Morphologic alterations ear, nose and lip detected with aging through facial photoanthropometric analysis

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KEYWORDS

Aging, Face, Forensic odontology, Growth and development.

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ABSTRACT

Background: Understanding the morphologic alterations of the human face over the time is an essential step towards optimal simulations of facial age progression. In practice, these simulations contribute to the forensic routine by tracking and recognizing missing persons.

Objective: This study aimed to assess the morphometric facial alterations with aging – concerning specifically the development of ear, nose and lip in relation to other facial structures.

Material and methods: The sample consisted of 700 photographs taken standardly in frontal view from male and female Caucasian subjects aged from 20 to 80 years old. The sample was divided in 7 age groups (20, 30, 40, 50, 60, 70 and 80 years old), in which 50 males and 50 females were distributed homogenously. Photoanthropometric analysis was applied with SAFF 2D® 2.0.05 (SEPAEL/INC, Federal Police, Brazil) software package considering 36 facial landmarks. A single examiner analyzed the sample aided by two other examiners for the assessment of intra-/inter-rater reliability.

Results: The most evident alterations found in the facial structures consisted of the enlargement of the nose and ears with aging, as well the reduction in size of the lip thickness. These alterations varied considerably in the specific age ranges studied in this research being different between males and females.

Conclusion: The present outcomes indicated the possibility of quantifying morphometric alterations observed in the human face with aging. These alterations may support the forensic practice providing tools for age estimation based on photographic analyses.

INTRODUCTION

Missing persons reached alarming rates worldwide. Trafficking, smuggling, illegal immigration, urban and domestic violence, delinquency, armed conflicts and accidents figure among the main causes behind this scenario.[1,2] Urgent improvements in searching systems emerge as a contemporary need. Currently, the search for missing persons is hampered by the lack of facial images registered in national and international databases. Even when registered, facial images may become obsolete by aging modifications over the time,[3] as well by intentional modifications, such as plastic surgeries.[4]

The concept of “updating” was used in the last decades as a tool for the investigation of missing persons. In general, this concept is founded on the projection of a potential contemporary resemblance of the face. Projecting facial traits and estimating the facial modification with aging is a challenging process.[5] Automated algorithms based on photographic registration arose for the simulation of facial aging through digital and artistic representations.[5-7] The demand for facial analysis increased exponentially in the last decades not only because of the increasing rates of missing persons but also because of the massification of imaging devices for social networking.[8] Digital inclusion also contributed to this panorama with the inclusion of closed-circuit television (CCTV) in surveillance systems.[9]

Once registered with photographic or video cameras, facial images undergo a qualitative analysis supported by information provided by the relatives of the alleged missing person. In this process, aging traits that could indicate how facial aspects were modified with time may be simulated in the facial images.[10] In general, this approach considers bone and cartilage grow and skin wrinkles that may contribute to recognition. More specifically, nose cartilage and fat tissue is degenerated gradually with age while the columella retracts.[11] Consequently, the nose is elongated and rotated vertically downwards.[11] In parallel, the ear lobes grow[12] followed by lip thinning and loss of mouth muscle tone.[11] Skin wrinkles also become more evident with facial muscle tone loss and constant influence of gravity.[11,13] Additional aspects figure contributing to the projection of facial aging, such as hair loss, tooth loss, and weight changes.[6]

Despite the need and importance of age projections for the recognition of missing persons, there is no standard method able to reproduce accurately the facial changes that occur during life.[14] Moreover, the scarce scientific literature and the lack of validation studies on image analysis of facial age progression hamper the routine of forensic services dedicated to the search of missing persons. Guided by the hypothesis that ear, nose and lips change considerably over the time, the present study aimed to bridge a gap in the scientific literature testing the application of image analysis for the morphometric investigation of facial aging in subjects aged from 20 to 80 years.

MATERIAL AND METHODS

The present study was conducted with the approval of the local Committee of Ethics in Research (protocol number: 1484305).

The sample consisted of 700 facial photographs taken in frontal view from Caucasian male (n=350) and female (n=350) subjects aged between 20 and 80 years old. The photographs were searched electronically from a civil database of the Brazilian Federal Police using FACE® software package (SEPAEL/INC®, Federal Police, Brazil). The ensure anonymity, the database was searched considering only sex and age information. The sample was divided in 7 age groups (20, 30, 40, 50, 60, 70, 80 years old), in which male (n=50) and female (n=50) subjects were distributed homogeneously. These subjects were aged exactly according to the group in which they were distributed (with a tolerance of +/-1 year, e.g. age group 20 consisted of patients ages 19, 20 or 21 years old).

The photographs were taken by following standards of the International Civil Aviation Organization (ICAO) and included the use of a digital camera with focal length of 35mm, positioned in the level of the eyes with a distance of 1.5 meters for facial photograph acquisition; and the use of dual source frontal flash with light diffusion film. The inclusion criteria consisted of photographs taken with the face centralized vertically and horizontally considering the symmetry between ears and the symmetry between eye corners, respectively; neutral facial expression, looking toward the camera; and image storage in .PNG format with resolution of 480x640 pixels 24-bit RGB. The exclusion criteria consisted of subjects with evident facial deformities or strabismus; facial hair; make up; and jewelry in the ear, nose and lips.

The photographs underwent photoanthropometry using SAFF 2D® 2.0.05 software package (SEPAEL/INC, Federal Police, Brazil). Fourteen examiners performed the analysis placing 36 landmarks on each of the 700 photographs individually. Twelve median uneven landmarks and 14 bilateral even landmarks were selected – 32 landmarks were placed manually and 4 landmarks were automated (Fig. 1). The software package registered the Cartesian coordinates of each landmark to enable morphometric investigations. For intra- and inter-rater reliability, an external examiner selected randomly 10 faces for duplication. The duplicates were included in the sample and were analyzed 3 times by each examiner (unaware of the duplicates). The software package controlled the image analysis and did not provide the same photograph for analysis in less than 15 days.

Following the literature, the data analysis consisted of quantifying the distances between landmarks and calculating their ratio with the diameter of iris.[3,13] The ratios (n=13) between landmarks of the ear, nose, lips and face were considered the study variables (Table 1) and were tested statistically for their association with age. The statistical tests consisted of Kolmogorov-Smirnov with correction of Lilliefors for assessing the normality of variables; Pearson's correlation coefficient for associations between variables and age; and Intraclass Correlation Coefficient (ICC) for assessing the intra- and inter-rater reliability. All the test were performed with SPSS® 23.0 (International Business Machines®, Armonk, NY, EUA).

Figure 1 – Photoanthropometric landmarks used in the present study
Bilateral manual landmarks: 1 (ectocanthion); 2 (endocanthion); 3 (iris lateral); 4 (iris medial); 5 (upper eyelid sulcus); 6 (upper eyelid); 7 (lower eyelid); 8 (eyebrow medial); 9 (eyebrow lateral); 10 (frontal-temporal); 11 (upper eyebrow); 12 (lower eyebrow); 16 (alar); 17 (upper nose); 18 (nose lateral); 19 (sub-alar); 21 (lower philtrum crest); 22 (cheilion); 27 (gonion); 28 (zygion); 29 (supra-auricular); 30 (post-auricular); 31 (sub-auricular); 32 (ear lobe upper); Median manual landmarks: 13 (trichion); 14 (pro-nasal); 15 (sub-nasal); 20 (upper lip); 23 (stomion); 24 (lower lip); 25 (labiomental); 26 (gnation); Bilateral automated landmarks: a2 (pupils); Median automated landmarks: a1 (midnasal); a3 (glabella); a4 (nasion).

Table 1 - Variables used in the present study and their respective ratio and anatomic structure

Variable	Ratio	Anatomic structure
v01	n-sn / iris	Nose
v02	al-al / iris	Nose
v03	n-prn / iris	Nose
v04	prn-sto / iris	Nose
v05	sn-sto / iris	Lips
v06	ls-sto / iris	Lips
v07	li-sto / iris	Lips
v08	ch-ch / iris	Lips
v09	ls-li / iris	Lips
v10	sa-sba / iris	Ears
v11	slb-sba / iris	Ears
v12	n-gn/iris	Face
v13	sn-gn/iris	Face

n: nasion; sn: subnasal; al: alar; prn: pronasal; sto: stomion; sn: subnasal; ls: upper lip; li: lower lip; ch: chelion; sa: supra-auricular; sba: sub-auricular; slb: upper ear lobe; gn: gnation; iris: diameter of the iris (distance between iris lateral and medial).

RESULTS

Komolgorov-Smirnov test revealed normal distribution in 92% of the variables in male sand 95% in females.

The mean and standard deviation of each variable distributed according to sex and age range are expressed in Table 2, while the variations of accumulated means are reported in Table 3. The means related to the variables "alal_íris" and "prnsto_iris" reached the highest variations, and were especially more evident in subjects aged >50 years old.

In females (Fig.3), strong correlations were observed for the variables listo_iris and lsli_iris, while moderate correlations were observed for the variables sasba_iris, alal_iris and slbsba_iris.

In males (Fig.4), strong correlations was observed for the variables sasba_iris, listo_iris and lsli_iris and moderate correlations were observed for the variables slbsba_iris and lssto_iris.

Fig. 2 expresses a graphic representation of the human facial growth, especially the progressive growth of nose, mouth and ear illustrating the morphometric alterations detected with aging in males and females.

ICC test reached high value for the intra- and inter-rater reliability (>0.75).

DISCUSSION

In the present study, the variables were calculated in relation to the diameter of the Iris, which is considered a highly stable anatomic structure.[3,15] Based on the low variation of the diameter of the iris with aging, it may be used as a reliable reference to investigate proportional facial growth. In specific, the diameter of the iris was measured linearly from the landmarks iris lateral to iris medial, which are considered landmarks with low variability in facial metric analysis.[3] The final quantification of the diameter of the iris was achieved taking the mean linear measurement between the two years.

Once the diameter of the iris was obtained, this study investigated the proportional growth of facial structures described in the literature with high variation with age: the ear, nose and mouth.[6,9] The analysis of these structures is relevant to support further studies on age estimation through facial aging and is justified on the scarce scientific literature testing and validating techniques in the field. In fact, most of the studies involving age estimation and facial aging are limited considering the sample size and quality.[6,9] In the present study, an expressive (n=700) and highly standardized sample was collected from a database of the Brazilian Federal Police.

Currently, no standard is established to set up studies on the morphometric variations within facial aging through imaging.[8,14] Efforts are made to simulate with drawings and computer graphics the facial variations with aging. However, the analysis of these simulations relies on a considerably subjective procedure. Yet subjective procedures may influence on the reliability of these analyses as tools in the forensic routine – especially in cases of missing persons, in which contemporary photographs of the face may not be available in databases.[6]

Table 2 – Proportional variations of the means of the 13 variables in relation to the diameter of the iris, distributed according to sex and age range

	Age range		**Age range**		**Age range**		**Age range**		**Age range**		**Age range**	
	20-30		**20-40**		**20-50**		**20-60**		**20-70**		**20-80**	
Sex	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**
Ratio												
v01_nsn_iris	-2.1%	3.1%	0.0%	-0.5%	-2.9%	4.1%	0.1%	3.2%	3.0%	2.6%	1.1%	7.5%
v02_alal_iris	1.4%	2.3%	4.8%	3.0%	4.4%	-1.1%	7.3%	6.8%	14.4%	10.5%	17.3%	11.7%
v03_nprn_iris	-2.7%	1.9%	-3.0%	-3.3%	-5.1%	2.2%	-2.4%	-0.6%	1.1%	0.4%	-1.6%	5.9%
v04_prnsto_iris	6.3%	6.0%	7.9%	1.3%	9.6%	6.5%	10.7%	13.2%	12.5%	8.5%	11.0%	10.6%
v05_snsto_iris	9.0%	5.3%	5.1%	-2.7%	10.5%	7.5%	9.9%	11.2%	12.5%	7.3%	9.4%	9.3%
v06_lssto_iris	1.1%	-5.7%	-0.8%	-16.5%	-10.4%	-32.2%	-20.3%	-32.6%	-19.9%	-34.4%	-18.7%	-40.3%
v07_listo_iris	-8.5%	-13.1%	-12.6%	-27.2%	-28.7%	-43.4%	-35.7%	-48.2%	-47.0%	-51.8%	-39.8%	-64.5%
v08_chch_iris	4.7%	7.2%	3.4%	5.0%	8.6%	8.8%	2.8%	11.2%	5.7%	6.7%	4.4%	4.4%
v09_lsli_iris	-4.9%	-10.4%	-8.6%	-23.2%	-22.4%	-40.0%	-30.5%	-43.3%	-38.1%	-45.8%	-32.9%	-56.6%
v10_sasba_iris	3.0%	3.1%	2.7%	3.2%	4.5%	13.2%	12.2%	14.5%	15.7%	20.6%	17.8%	27.0%
v11_slbsba_iris	-3.3%	-1.3%	0.9%	11.4%	0.6%	18.6%	25.8%	18.4%	14.3%	24.1%	25.3%	38.7%
v12_ngn_iris	0.1%	1.9%	0.0%	-4.2%	-2.4%	-1.4%	-1.5%	-0.5%	-0.6%	-2.4%	-1.6%	-0.5%
v13_sngn_iris	3.3%	0.0%	-0.6%	-9.9%	-2.2%	-7.6%	-4.9%	-6.2%	-6.9%	-10.0%	-6.6%	-12.3%

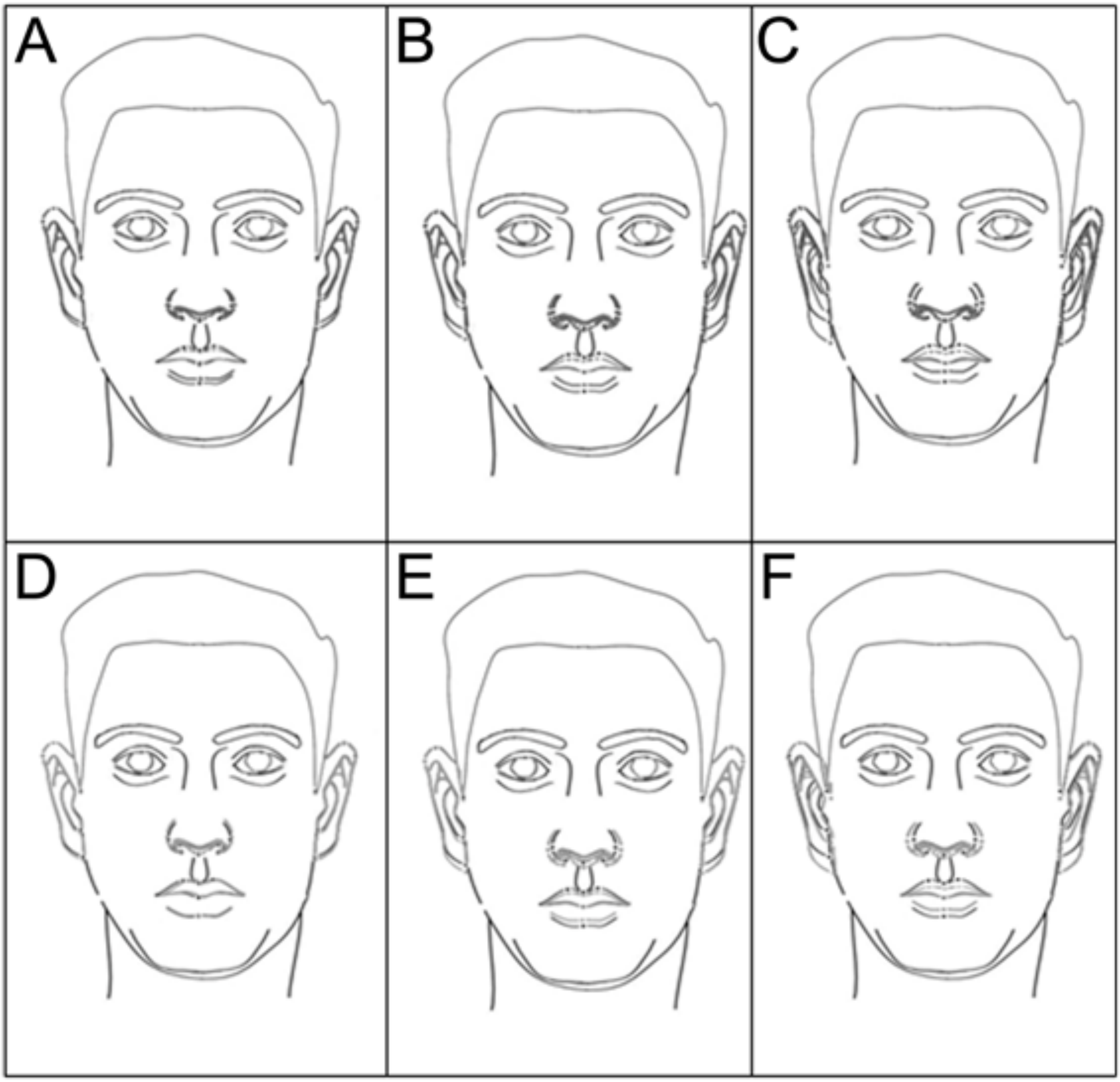
F: female; M: male; age range expressed in years; 13 variables described in Table 1.

Table 3 – Means of the 13 variables used in the present study distributed by sex and age range

Age range		**20.0**		**30.0**		**40.0**		**50.0**		**60.0**		**70.0**		**80.0**	
Variable	**Sex**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
v01_nsn_iris	F	4.28	0.34	4.19	0.35	4.28	0.35	4.16	0.33	4.29	0.36	4.41	0.34	4.33	0.41
	M	4.31	0.40	4.44	0.45	4.29	0.40	4.48	0.37	4.45	0.42	4.42	0.41	4.63	0.45
v02_alal_iris	F	2.91	0.28	2.95	0.24	3.05	0.24	3.03	0.25	3.12	0.22	3.33	0.28	3.41	0.32
	M	3.26	0.22	3.34	0.25	3.36	0.21	3.23	0.94	3.48	0.29	3.60	0.35	3.64	0.31
v03_nprn_iris	F	3.38	0.34	3.29	0.35	3.28	0.37	3.21	0.33	3.30	0.35	3.42	0.38	3.33	0.39
	M	3.38	0.42	3.45	0.44	3.27	0.39	3.46	0.38	3.36	0.41	3.40	0.46	3.58	0.44
v04_prnsto_iris	F	2.70	0.26	2.87	0.26	2.91	0.34	2.96	0.33	2.99	0.27	3.04	0.31	3.00	0.37
	M	2.96	0.28	3.14	0.28	3.00	0.26	3.15	0.31	3.35	0.35	3.21	0.41	3.28	0.38
v05_snsto_iris	F	1.82	0.27	1.98	0.23	1.91	0.25	2.01	0.25	2.00	0.21	2.05	0.26	1.99	0.32
	M	2.04	0.22	2.15	0.23	1.98	0.22	2.19	0.39	2.27	0.29	2.19	0.32	2.23	0.31
v06_lssto_iris	F	0.48	0.10	0.49	0.10	0.48	0.12	0.43	0.12	0.38	0.12	0.38	0.10	0.39	0.14
	M	0.50	0.13	0.47	0.12	0.42	0.13	0.34	0.10	0.34	0.12	0.33	0.12	0.30	0.12
v07_listo_iris	F	0.89	0.15	0.81	0.16	0.77	0.15	0.63	0.18	0.57	0.16	0.47	0.20	0.53	0.16
	M	0.85	0.20	0.74	0.19	0.62	0.23	0.48	0.17	0.44	0.14	0.41	0.17	0.30	0.16
v08_chch_iris	F	3.93	0.28	4.11	0.31	4.06	0.30	4.26	0.46	4.04	0.32	4.15	0.39	4.10	0.37
	M	4.01	0.35	4.30	0.37	4.22	0.36	4.37	0.32	4.46	0.52	4.28	0.47	4.19	0.47
v09_lsli_iris	F	1.36	0.20	1.29	0.21	1.24	0.22	1.05	0.27	0.94	0.23	0.84	0.24	0.91	0.23
	M	1.34	0.29	1.20	0.27	1.03	0.31	0.80	0.25	0.76	0.23	0.72	0.26	0.58	0.24
v10_sasba_iris	F	4.67	0.54	4.81	0.34	4.79	0.38	4.87	0.38	5.24	0.39	5.40	0.43	5.50	0.42
	M	4.70	0.40	4.85	0.41	4.85	0.38	5.33	0.40	5.39	0.51	5.67	0.49	5.97	0.44
v11_slbsba_iris	F	1.57	0.23	1.52	0.21	1.58	0.21	1.58	0.22	1.97	0.68	1.79	0.25	1.97	0.28
	M	1.45	0.23	1.43	0.25	1.62	0.19	1.72	0.25	1.72	0.26	1.80	0.30	2.01	0.33
v12_ngn_iris	F	6.96	0.42	6.96	0.43	6.96	0.50	6.79	0.50	6.85	0.40	6.92	0.51	6.85	0.50
	M	7.18	0.44	7.32	0.56	6.88	0.54	7.08	0.51	7.14	0.56	7.01	0.49	7.15	0.54
v13_sngn_iris	F	2.70	0.31	2.79	0.26	2.68	0.32	2.64	0.34	2.57	0.26	2.51	0.34	2.52	0.38
	M	2.88	0.32	2.88	0.33	2.60	0.34	2.66	0.45	2.70	0.36	2.60	0.39	2.53	0.37

SD: Standard deviation; F: female; M: male; age range expressed in years; 13 variables described in Table 1.

Figure 2 - Graphic illustration of the progressive growth of ear, nose and mouth with ageing, based exclusively in the metric analyses (variables) considered in the present study
Caption: Growth of ear, nose and mouth in the ages of 30, 50 and 80 year old are represented for males (from A to C, respectively) and females (from D to F, respectively). Faces outlined in black indicate the age of 20 years old (initial), while the color outlines indicate the variations with ageing.



The scientific literature reports several signs of aging in the human face, such as degeneration of cartilage, loss of elasticity and facial flaccidity. More detailed alterations are reported for specific facial structures, such as nose growth downwards – resulting from the decrease in fat tissue, gravity and retraction of the columella; ear growth – especially the ear lobes influenced by gravity; and progressive loss of lip thickness influenced by the alveolar bone resorption and reduction of perioral muscle tonus.[9-13,16] On the other hand, there is no quantitative information of these facial alterations in the literature. The present research provides innovative outcomes that contribute to the study of facial growth with aging.

In relation to the nose, the variables "nsn" (from nasion to subnasal), "alal" (from right alar to left alar), "npm" (from nasion to pronasal) and "prnsto" (from pronasal to stomion) (Table 1)

represented the height, width, vertical upper length, and vertical lower length of the nose, respectively. The most evident variations were observed in variables "alal" and "prnsto" – especially in subjects aged >50 years old. While in one hand the literature lacks information on the progressive increase in nose width ("alal") with age, on the other hand it indicates that the vertical lower length of the nose (distance from the nose to the mouth) decreases with age.[9] Despite that, only the nose width in females reached differences significant statistically in relation to age (p<0.05). When analyzing sex separately, all the variables except "nprrn" reached differences significant statistically (p<0.05). More evident alterations were observed in males.
Considering the age range of 20 years old, the only variables with means statistically significant higher in males than females were "alal" and "prnsto", which indicate that at this period men present the nose larger and with a distance from the mouth higher than women. In the age range of 30 years old, all the variables reached means significantly higher in men than women, while within the range of 40 years old nose width ("alal") becomes larger (p<0.05) in males again. In the age range of 50 years old, the statistical significance of the variables invert and "alal" becomes the only nose-related variable with no difference between males and females. In the following age ranges (60 and 70 years old), "alal" and "prnsto" reveal higher mean values in males than in females (p<0.05), as well "nsn" exclusively for the range of 60 years old. Finally, in the age range of 80 years old, all the variables related to the nose have means higher in men than women (p<0.05).
The present study also detected alterations related to the lip. The variables used to assess these alterations were "snsto" (from subnasal to stomion), "lssto" (from upper lip to stomion), "listo" (from lower lip to stomion), "chch" (from right cheilion to left cheilion), and "lsli" (from upper lip to lower lip) (Table 1). The morphological structures represented by these variables consisted of the total height of upper lip (distance from the nose), height of the upper lip (mucous portion), height of the mucous portion of the lower lip (mucous portion), width of the lips, and height of both lips (mucous portion), respectively. The most evident alteration observed was the decrease in the mean value of the variable "lsli". This finding corroborates the literature[6,8] and is translated as the reduction in the height of both lips (loss of lip thickness) with age. In men, the lips reduced vertically up to 56.6%, while in females it reached 32.9%. All the variables related to the lips revealed differences significant statistically between males and females. Once more, the alterations were more evident in men.
For patients aging 20 years old, no different significant statistically (>0.05) were observed between males and females considering the variables "lssto", "listo", "chch" and "lsli". The opposite was observed for the variable "snsto" (p<0.05), which presented higher mean values in men. It indicates that the upper lip trends to be thicker in males at this age range. Next, in the age range of 30 years old, males presented mean values above females not only for "snsto" but also considering the width of the mouth ("chch") (p<0.05). On the other hand, females presented the mucous portion of the lower lip (listo) larger than males (p<0.05). In the age of range of 40 years old, "snsto" was not different between males and females (p>0.05). At this stage, females presented lip proportion larger than males (p<0.05) – including "lssto", "listo", and "lsli". The only variable remaining higher in males was the width of the mouth ("chch"). In the following age range (50 years old), the width of the mouth was not different between males and females, while the mean of "snsto" became higher in males again. The other variables remained with mean values higher in females (p<0.05). Within 60 years old, the variables observed higher in men were the same observed higher in the age range of 30 years old (p<0.05). The variables "listo" and "lsli" were higher in females, while "lssto" was not different between sexes. For subjects aged 70 years old, two variables ("listo" and "chch") did not reach differences significant statistically between males and females, while "snsto" was higher in males and "lssto" and "lsli" in females (p<0.05). In the last age range (80 years old), "chch" did not result in differences between sexes. The only variable with higher mean value in men was "snsto", while the others were higher in females (p<0.05).
Morphometric alterations in the ear were also investigated in this study. The variables related to these alterations were "sasba" and "slbsba", which represent the distances between the landmarks supra-auricular and sub-auricular (height of the

Figure 3 - Outcomes of Pearson's correlation coefficient for the association of variables in fuction of age in females (Variables described in Table 1).

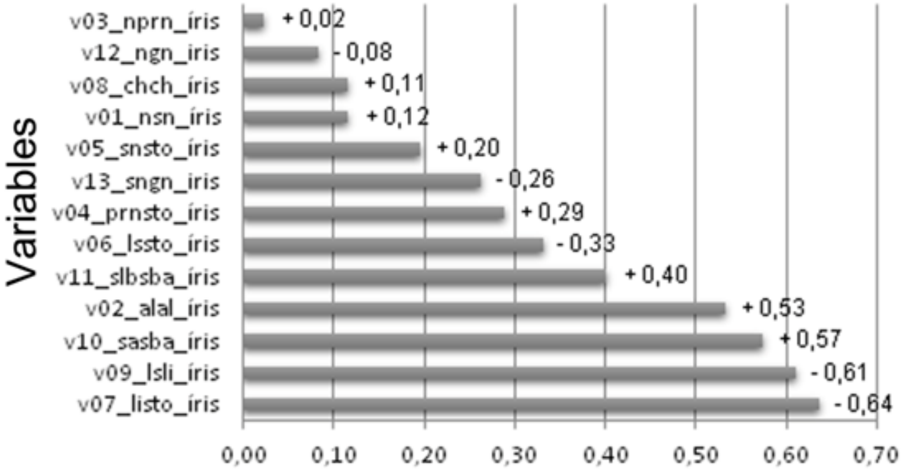
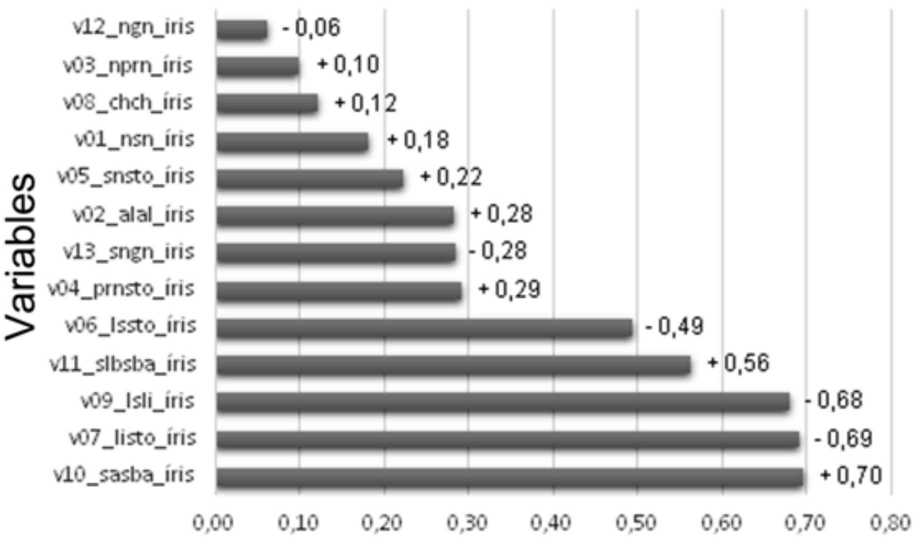


Figure 4 - Outcomes of Pearson's correlation coefficient for the association of variables in fuction of age in males. (Variables described in Table 1).



ear) and between the sub-auricular and the upper ear lobe (height of the ear lobe), respectively. Confirming the scientific literature, both variables increased with age and were manifested clinically with the enlargement of ear and ear lobe.[11] Moderate correlations with age ranges were observed for these variables. All the morphometric variations were different statistically between males and females ($p<0.05$). Specifically, in males the lower portion of the ear increased in size in 38.7%, while in females this portion increased in 25.3%.

The morphometric variations of the ear observed in relation to age indicated that in the range of 20 years old the ear lobe ("slbsba") of females was larger than males ($p<0.05$). No difference significant statistically was observed for "sasba" in relation to sex. In the age ranges of 30 and 40 years old, no difference was observed between sexes considering both variables. In subjects aged 50 years old, both variables reached mean values considerably higher in males ($p<0.05$). In the range of 60 years old, no difference significant statistically was observed for the variable "sasba", while "slbsba" was higher in females than males. In the last age ranges (70 and 80 years old), no difference ($p>0.05$) was observed between males and females considering the variable "slbsba", while "sasba" was higher in males. It reveals an inversion on the size of the ear lobe, which is larger in females in the age range of 20 years old and becomes larger in males in the age ranges of 70 and 80 years old.

Besides the nose, mouth and ear, the present study investigated two variables related to the height of the human face: "ngn" and "sngn", which indicate the distance between nasion and gnation (2/3 of the face), and between subnasal and gnation (1/3 of the face), respectively. A trend on the decrease of the lower portion (1/3) of the human face was observed with age. In males aged 80 years old, the decrease in mean values reached 12.3%, while it reached 6.6%. According to the literature, the reduction may be justified on the loss of muscle tonus and teeth as well alveolar bone resorption.[6,12,13] In specific, major variations were observed among males. In the age ranges of 20, 30, 50, 60 and 80 years old "ngn" was had mean values considerably higher in males ($p<0.05$). In the ranges of 20 and 60 years old "sngn" was also higher in males ($p<0.05$). Variable "sngn" was not different between sexes in subjects aged in the ranges of 30, 50 and 80 years old ($p>0.05$). Lack of differences significant statistically between males and females considering both variables were observed in the age ranges of 40 and 70 years old.

It is important to note that, the metric analysis performed in this study was restricted to the facial structures known for having more evident alterations in relation to age.[6,9] Moreover, these structures were analyzed bidimensionally in photographs. In future studies, three-dimensional analyses are encouraged to improve the investigation of facial alterations with aging, enabling simulations and morphometric assessment with more contemporary imaging, such as facial scanning and photogrammetry. On the other hand, bidimensional photoanthropometry – used in this study, represented a reliable tool for facial morphometrics in a forensic context.

CONCLUSION

The validation of alternatives for the assessment of age through facial analysis is essential to improve the routine of police services and medico-legal institutes. The present study supports these alternatives with the application of a non-expensive and practical approach.

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