE^*_{ab} =	9.56		
ΔL^* =	-8.50	**chroma**	0.001
ΔC^*_{ab} =	4.39	**hue**	0.000
ΔH^*_{ab} =	#NUM!	**lightness**	0.001

Patient number = 15 | Patient age = 34 | Patient gender = M

	Central Incisor						*Canine*				
	Test 1	**Test 2**	**Test 3**	**mean**	**SD**		**Test 1**	**Test 2**	**Test 3**	**mean**	**SD**
L* =	76.0	75.9	76.0	75.97	0.06	**L* =**	74.8	75.2	75.0	75.00	0.20
a* =	0.0	0.0	0.0	0.00	0.00	**a* =**	0.2	0.0	0.0	0.07	0.12
b* =	19.1	19.0	19.3	19.13	0.15	**b* =**	21.1	21.6	21.5	21.40	0.26
C =	19.1	19.0	19.3	19.13	0.15	**C =**	21.1	21.6	21.5	21.40	0.26
h =	90.0	90.1	90.0	90.03	0.06	**h =**	89.3	89.9	89.9	89.70	0.35

		t-test comparisons	*p* =
ΔE^*_{ab} =	2.47		
ΔL^* =	-0.97	**chroma**	0.006
ΔC^*_{ab} =	2.27	**hue**	0.214
ΔH^*_{ab} =	0.063	**lightness**	0.022

Patient number = 16 | Patient age = 44 | Patient gender = M

	Central Incisor						*Canine*				
	Test 1	**Test 2**	**Test 3**	**mean**	**SD**		**Test 1**	**Test 2**	**Test 3**	**mean**	**SD**
L* =	77.6	77.5	77.2	77.43	0.21	**L* =**	74.1	75.7	75.2	75.00	0.82
a* =	-0.7	-0.7	-0.7	-0.70	0.00	**a* =**	1.8	1.8	1.8	1.80	0.00
b* =	18.8	18.8	18.3	18.63	0.29	**b* =**	27.1	27.4	27.6	27.37	0.25
C =	18.8	18.8	18.3	18.63	0.29	**C =**	27.2	27.5	27.6	27.43	0.21
h =	92.2	92.2	92.3	92.23	0.06	**h =**	86.2	86.3	86.2	86.23	0.06

		t-test comparisons	*p* =
ΔE^*_{ab} =	9.40		
ΔL^* =	-2.23	**chroma**	0.001
ΔC^*_{ab} =	8.78	**hue**	0.000
ΔH^*_{ab} =	2.525	**lightness**	0.045

Patient number = 17 | Patient age = 44 | Patient gender = M

	Central Incisor						*Canine*				
	Test 1	**Test 2**	**Test 3**	**mean**	**SD**		**Test 1**	**Test 2**	**Test 3**	**mean**	**SD**
L* =	79.2	79.3	79.2	79.23	0.06	**L* =**	76.7	75.9	75.6	76.07	0.57
a* =	-0.9	-1.0	-1.0	-0.97	0.06	**a* =**	3.2	3.1	3.1	3.13	0.06
b* =	17.9	17.9	17.8	17.87	0.06	**b* =**	30.3	29.6	29.6	29.83	0.40
C =	17.9	17.9	17.8	17.87	0.06	**C =**	30.5	29.8	29.8	30.03	0.40
h =	93.0	93.3	93.3	93.20	0.17	**h =**	84.0	84.0	84.0	84.00	0.00

		t-test comparisons	*p* =
ΔE^*_{ab} =	13.04		
ΔL^* =	-3.63	**chroma**	0.000
ΔC^*_{ab} =	12.10	**hue**	0.000
ΔH^*_{ab} =	3.212	**lightness**	0.011

Patient number = 18 **Patient age =** 27 **Patient gender =** M

	Central Incisor						*Canine*				
	Test 1	**Test 2**	**Test 3**	**mean**	**SD**		**Test 1**	**Test 2**	**Test 3**	**mean**	**SD**
L* =	72.5	75.2	74.9	74.20	1.48	**L* =**	71.8	73.0	73.1	72.63	0.72
a* =	-0.4	-0.4	-0.3	-0.37	0.06	**a* =**	1.1	1.1	1.1	1.10	0.00
b* =	18.1	18.9	18.9	18.63	0.46	**b* =**	21.8	22.3	22.3	22.13	0.29
C =	18.1	18.9	18.9	18.63	0.46	**C =**	21.8	22.3	22.3	22.13	0.29
h =	91.2	91.1	91.0	91.10	0.10	**h =**	87.1	87.1	87.1	87.10	0.00

ΔE^*_{ab} =	4.11	**t-test comparisons**	p =
ΔL^* =	-1.10	**chroma**	0.001
ΔC^*_{ab} =	3.52	**hue**	0.000
ΔH^*_{ab} =	1.797	**lightness**	0.073

Patient number = 19 **Patient age =** 29 **Patient gender =** M

	Central Incisor						*Canine*				
	Test 1	**Test 2**	**Test 3**	**mean**	**SD**		**Test 1**	**Test 2**	**Test 3**	**mean**	**SD**
L* =	73.8	73.8	74.1	73.90	0.17	**L* =**	82.0	82.7	82.4	82.37	0.35
a* =	-1.7	-1.7	-1.6	-1.67	0.06	**a* =**	-0.9	-0.9	-0.9	-0.90	0.00
b* =	12.4	12.4	12.6	12.47	0.12	**b* =**	18.8	19.2	19.3	19.10	0.26
C =	12.5	12.5	12.7	12.57	0.12	**C =**	18.8	19.2	19.3	19.10	0.26
h =	97.9	97.8	97.2	97.63	0.38	**h =**	92.8	92.8	92.7	92.77	0.06

ΔE^*_{ab} =	10.78	**t-test comparisons**	p =
ΔL^* =	8.50	**chroma**	0.000
ΔC^*_{ab} =	6.54	**hue**	0.001
ΔH^*_{ab} =	1.097	**lightness**	0.001

Patient number = 20 **Patient age =** 21 **Patient gender =** M

	Central Incisor						*Canine*				
	Test 1	**Test 2**	**Test 3**	**mean**	**SD**		**Test 1**	**Test 2**	**Test 3**	**mean**	**SD**
L* =	79.1	77.4	76.7	77.73	1.23	**L* =**	75.5	75.4	75.0	75.30	0.26
a* =	-0.8	-0.8	-0.5	-0.70	0.17	**a* =**	1.3	1.3	1.4	1.33	0.06
b* =	15.8	15.8	16.6	16.07	0.46	**b* =**	24.8	25.3	25.6	25.23	0.40
C =	15.8	15.8	16.6	16.07	0.46	**C =**	24.9	25.4	25.6	25.30	0.36
h =	93.0	92.7	91.8	92.50	0.62	**h =**	86.9	87.0	86.9	86.93	0.06

ΔE^*_{ab} =	9.70	**t-test comparisons**	p =
ΔL^* =	-2.73	**chroma**	0.000
ΔC^*_{ab} =	9.19	**hue**	0.004
ΔH^*_{ab} =	1.489	**lightness**	0.054

Patient number = 21 **Patient age =** 75 **Patient gender =** M

	Central Incisor						*Canine*				
	Test 1	**Test 2**	**Test 3**	**mean**	**SD**		**Test 1**	**Test 2**	**Test 3**	**mean**	**SD**
L* =	66.7	66.8	66.6	66.70	0.10	**L* =**	69.6	68.9	69.3	69.27	0.35
a* =	1.0	0.9	0.9	0.93	0.06	**a* =**	0.5	0.6	0.5	0.53	0.06
b* =	27.3	27.3	27.5	27.37	0.12	**b* =**	28.0	26.7	27.2	27.30	0.66
C =	27.3	27.3	27.5	27.37	0.12	**C =**	28.0	26.2	27.2	27.13	0.90
h =	87.9	88.0	88.1	88.00	0.10	**h =**	89.0	88.8	88.9	88.90	0.10

ΔE^*_{ab} =	2.60	**t-test comparisons**	p =
ΔL^* =	2.60	**chroma**	0.698
ΔC^*_{ab} =	-0.08	**hue**	0.012
ΔH^*_{ab} =	#NUM!	**lightness**	0.009

Patient number = 22 **Patient age =** 73 **Patient gender =** F

	Central Incisor						*Canine*				
	Test 1	**Test 2**	**Test 3**	**mean**	**SD**		**Test 1**	**Test 2**	**Test 3**	**mean**	**SD**
L* =	73.0	72.8	72.8	72.87	0.12	**L* =**	81.9	81.8	81.9	81.87	0.06
a* =	-0.5	-0.5	-0.5	-0.50	0.00	**a* =**	-0.7	-0.7	-0.7	-0.70	0.00
b* =	13.0	13.0	13.0	13.00	0.00	**b* =**	19.5	19.1	19.4	19.33	0.21
C =	13.0	13.0	13.0	13.00	0.00	**C =**	19.5	19.1	19.4	19.33	0.21
h =	92.2	92.1	92.1	92.13	0.06	**h =**	92.2	92.1	92.1	92.13	0.06

ΔE^*_{ab} =	11.01	**t-test comparisons**	p =
ΔL^* =	9.03	**chroma**	0.000
ΔC^*_{ab} =	6.34	**hue**	#DIV/0!
ΔH^*_{ab} =	#NUM!	**lightness**	0.000

Patient number = 23 **Patient age =** 27 **Patient gender =** M

	Central Incisor						*Canine*				
	Test 1	**Test 2**	**Test 3**	**mean**	**SD**		**Test 1**	**Test 2**	**Test 3**	**mean**	**SD**
L* =	75.3	74.5	74.4	74.73	0.49	**L* =**	73.3	72.6	72.1	72.67	0.60
a* =	0.0	0.0	0.0	0.00	0.00	**a* =**	1.5	1.5	1.5	1.50	0.00
b* =	15.7	15.8	16.0	15.83	0.15	**b* =**	22.3	22.0	21.6	21.97	0.35
C =	15.7	15.8	16.0	15.83	0.15	**C =**	22.4	22.1	21.6	22.03	0.40
h =	90.0	90.0	89.9	89.97	0.06	**h =**	86.2	86.1	86.0	86.10	0.10

ΔE^*_{ab} =	6.64	**t-test comparisons**	p =
ΔL^* =	-2.63	**chroma**	0.003
ΔC^*_{ab} =	6.18	**hue**	0.000
ΔH^*_{ab} =	#NUM!	**lightness**	0.003

Patient number = 24 | Patient age = 26 | Patient gender = M

Central Incisor

	Test 1	Test 2	Test 3	mean	SD
L* =	77.5	80.5	81.9	79.97	2.25
a* =	-2.0	-2.1	-2.1	-2.07	0.06
b* =	10.6	11.2	11.7	11.17	0.55
C =	10.8	11.4	11.9	11.37	0.55
h =	100.7	100.7	100.2	100.53	0.29

Canine

	Test 1	Test 2	Test 3	mean	SD
L* =	81.2	80.7	81.2	81.03	0.29
a* =	0.4	0.4	0.3	0.37	0.06
b* =	25.9	25.7	25.7	25.77	0.12
C =	25.9	25.7	25.7	25.77	0.12
h =	89.2	89.1	89.2	89.17	0.06

		t-test comparisons	*p* =
ΔE^*_{ab} =	14.84		
ΔL^* =	1.23	chroma	0.001
ΔC^*_{ab} =	14.41	hue	0.000
ΔH^*_{ab} =	3.311	lightness	0.510

Patient number = 25 | Patient age = 76 | Patient gender = M

Central Incisor

	Test 1	Test 2	Test 3	mean	SD
L* =	75.5	76.6	76.0	76.03	0.55
a* =	0.5	0.3	0.4	0.40	0.10
b* =	24.9	24.2	24.4	24.50	0.36
C =	24.9	24.2	24.5	24.53	0.35
h =	88.9	89.3	89.0	89.07	0.21

Canine

	Test 1	Test 2	Test 3	mean	SD
L* =	71.5	71.5	71.5	71.50	0.00
a* =	2.3	2.1	2.2	2.20	0.10
b* =	28.1	27.6	27.7	27.80	0.26
C =	28.2	27.7	27.8	27.90	0.26
h =	85.4	85.6	85.6	85.53	0.12

		t-test comparisons	*p* =
ΔE^*_{ab} =	5.89		
ΔL^* =	-4.53	chroma	0.000
ΔC^*_{ab} =	3.38	hue	0.001
ΔH^*_{ab} =	1.637	lightness	0.005

Patient number = 26 | Patient age = 46 | Patient gender = M

Central Incisor

	Test 1	Test 2	Test 3	mean	SD
L* =	71.4	71.3	71.3	71.33	0.06
a* =	-0.2	-0.4	-0.4	-0.33	0.12
b* =	20.8	19.6	19.4	19.93	0.76
C =	20.8	19.6	19.4	19.93	0.76
h =	90.5	91.1	91.1	90.90	0.35
CLASSIC	C3	C3	C3		

Canine

	Test 1	Test 2	Test 3	mean	SD
L* =	81.1	80.0	79.8	80.30	0.70
a* =	0.2	0.2	0.2	0.20	0.00
b* =	23.6	22.9	22.8	23.10	0.44
C =	23.6	22.9	22.8	23.10	0.44
h =	89.5	89.5	89.5	89.50	0.00
CLASSIC	A2	A2	A2		

		t-test comparisons	*p* =
ΔE^*_{ab} =	9.52		
ΔL^* =	8.47	chroma	0.003
ΔC^*_{ab} =	3.16	hue	0.020
ΔH^*_{ab} =	3.002	lightness	0.002

Patient number = 27 | Patient age = 24 | Patient gender = F

Central Incisor

	Test 1	Test 2	Test 3	mean	SD
L* =	88.0	88.3	87.6	87.97	0.35
a* =	-2.3	-2.3	-2.3	-2.30	0.00
b* =	12.9	13.1	12.8	12.93	0.15
C =	13.1	13.3	13.0	13.13	0.15
h =	100.1	99.9	100.0	100.00	0.10
CLASSIC	B1	B1	B1		

Canine

	Test 1	Test 2	Test 3	mean	SD
L* =	84.5	84.5	84.2	84.40	0.17
a* =	-1.2	-1.2	-1.1	-1.17	0.06
b* =	15.3	15.2	15.3	15.27	0.06
C =	15.3	15.2	15.3	15.27	0.06
h =	94.4	94.4	94.2	94.33	0.12
CLASSIC	A1	A1	A1		

		t-test comparisons	*p* =
ΔE^*_{ab} =	4.41		
ΔL^* =	-3.77	chroma	0.003
ΔC^*_{ab} =	2.17	hue	0.000
ΔH^*_{ab} =	0.729	lightness	0.001

Patient number = 28 | Patient age = 49 | Patient gender = M

Central Incisor

	Test 1	Test 2	Test 3	mean	SD
L* =	70.5	69.5	67.8	69.27	1.37
a* =	0.2	0.1	0.3	0.20	0.10
b* =	18.4	18.0	18.6	18.33	0.31
C =	18.4	18.0	18.6	18.33	0.31
h =	89.5	89.6	88.9	89.33	0.38
CLASSIC	C3	C3	C3		

Canine

	Test 1	Test 2	Test 3	mean	SD
L* =	70.8	70.7	71.1	70.87	0.21
a* =	0.6	0.5	0.6	0.57	0.06
b* =	22.6	21.7	22.2	22.17	0.45
C =	22.6	21.7	22.3	22.20	0.46
h =	88.5	88.6	88.6	88.57	0.06
CLASSIC	C3	C3	C3		

		t-test comparisons	*p* =
ΔE^*_{ab} =	4.17		
ΔL^* =	1.83	chroma	0.002
ΔC^*_{ab} =	3.84	hue	0.081
ΔH^*_{ab} =	#NUM!	lightness	0.214

Patient number = 29 | Patient age = 25 | Patient gender = F

Central Incisor

	Test 1	Test 2	Test 3	mean	SD
L* =	83.9	83.6	83.6	83.70	0.17
a* =	-1.5	-1.6	-1.5	-1.53	0.06
b* =	17.9	17.5	17.6	17.67	0.21
C =	17.9	17.6	17.7	17.73	0.15
h =	94.9	95.1	95.0	95.00	0.10
CLASSIC	B2	B2	B2		

Canine

	Test 1	Test 2	Test 3	mean	SD
L* =	75.8	77.4	76.7	76.63	0.80
a* =	2.1	2.1	2.1	2.10	0.00
b* =	29.5	29.6	29.6	29.57	0.06
C =	29.6	29.6	29.7	29.63	0.06
h =	86.0	86.0	85.9	85.97	0.06
CLASSIC	A3.5	B4	A3.5		

		t-test comparisons	*p* =
ΔE^*_{ab} =	14.31		
ΔL^* =	-7.00	chroma	0.000
ΔC^*_{ab} =	11.91	hue	0.000
ΔH^*_{ab} =	3.735	lightness	0.006

Patient number = 30 **Patient age =** 25 **Patient gender =** F

	Central Incisor						*Canine*				
	Test 1	**Test 2**	**Test 3**	**mean**	**SD**		**Test 1**	**Test 2**	**Test 3**	**mean**	**SD**
L* =	78.2	78.5	78.6	78.43	0.21	**L* =**	82.2	82.8	83.1	82.70	0.46
a* =	-1.6	-1.6	-1.6	-1.60	0.00	**a* =**	-0.9	-0.8	-0.8	-0.83	0.06
b* =	10.5	10.8	10.7	10.67	0.15	**b* =**	14.4	14.7	14.9	14.67	0.25
C =	10.6	10.9	19.8	13.77	5.23	**C =**	14.4	14.7	14.9	14.67	0.25
h =	98.8	98.3	98.5	98.53	0.25	**h =**	93.4	93.3	93.0	93.23	0.21
CLASSIC	D2	D2	D2			**CLASSIC**	A1	A1	A1		

ΔE^*_{ab} =	5.90	**t-test comparisons**	*p* =
ΔL^* =	4.67	**chroma**	0.786
ΔC^*_{ab} =	3.90	**hue**	0.001
ΔH^*_{ab} =	#NUM!	**lightness**	0.001

Patient number = 31 **Patient age =** 47 **Patient gender =** F

	Central Incisor						*Canine*				
	Test 1	**Test 2**	**Test 3**	**mean**	**SD**		**Test 1**	**Test 2**	**Test 3**	**mean**	**SD**
L* =	76.4	76.7	76.9	76.67	0.25	**L* =**	62.0	62.4	62.9	62.43	0.45
a* =	-0.3	-0.2	-0.2	-0.23	0.06	**a* =**	0.0	-0.2	-0.5	-0.23	0.25
b* =	13.3	13.8	14.0	13.70	0.36	**b* =**	7.0	6.1	5.2	6.10	0.90
C =	13.3	13.8	14.0	13.70	0.36	**C =**	7.0	6.1	5.3	6.13	0.85
h =	91.1	90.9	90.8	90.93	0.15	**h =**	90.2	92.1	95.6	92.63	2.74
CLASSIC	D2	D2	D2			**CLASSIC**	C3	C3	C3		

ΔE^*_{ab} =	16.14	**t-test comparisons**	*p* =
ΔL^* =	-13.77	**chroma**	0.008
ΔC^*_{ab} =	-7.60	**hue**	0.414
ΔH^*_{ab} =	3.620	**lightness**	0.000

Patient number = 32 **Patient age =** 30 **Patient gender =** F ***

	Central Incisor						*Canine*				
	Test 1	**Test 2**	**Test 3**	**mean**	**SD**		**Test 1**	**Test 2**	**Test 3**	**mean**	**SD**
L* =	79.0	77.3	77.6	77.97	0.91	**L* =**	68.4	68.0	68.5	68.30	0.26
a* =	-1.5	-1.5	-1.5	-1.50	0.00	**a* =**	1.4	1.4	1.3	1.37	0.06
b* =	17.6	16.4	17.1	17.03	0.60	**b* =**	24.3	23.8	24.0	24.03	0.25
C =	17.7	16.5	17.1	17.03	0.60	**C =**	24.3	23.8	24.0	24.03	0.25
h =	94.8	95.4	94.9	95.03	0.32	**h =**	86.6	86.7	86.8	86.70	0.10
CLASSIC	C1	C1	C1			**CLASSIC**	C3	C3	C3		

ΔE^*_{ab} =	12.27	**t-test comparisons**	*p* =
ΔL^* =	-9.47	**chroma**	0.001
ΔC^*_{ab} =	6.97	**hue**	0.000
ΔH^*_{ab} =	3.525	**lightness**	0.002

Patient number = 33 **Patient age =** 25 **Patient gender =** M

	Central Incisor						*Canine*				
	Test 1	**Test 2**	**Test 3**	**mean**	**SD**		**Test 1**	**Test 2**	**Test 3**	**mean**	**SD**
L* =	73.9	73.8	73.8	73.83	0.06	**L* =**	70.7	70.4	70.8	70.63	0.21
a* =	0.4	0.3	0.3	0.33	0.06	**a* =**	2.2	2.2	2.3	2.23	0.06
b* =	20.8	20.4	20.8	20.67	0.23	**b* =**	28.4	28.8	29.2	28.80	0.40
C =	20.8	20.4	20.8	20.67	0.23	**C =**	28.5	28.9	29.3	28.90	0.40
h =	89.0	89.2	89.1	89.10	0.10	**h =**	85.6	85.6	85.5	85.57	0.06
CLASSIC	C2	C2	D3			**CLASSIC**	A4	A4	A4		

ΔE^*_{ab} =	8.94	**t-test comparisons**	*p* =
ΔL^* =	-3.03	**chroma**	0.001
ΔC^*_{ab} =	8.22	**hue**	0.000
ΔH^*_{ab} =	1.811	**lightness**	0.001

Patient number = 34 **Patient age =** 28 **Patient gender =** M

	Central Incisor						*Canine*				
	Test 1	**Test 2**	**Test 3**	**mean**	**SD**		**Test 1**	**Test 2**	**Test 3**	**mean**	**SD**
L* =	79.3	79.3	79.9	79.50	0.35	**L* =**	83.9	83.1	83.0	83.33	0.49
a* =	-0.3	-0.3	-0.3	-0.30	0.00	**a* =**	0.0	0.1	0.2	0.10	0.10
b* =	17.3	16.6	16.9	16.93	0.35	**b* =**	25.1	24.2	24.0	24.43	0.59
C =	17.3	16.6	16.9	16.93	0.35	**C =**	25.1	24.2	24.0	24.43	0.59
h =	91.1	91.1	91.0	91.07	0.06	**h =**	89.9	89.7	89.6	89.73	0.15
CLASSIC	C1	C1	B2			**CLASSIC**	A2	A2	A2		

ΔE^*_{ab} =	8.43	**t-test comparisons**	*p* =
ΔL^* =	3.50	**chroma**	0.001
ΔC^*_{ab} =	7.50	**hue**	0.002
ΔH^*_{ab} =	1.625	**lightness**	0.013

Patient number = 35 **Patient age =** 25 **Patient gender =** F

	Central Incisor						*Canine*				
	Test 1	**Test 2**	**Test 3**	**mean**	**SD**		**Test 1**	**Test 2**	**Test 3**	**mean**	**SD**
L* =	79.4	79.3	79.5	79.40	0.10	**L* =**	71.3	74.3	74.6	73.40	1.82
a* =	-1.4	-1.5	-1.4	-1.43	0.06	**a* =**	0.0	0.3	0.4	0.23	0.21
b* =	10.2	9.9	10.3	10.13	0.21	**b* =**	17.3	19.3	19.5	18.70	1.22
C =	10.2	10.0	10.3	10.17	0.15	**C =**	17.3	19.3	19.5	18.70	1.22
h =	97.8	98.6	97.6	98.00	0.53	**h =**	89.9	89.1	88.8	89.27	0.57
CLASSIC	A1	A1	A1			**CLASSIC**	C3	C2	C2		

ΔE^*_{ab} =	10.59	**t-test comparisons**	*p* =
ΔL^* =	-4.80	**chroma**	0.007
ΔC^*_{ab} =	8.47	**hue**	0.003
ΔH^*_{ab} =	4.175	**lightness**	0.029

Patient number = 36 **Patient age =** 61 **Patient gender =** M

	Central Incisor						*Canine*				
	Test 1	**Test 2**	**Test 3**	**mean**	**SD**		**Test 1**	**Test 2**	**Test 3**	**mean**	**SD**
L* =	70.7	69.7	69.8	70.07	0.55	**L* =**	66.4	66.3	67.7	66.80	0.78
a* =	1.8	1.9	2.0	1.90	0.10	**a* =**	1.2	1.5	1.7	1.47	0.25
b* =	27.0	27.3	27.3	27.20	0.17	**b* =**	21.4	22.0	23.0	22.13	0.81
C =	27.0	27.3	27.4	27.23	0.21	**C =**	21.4	22.0	23.0	22.13	0.81
h =	86.2	86.0	85.9	86.03	0.15	**h =**	86.7	86.2	85.8	86.23	0.45
CLASSIC	A3.5	A4	A4			**CLASSIC**	C3	C3	C3		

ΔE^*_{ab} =	6.04	**t-test comparisons**	*p* =
ΔL^* =	-2.37	**chroma**	0.005
ΔC^*_{ab} =	-5.08	**hue**	0.368
ΔH^*_{ab} =	2.253	**lightness**	0.036

Patient number = 37 **Patient age =** 39 **Patient gender =** F

	Central Incisor						*Canine*				
	Test 1	**Test 2**	**Test 3**	**mean**	**SD**		**Test 1**	**Test 2**	**Test 3**	**mean**	**SD**
L* =	81.5	81.1	82.1	81.57	0.50	**L* =**	78.4	78.4	78.3	78.37	0.06
a* =	-0.5	-0.6	-0.6	-0.57	0.06	**a* =**	1.9	1.9	1.9	1.90	0.00
b* =	20.0	19.8	20.6	20.13	0.42	**b* =**	29.8	29.7	29.5	29.67	0.15
C =	20.0	19.9	20.6	20.17	0.38	**C =**	29.8	29.7	29.6	29.70	0.10
h =	91.5	91.7	91.7	91.63	0.12	**h =**	86.4	86.3	86.4	86.37	0.06
CLASSIC	A2	A2	A2			**CLASSIC**	B4	B4	B4		

ΔE^*_{ab} =	10.35	**t-test comparisons**	*p* =
ΔL^* =	-3.27	**chroma**	0.001
ΔC^*_{ab} =	9.59	**hue**	0.000
ΔH^*_{ab} =	2.155	**lightness**	0.010

Patient number = 38 **Patient age =** 54 **Patient gender =** F

	Central Incisor						*Canine*				
	Test 1	**Test 2**	**Test 3**	**mean**	**SD**		**Test 1**	**Test 2**	**Test 3**	**mean**	**SD**
L* =	70.4	70.6	70.8	70.60	0.20	**L* =**	68.2	68.5	68.3	68.33	0.15
a* =	-0.1	-0.2	-0.3	-0.20	0.10	**a* =**	0.6	0.7	0.5	0.60	0.10
b* =	17.0	17.2	17.2	17.13	0.12	**b* =**	21.2	21.5	21.0	21.23	0.25
C =	17.0	17.3	17.2	17.17	0.15	**C =**	21.2	21.5	21.0	21.23	0.25
h =	90.4	90.7	90.8	90.63	0.21	**h =**	88.4	88.1	88.5	88.33	0.21
CLASSIC	C3	C3	C3			**CLASSIC**	C3	C3	C3		

ΔE^*_{ab} =	4.75	**t-test comparisons**	*p* =
ΔL^* =	-2.30	**chroma**	0.001
ΔC^*_{ab} =	4.11	**hue**	0.006
ΔH^*_{ab} =	0.654	**lightness**	0.003

Patient number = 39 **Patient age =** 35 **Patient gender =** F

	Central Incisor						*Canine*				
	Test 1	**Test 2**	**Test 3**	**mean**	**SD**		**Test 1**	**Test 2**	**Test 3**	**mean**	**SD**
L* =	78.9	80.0	79.7	79.53	0.57	**L* =**	75.4	75.6	75.3	75.43	0.15
a* =	-1.0	-1.0	-1.1	-1.03	0.06	**a* =**	0.3	0.4	0.4	0.37	0.06
b* =	13.4	13.7	13.5	13.53	0.15	**b* =**	19.2	19.5	19.8	19.50	0.30
C =	13.4	13.7	13.5	13.53	0.15	**C =**	19.2	19.5	19.8	19.50	0.30
h =	94.2	94.2	94.1	94.17	0.06	**h =**	89.0	88.9	89.0	88.97	0.06
CLASSIC	D2	D2	D2			**CLASSIC**	C2	C2	D3		

ΔE^*_{ab} =	7.37	**t-test comparisons**	*p* =
ΔL^* =	-4.23	**chroma**	0.001
ΔC^*_{ab} =	5.93	**hue**	0.000
ΔH^*_{ab} =	1.130	**lightness**	0.005

Patient number = 40 **Patient age =** 69 **Patient gender =** M

	Central Incisor						*Canine*				
	Test 1	**Test 2**	**Test 3**	**mean**	**SD**		**Test 1**	**Test 2**	**Test 3**	**mean**	**SD**
L* =	71.5	71.3	71.0	71.27	0.25	**L* =**	71.9	71.9	72.6	72.13	0.40
a* =	-1.4	-1.5	-1.4	-1.43	0.06	**a* =**	-1.6	-1.5	-1.6	-1.57	0.06
b* =	16.3	15.3	15.6	15.73	0.51	**b* =**	14.7	15.7	15.8	15.40	0.61
C =	16.4	15.4	15.7	15.83	0.51	**C =**	14.8	15.8	15.9	15.50	0.61
h =	95.0	95.5	95.2	95.23	0.25	**h =**	96.3	95.6	95.7	95.87	0.38
CLASSIC	C2	C2	C2			**CLASSIC**	C2	C2	C2		

ΔE^*_{ab} =	0.94	**t-test comparisons**	*p* =
ΔL^* =	1.33	**chroma**	0.652
ΔC^*_{ab} =	-0.32	**hue**	0.214
ΔH^*_{ab} =	#NUM!	**lightness**	0.145

Patient number = 41 **Patient age =** 54 **Patient gender =** F

	Central Incisor						*Canine*				
	Test 1	**Test 2**	**Test 3**	**mean**	**SD**		**Test 1**	**Test 2**	**Test 3**	**mean**	**SD**
L* =	66.0	68.2	69.2	67.80	1.64	**L* =**	73.0	75.3	73.8	74.03	1.17
a* =	1.5	1.4	1.4	1.43	0.06	**a* =**	2.6	2.8	2.7	2.70	0.10
b* =	14.0	15.3	15.8	15.03	0.93	**b* =**	19.4	22.0	20.6	20.67	1.30
C =	14.1	15.4	15.9	15.13	0.93	**C =**	19.6	22.2	20.8	20.87	1.30
h =	83.8	84.7	84.9	84.47	0.59	**h =**	82.3	82.8	82.5	82.53	0.25
CLASSIC	C3	C3	C3			**CLASSIC**	D3	C2	D3		

ΔE^*_{ab} =	8.50	**t-test comparisons**	*p* =
ΔL^* =	6.00	**chroma**	0.009
ΔC^*_{ab} =	5.74	**hue**	0.018
ΔH^*_{ab} =	1.799	**lightness**	0.017

Patient number =	42		Patient age =	36		Patient gender =	M				
	Central Incisor						*Canine*				
	Test 1	**Test 2**	**Test 3**	**mean**	**SD**		**Test 1**	**Test 2**	**Test 3**	**mean**	**SD**
L* =	62.4	66.3	64.2	64.30	1.95	**L* =**	74.7	74.0	74.3	74.33	0.35
a* =	-1.2	-1.3	-1.3	-1.27	0.06	**a* =**	-0.6	-0.6	-0.6	-0.60	0.00
b* =	11.6	12.6	12.2	12.13	0.50	**b* =**	19.0	19.5	19.7	19.40	0.36
C =	11.7	12.6	12.3	12.20	0.46	**C =**	19.0	19.6	19.7	19.43	0.38
h =	95.7	96.0	95.9	95.87	0.15	**h =**	91.9	91.7	91.9	91.83	0.12
CLASSIC	C3	C3	C3			**CLASSIC**	C2	C2	C2		

ΔE^*_{ab} =	12.41	**t-test comparisons**	*p* =
ΔL^* =	10.00	**chroma**	0.000
ΔC^*_{ab} =	7.21	**hue**	0.001
ΔH^*_{ab} =	1.390	**lightness**	0.017

Patient number =	43		Patient age =	68		Patient gender =	M				
	Central Incisor						*Canine*				
	Test 1	**Test 2**	**Test 3**	**mean**	**SD**		**Test 1**	**Test 2**	**Test 3**	**mean**	**SD**
L* =	80.7	81.1	81.7	81.17	0.50	**L* =**	70.4	71.0	70.4	70.60	0.35
a* =	-1.2	-1.3	-1.4	-1.30	0.10	**a* =**	1.7	1.6	1.7	1.67	0.06
b* =	20.3	20.3	20.3	20.30	0.00	**b* =**	26.7	27.4	27.0	27.03	0.35
C =	20.4	20.3	20.3	20.33	0.06	**C =**	26.8	27.5	27.1	27.13	0.35
h =	93.4	93.6	93.8	93.60	0.20	**h =**	86.4	86.7	86.3	86.47	0.21
CLASSIC	B2	B2	B2			**CLASSIC**	A3.5	A3.5	A3.5		

ΔE^*_{ab} =	12.88	**t-test comparisons**	*p* =
ΔL^* =	-10.77	**chroma**	0.001
ΔC^*_{ab} =	6.74	**hue**	0.001
ΔH^*_{ab} =	2.098	**lightness**	0.001

Patient number =	44		Patient age =	24		Patient gender =	M				
	Central Incisor						*Canine*				
	Test 1	**Test 2**	**Test 3**	**mean**	**SD**		**Test 1**	**Test 2**	**Test 3**	**mean**	**SD**
L* =	77.5	77.3	77.1	77.30	0.20	**L* =**	68.3	69.9	70.0	69.40	0.95
a* =	-1.3	-1.3	-1.2	-1.27	0.06	**a* =**	0.8	0.6	0.7	0.70	0.10
b* =	12.9	12.8	13.0	12.90	0.10	**b* =**	19.7	19.7	20.0	19.80	0.17
C =	12.9	12.9	13.0	12.93	0.06	**C =**	19.7	19.7	20.0	19.80	0.17
h =	95.8	95.7	95.3	95.60	0.26	**h =**	87.8	88.1	88.0	87.97	0.15
CLASSIC	D2	D2	D2			**CLASSIC**	C3	C3	C3		

ΔE^*_{ab} =	10.67	**t-test comparisons**	*p* =
ΔL^* =	-7.30	**chroma**	0.000
ΔC^*_{ab} =	6.85	**hue**	0.001
ΔH^*_{ab} =	3.697	**lightness**	0.007

Patient number =	45		Patient age =	24		Patient gender =	M				
	Central Incisor						*Canine*				
	Test 1	**Test 2**	**Test 3**	**mean**	**SD**		**Test 1**	**Test 2**	**Test 3**	**mean**	**SD**
L* =	82.2	82.9	83.3	82.80	0.56	**L* =**	73.6	74.7	74.6	74.30	0.61
a* =	-0.6	-0.6	-0.5	-0.57	0.06	**a* =**	1.0	1.0	1.0	1.00	0.00
b* =	15.3	15.2	15.4	15.30	0.10	**b* =**	22.9	22.9	23.0	22.93	0.06
C =	15.3	15.2	15.4	15.30	0.10	**C =**	22.9	22.9	23.0	22.93	0.06
h =	92.1	92.1	92.0	92.07	0.06	**h =**	87.4	87.6	87.6	87.53	0.12
CLASSIC	A1	A1	A1			**CLASSIC**	C2	C2	C2		

ΔE^*_{ab} =	11.53	**t-test comparisons**	*p* =
ΔL^* =	-8.20	**chroma**	0.000
ΔC^*_{ab} =	7.64	**hue**	0.000
ΔH^*_{ab} =	2.700	**lightness**	0.000

Patient number =	46		Patient age =	25		Patient gender =	M				
	Central Incisor						*Canine*				
	Test 1	**Test 2**	**Test 3**	**mean**	**SD**		**Test 1**	**Test 2**	**Test 3**	**mean**	**SD**
L* =	71.5	72.4	72.5	72.13	0.55	**L* =**	78.7	78.2	78.5	78.47	0.25
a* =	-1.1	-1.1	-1.1	-1.10	0.00	**a* =**	1.0	1.0	0.8	0.93	0.12
b* =	12.6	12.6	13.0	12.73	0.23	**b* =**	24.8	24.3	24.5	24.53	0.25
C =	12.6	12.7	13.0	12.77	0.21	**C =**	24.8	24.4	24.5	24.57	0.21
h =	95.0	94.9	94.7	94.87	0.15	**h =**	87.7	87.7	88.0	87.80	0.17
CLASSIC	C2	C2	C2			**CLASSIC**	A3	A3	A3		

ΔE^*_{ab} =	13.55	**t-test comparisons**	*p* =
ΔL^* =	6.37	**chroma**	0.000
ΔC^*_{ab} =	11.77	**hue**	0.001
ΔH^*_{ab} =	2.100	**lightness**	0.005

Patient number =	47		Patient age =	26		Patient gender =	M				
	Central Incisor						*Canine*				
	Test 1	**Test 2**	**Test 3**	**mean**	**SD**		**Test 1**	**Test 2**	**Test 3**	**mean**	**SD**
L* =	68.6	69.3	69.4	69.10	0.44	**L* =**	66.1	67.7	68.0	67.27	1.02
a* =	-0.7	-0.8	-0.9	-0.80	0.10	**a* =**	2.3	2.2	2.3	2.27	0.06
b* =	15.7	15.4	15.1	15.40	0.30	**b* =**	24.9	25.6	25.8	25.43	0.47
C =	15.7	15.5	15.1	15.43	0.31	**C =**	25.0	25.7	25.9	25.53	0.47
h =	92.7	93.1	93.3	93.03	0.31	**h =**	84.8	85.0	85.0	84.93	0.12
CLASSIC	C3	C3	C3			**CLASSIC**	A4	A4	A4		

ΔE^*_{ab} =	10.65	**t-test comparisons**	*p* =
ΔL^* =	-1.10	**chroma**	0.002
ΔC^*_{ab} =	10.11	**hue**	0.000
ΔH^*_{ab} =	3.153	**lightness**	0.032

Patient number = 48 **Patient age =** 28 **Patient gender =** M

	Central Incisor						*Canine*				
	Test 1	**Test 2**	**Test 3**	**mean**	**SD**		**Test 1**	**Test 2**	**Test 3**	**mean**	**SD**
L* =	78.3	78.3	77.9	78.17	0.23	**L* =**	67.1	69.4	69.6	68.70	1.39
a* =	-0.5	-0.3	-0.4	-0.40	0.10	**a* =**	1.1	1.2	1.0	1.10	0.10
b* =	14.3	14.9	14.5	14.57	0.31	**b* =**	19.3	20.0	19.7	19.67	0.35
C =	14.3	14.9	14.5	14.57	0.31	**C =**	19.4	20.0	19.7	19.70	0.30
h =	91.9	91.1	91.6	91.53	0.40	**h =**	86.8	86.7	87.1	86.87	0.21
CLASSIC	D2	D2	D2			**CLASSIC**	C3	C3	C3		

ΔE^*_{ab} =	10.86		**t-test comparisons**	*p* =
ΔL^* =	-8.57		**chroma**	0.000
ΔC^*_{ab} =	5.13		**hue**	0.002
ΔH^*_{ab} =	4.269		**lightness**	0.009

Patient number = 49 **Patient age =** 23 **Patient gender =** F

	Central Incisor						*Canine*				
	Test 1	**Test 2**	**Test 3**	**mean**	**SD**		**Test 1**	**Test 2**	**Test 3**	**mean**	**SD**
L* =	80.0	81.7	80.5	80.73	0.87	**L* =**	81.6	82.1	82.2	81.97	0.32
a* =	-1.2	-1.3	-1.2	-1.23	0.06	**a* =**	-1.1	-1.1	-1.1	-1.10	0.00
b* =	12.9	13.0	12.5	12.80	0.26	**b* =**	14.8	15.0	15.0	14.93	0.12
C =	12.9	13.1	12.5	12.83	0.31	**C =**	14.9	15.1	15.0	15.00	0.10
h =	95.3	95.6	95.5	95.47	0.15	**h =**	94.2	94.1	94.2	94.17	0.06
CLASSIC	D2	A1	A1			**CLASSIC**	A1	A1	A1		

ΔE^*_{ab} =	2.47		**t-test comparisons**	*p* =
ΔL^* =	1.47		**chroma**	0.006
ΔC^*_{ab} =	2.11		**hue**	0.008
ΔH^*_{ab} =	#NUM!		**lightness**	0.098

Patient number = 50 **Patient age =** 25 **Patient gender =** M

	Central Incisor						*Canine*				
	Test 1	**Test 2**	**Test 3**	**mean**	**SD**		**Test 1**	**Test 2**	**Test 3**	**mean**	**SD**
L* =	85.1	85.3	85.7	85.37	0.31	**L* =**	75.8	76.8	79.0	77.20	1.64
a* =	-1.3	-1.3	-1.2	-1.27	0.06	**a* =**	0.4	0.4	0.2	0.33	0.12
b* =	14.7	15.1	15.5	15.10	0.40	**b* =**	21.2	21.4	22.0	21.53	0.42
C =	14.8	15.2	15.6	15.20	0.40	**C =**	21.2	21.4	22.1	21.57	0.47
h =	95.1	94.8	94.4	94.77	0.35	**h =**	88.9	89.0	89.4	89.10	0.26
CLASSIC	A1	A1	A1			**CLASSIC**	D3	C2	A2		

ΔE^*_{ab} =	10.52		**t-test comparisons**	*p* =
ΔL^* =	-6.37		**chroma**	0.000
ΔC^*_{ab} =	6.38		**hue**	0.004
ΔH^*_{ab} =	5.419		**lightness**	0.009

Patient number = 51 **Patient age =** 26 **Patient gender =** M

	Central Incisor						*Canine*				
	Test 1	**Test 2**	**Test 3**	**mean**	**SD**		**Test 1**	**Test 2**	**Test 3**	**mean**	**SD**
L* =	76.9	78.2	79.1	78.07	1.11	**L* =**	81.2	78.9	78.6	79.57	1.42
a* =	-1.9	-1.8	-1.7	-1.80	0.10	**a* =**	-0.9	-0.9	-0.6	-0.80	0.17
b* =	14.2	15.0	15.6	14.93	0.70	**b* =**	20.4	19.4	21.3	20.37	0.95
C =	14.3	15.1	15.7	15.03	0.70	**C =**	20.4	19.4	21.3	20.37	0.95
h =	97.6	96.8	96.2	96.87	0.70	**h =**	92.5	92.7	91.6	92.27	0.59
CLASSIC	D2	D2	D2			**CLASSIC**	B2	B2	B2		

ΔE^*_{ab} =	5.72		**t-test comparisons**	*p* =
ΔL^* =	0.53		**chroma**	0.010
ΔC^*_{ab} =	5.34		**hue**	0.004
ΔH^*_{ab} =	1.990		**lightness**	0.408

Patient number = 52 **Patient age =** 24 **Patient gender =** F

	Central Incisor						*Canine*				
	Test 1	**Test 2**	**Test 3**	**mean**	**SD**		**Test 1**	**Test 2**	**Test 3**	**mean**	**SD**
L* =	78.9	77.1	74.2	76.73	2.37	**L* =**	77.7	77.7	76.8	77.40	0.52
a* =	-0.5	0.7	0.8	0.33	0.72	**a* =**	0.8	-0.5	-0.5	-0.07	0.75
b* =	18.1	20.7	19.2	19.33	1.31	**b* =**	20.3	17.6	16.9	18.27	1.80
C =	18.1	20.7	18.1	18.97	1.50	**C =**	20.3	17.6	16.9	18.27	1.80
h =	91.5	87.9	87.7	89.03	2.14	**h =**	87.8	91.7	91.8	90.43	2.28
CLASSIC	C1	C2	C2			**CLASSIC**	A2	C1	C1		

ΔE^*_{ab} =	1.32		**t-test comparisons**	*p* =
ΔL^* =	0.07		**chroma**	0.696
ΔC^*_{ab} =	-1.07		**hue**	0.638
ΔH^*_{ab} =	0.771		**lightness**	0.605

Patient number = 53 **Patient age =** 39 **Patient gender =** F

	Central Incisor						*Canine*				
	Test 1	**Test 2**	**Test 3**	**mean**	**SD**		**Test 1**	**Test 2**	**Test 3**	**mean**	**SD**
L* =	82.6	83.2	83.5	83.10	0.46	**L* =**	79.0	78.4	79.3	78.90	0.46
a* =	-0.9	-0.9	-0.9	-0.90	0.00	**a* =**	-0.5	-0.5	-0.5	-0.50	0.00
b* =	16.8	17.2	17.4	17.13	0.31	**b* =**	22.9	22.3	22.9	22.70	0.35
C =	16.8	17.2	17.4	17.13	0.31	**C =**	22.9	22.3	22.9	22.70	0.35
h =	93.2	93.1	92.9	93.07	0.15	**h =**	91.2	91.4	91.3	91.30	0.10
CLASSIC	B2	B2	B2			**CLASSIC**	A2	B2	A2		

ΔE^*_{ab} =	6.98		**t-test comparisons**	*p* =
ΔL^* =	-3.80		**chroma**	0.003
ΔC^*_{ab} =	5.55		**hue**	0.005
ΔH^*_{ab} =	1.887		**lightness**	0.007

Patient number = 54 | Patient age = 24 | Patient gender = M

	Central Incisor						*Canine*				
	Test 1	**Test 2**	**Test 3**	**mean**	**SD**		**Test 1**	**Test 2**	**Test 3**	**mean**	**SD**
L* =	84.9	85.1	84.8	84.93	0.15	**L* =**	80.8	79.7	79.3	79.93	0.78
a* =	-1.0	-1.1	-1.1	-1.07	0.06	**a* =**	1.1	1.0	1.0	1.03	0.06
b* =	20.1	20.1	19.8	20.00	0.17	**b* =**	25.8	24.9	24.5	25.07	0.67
C =	20.1	20.1	19.8	20.00	0.17	**C =**	25.8	25.0	24.5	25.10	0.66
h =	92.9	93.0	93.1	93.00	0.10	**h =**	87.5	87.6	87.6	87.57	0.06
CLASSIC	B2	B2	B2			**CLASSIC**	A3	A3	A3		

ΔE^*_{ab} =	7.42	**t-test comparisons**	p =
ΔL^* =	-5.63	**chroma**	0.004
ΔC^*_{ab} =	5.06	**hue**	0.000
ΔH^*_{ab} =	#NUM!	**lightness**	0.008

Patient number = 55 | Patient age = 70 | Patient gender = F

	Central Incisor						*Canine*				
	Test 1	**Test 2**	**Test 3**	**mean**	**SD**		**Test 1**	**Test 2**	**Test 3**	**mean**	**SD**
L* =	62.9	62.7	62.6	62.73	0.15	**L* =**	59.7	59.6	59.6	59.63	0.06
a* =	1.4	1.4	1.4	1.40	0.00	**a* =**	1.0	1.0	1.0	1.00	0.00
b* =	18.8	18.8	18.5	18.70	0.17	**b* =**	18.2	18.1	18.2	18.17	0.06
C =	18.8	18.8	18.5	18.70	0.17	**C =**	18.2	18.1	18.2	18.17	0.06
h =	85.9	85.8	85.8	85.83	0.06	**h =**	86.8	86.8	86.7	86.77	0.06
CLASSIC	C3	C3	C3			**CLASSIC**	C4	C4	C4		

ΔE^*_{ab} =	3.17	**t-test comparisons**	p =
ΔL^* =	-3.13	**chroma**	0.047
ΔC^*_{ab} =	-0.56	**hue**	0.001
ΔH^*_{ab} =	#NUM!	**lightness**	0.000

Patient number = 56 | Patient age = 55 | Patient gender = M

	Central Incisor						*Canine*				
	Test 1	**Test 2**	**Test 3**	**mean**	**SD**		**Test 1**	**Test 2**	**Test 3**	**mean**	**SD**
L* =	71.6	72.4	73.1	72.37	0.75	**L* =**	71.8	71.2	71.4	71.47	0.31
a* =	1.9	1.8	1.8	1.83	0.06	**a* =**	3.2	2.9	2.9	3.00	0.17
b* =	27.3	26.9	26.7	26.97	0.31	**b* =**	31.4	30.6	30.6	30.87	0.46
C =	27.4	27.0	26.7	27.03	0.35	**C =**	31.6	30.7	30.7	31.00	0.52
h =	86.0	86.1	86.1	86.07	0.06	**h =**	84.2	84.6	84.6	84.47	0.23
CLASSIC	A3.5	A3.5	A3.5			**CLASSIC**	A4	A4	A4		

ΔE^*_{ab} =	4.17	**t-test comparisons**	p =
ΔL^* =	-0.97	**chroma**	0.001
ΔC^*_{ab} =	3.98	**hue**	0.004
ΔH^*_{ab} =	0.762	**lightness**	0.254

Patient number = 57 | Patient age = 64 | Patient gender = M

	Central Incisor						*Canine*				
	Test 1	**Test 2**	**Test 3**	**mean**	**SD**		**Test 1**	**Test 2**	**Test 3**	**mean**	**SD**
L* =	71.3	71.4	70.9	71.20	0.26	**L* =**	71.7	72.0	71.9	71.87	0.15
a* =	2.8	2.9	2.9	2.87	0.06	**a* =**	1.4	1.5	1.6	1.50	0.10
b* =	28.1	27.0	26.5	27.20	0.82	**b* =**	25.9	26.4	26.8	26.37	0.45
C =	28.3	27.1	26.7	27.37	0.83	**C =**	26.0	26.4	26.8	26.40	0.40
h =	84.3	83.9	83.9	84.03	0.23	**h =**	86.9	86.7	86.5	86.70	0.20
CLASSIC	A3.5	A3.5	A3.5			**CLASSIC**	A3.5	A3.5	A3.5		

ΔE^*_{ab} =	1.73	**t-test comparisons**	p =
ΔL^* =	0.70	**chroma**	0.304
ΔC^*_{ab} =	-0.94	**hue**	0.001
ΔH^*_{ab} =	1.277	**lightness**	0.063

Patient number = 58 | Patient age = 49 | Patient gender = M

	Central Incisor						*Canine*				
	Test 1	**Test 2**	**Test 3**	**mean**	**SD**		**Test 1**	**Test 2**	**Test 3**	**mean**	**SD**
L* =	66.4	66.7	66.8	66.63	0.21	**L* =**	70.1	70.0	69.0	69.70	0.61
a* =	-1.0	-1.1	-1.2	-1.10	0.10	**a* =**	0.8	0.9	0.8	0.83	0.06
b* =	16.8	17.5	18.0	17.43	0.60	**b* =**	25.8	25.4	25.0	25.40	0.40
C =	16.8	17.5	18.1	17.47	0.65	**C =**	25.8	25.4	25.0	25.40	0.40
h =	93.5	93.7	93.7	93.63	0.12	**h =**	88.1	88.0	88.1	88.07	0.06
CLASSIC	C3	C3	C3			**CLASSIC**	B4	B4	C3		

ΔE^*_{ab} =	8.75	**t-test comparisons**	p =
ΔL^* =	2.37	**chroma**	0.006
ΔC^*_{ab} =	7.95	**hue**	0.000
ΔH^*_{ab} =	2.806	**lightness**	0.021

Patient number = 59 | Patient age = 70 | Patient gender = F

	Central Incisor						*Canine*				
	Test 1	**Test 2**	**Test 3**	**mean**	**SD**		**Test 1**	**Test 2**	**Test 3**	**mean**	**SD**
L* =	68.0	67.3	66.8	67.37	0.60	**L* =**	66.0	67.2	66.9	66.70	0.62
a* =	2.7	2.6	2.4	2.57	0.15	**a* =**	3.3	3.2	3.4	3.30	0.10
b* =	27.6	27.4	27.5	27.50	0.10	**b* =**	28.3	28.6	28.7	28.53	0.21
C =	27.8	27.5	27.6	27.63	0.15	**C =**	28.5	28.8	28.9	28.73	0.21
h =	84.4	84.7	85.0	84.70	0.30	**h =**	83.4	83.6	83.2	83.40	0.20
CLASSIC	A4	A4	A4			**CLASSIC**	A4	A4	A4		

ΔE^*_{ab} =	1.43	**t-test comparisons**	p =
ΔL^* =	-0.47	**chroma**	0.032
ΔC^*_{ab} =	1.10	**hue**	0.035
ΔH^*_{ab} =	0.783	**lightness**	0.424

Patient number =	60			**Patient age =**		47	**Patient gender =**	F				
		Central Incisor								***Canine***		
	Test 1	**Test 2**	**Test 3**	**mean**	**SD**			**Test 1**	**Test 2**	**Test 3**	**mean**	**SD**
L* =	78.0	77.7	77.8	77.83	0.15		**L* =**	75.8	76.5	76.9	76.40	0.56
a* =	0.4	0.4	0.4	0.40	0.00		**a* =**	0.6	0.7	0.7	0.67	0.06
b* =	20.0	20.4	20.3	20.23	0.21		**b* =**	21.2	22.0	22.3	21.83	0.57
C =	20.0	20.4	20.3	20.23	0.21		**C =**	21.2	22.0	22.3	21.83	0.57
h =	89.0	88.8	88.9	88.90	0.10		**h =**	88.4	88.2	88.1	88.23	0.15
CLASSIC	A2	A2	A2				**CLASSIC**	D3	B3	B3		
ΔE^*_{ab} =	2.16			**t-test comparisons**		p =						
ΔL^* =	-0.93				**chroma**	0.020						
ΔC^*_{ab} =	1.61				**hue**	0.010						
ΔH^*_{ab} =	1.111				**lightness**	0.068						

Patient number =	61			**Patient age =**		79	**Patient gender =**	F				
		Central Incisor								***Canine***		
	Test 1	**Test 2**	**Test 3**	**mean**	**SD**			**Test 1**	**Test 2**	**Test 3**	**mean**	**SD**
L* =	60.9	60.5	60.4	60.60	0.26		**L* =**	72.0	72.2	73.0	72.40	0.53
a* =	1.4	1.4	1.4	1.40	0.00		**a* =**	-0.7	-0.7	-0.7	-0.70	0.00
b* =	21.3	21.1	21.2	21.20	0.10		**b* =**	18.5	18.8	19.0	18.77	0.25
C =	21.3	21.1	21.2	21.20	0.10		**C =**	18.5	18.8	19.0	18.77	0.25
h =	86.2	86.3	86.2	86.23	0.06		**h =**	92.1	92.0	92.0	92.03	0.06
CLASSIC	C4	C4	C4				**CLASSIC**	C2	C2	C2		
ΔE^*_{ab} =	12.23			**t-test comparisons**		p =						
ΔL^* =	12.40				**chroma**	0.006						
ΔC^*_{ab} =	-2.47				**hue**	#DIV/0!						
ΔH^*_{ab} =	#NUM!				**lightness**	0.001						

Patient number =	62			**Patient age =**		66	**Patient gender =**	F				
		Central Incisor								***Canine***		
	Test 1	**Test 2**	**Test 3**	**mean**	**SD**			**Test 1**	**Test 2**	**Test 3**	**mean**	**SD**
L* =	84.2	84.6	84.7	84.50	0.26		**L* =**	73.1	74.5	74.6	74.07	0.84
a* =	-2.0	-2.0	-2.0	-2.00	0.00		**a* =**	-0.7	-0.8	-0.9	-0.80	0.10
b* =	16.9	16.9	16.8	16.87	0.06		**b* =**	19.1	18.8	18.8	18.90	0.17
C =	17.1	17.0	17.0	17.03	0.06		**C =**	19.1	18.8	18.8	18.90	0.17
h =	96.9	96.7	96.9	96.83	0.12		**h =**	92.2	92.6	92.6	92.47	0.23
CLASSIC	A1	A1	A1				**CLASSIC**	C2	C2	C2		
ΔE^*_{ab} =	10.70			**t-test comparisons**		p =						
ΔL^* =	-9.90				**chroma**	0.001						
ΔC^*_{ab} =	1.93				**hue**	0.002						
ΔH^*_{ab} =	3.562				**lightness**	0.001						