PROSOPOGRAFIA: COMPARATIVE STUDY ABOUT ANTHROPOMETRIC MEASURES OF PATTERN AND QUESTIONED IMAGES IN KNOWN SUBJECTS

Prosopografia: estudo comparativo das medidas antropométricas de imagem padrão e questionada em sujeitos conhecidos

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ABSTRACT

Purpose: to compare the results of measurements of known faces in order to establish the foundations of existing measures and ratios in science concepts used by prosopography. **Methods:** the collection of this research consisted of 3 subjects. We collected photographs of Civil Identification documents, withdrew picture of the front face, it was computer-retired measurements and angles for comparison. **Results:** there was the identification of known subjects in images at different ages; **Conclusion:** it was found that the proposed quantitative method presents effective to prove the compatibility of familiar faces.

KEYWORDS: Face; Anthropometric; Orthodontics; Biometric Identification

INTRODUCTION

Anthropometry is the science that studies the size measures, weight and proportions of the human body supplying data objectives of evaluation of the morphology craniofacial, through measures of the head and face [1,2]. It Extols the quantitative analysis of the dimensions of the body and he/she offers countless advantages in the evaluation of the morphology of the compound craniofacial for being simple, non invasive, without risk for the subject and with low cost [3-6].

Na era romana, Vitrúvius via a ciência das proporções humanas como um princípio fundamental na concepção[7] do corpo humano, mas foi, provavelmente, Albrecht Dürer (1471-1528) que marcou o início da ciência antropométrica, tentando categorizar a diversidade de tipos físicos humanos de acordo com uma observação sistemática e medição de um largo número de pessoas. No entanto, neste período renascentista, a teoria da estética permanecia a mais importante. O desenho de Leonardo da Vinci (1452-1519), no qual um homem é mostrado inscrito dentro de um quadrado e de um círculo, deriva diretamente de Vitruvios e é uma das imagens mais conhecidas[7].

In the Roman epoch, Vitrúvius through the science of the human proportions as a fundamental beginning in the conception[7] of the human body, but it was, probably, Albrecht Dürer (1471-1528) that marked the beginning of the science anthropometry, trying to classify the diversity of human physical types in agreement with a systematic observation and measurement of a square number of people. However, in this period renaissance, the theory of the aesthetics stayed the most important. The drawing of Leonardo of Vinci (1452-1519), in which a man is shown enrolled inside of a square and of a circle, it flows directly of Vitruvios and it is one of the images more Known[7].

The science anthropometry developed in the century XIX and beginning of the century XX. In that time they were made attempts to subdivide and to classify the humanity in agreement with the physical dimensions. Bertillon was the first to use the labelling anthropometrical points in crimes[8] resolution. It was also the creator of the term " Spoken " Picture, that the time was just a physical description of the

(1) Fingerprint of the Technician-scientific Police of the State of Goiás, Goiânia, GO, Brazil.

(2) Fingerprint of the Technician-scientific Police of the State of Goiás, Goiânia, GO, Brazil.

Conflict of interest: non-existent

person, being observed notions chromatic, morphologic and the complemental lines.

According to the dictionary of the Portuguese Language, Hoauis, PROSOPOGRAFIA is the description of the human features and he/she has for synonyms the following words: anthropometrical, appearance and morphologic. The PROSOPOGRÁFICO investigation is the comparison of the human features. The word " prosopográfico " comes from the Greek " prosopongrafhein " (prósopon = face + grafhein = to describe) [9].

Nowadays, the Prosopográfico Investigation is the description of the human face in a comparative way, evidencing likeness or differences among two pictures in the general and specific physical aspects, as the head's format, the type and the positioning of the ears, the distance among the eyes, the type of brows, the forehead, the root of the nose, the size of the mouth, among others. The scientific and objective criteria of the exam seek to obtain information regarding human faces through measurements and comparisons with morphologic patterns adopted by the doctrine. With base in those information is possible to point likeness or divergences among faces that they are being compared, in way to constitute an useful conclusion to the development of the activity policial[1].

For middle of that process of human identification it is possible to compare and to establish if there are likeness or significant divergences among facial images. It is a comparison it aims at of the elements presented in the examined images, done by Forensic Speech Language (expert the doc) or for Fingerprint Policial that, with technical and scientific argument, it can provide to the investigation the necessary subsidies to the formation of a conviction [10].

The objective of that work was to compare the results of the measures facial retreats of images denominated pattern and questioned to observe and to prove the foundations of the measures and existent proportions in the concepts of the sciences used in the prosopografia through images of known individuals.

METHODS

This research was approved by the Committee of Ethics of CEFAC with seeming nº 185/12. For this traverse study, whose data were collected in an only moment, three individuals of the sex feminine randomly were selected. After signature of the free and illustrious term, a picture was removed of each one of them and selected the picture of the identity card for the comparison. The inclusion criteria contemplated individuals' facial analyses supposedly known. As exclusion criterion was contemplated individuals to have accomplished any surgical intervention in the face.

The necessary material to apply this method is composed of a digital photographic camera it marks Kodak 7.1 pixels, three softwares developed for the collection of the measures starting from the images (Windows Seen, Adobe Photoshop CS5 and Radiocef Studio 2), and a computer (Pentium Intel Dual-Core).

The inherent methodology to the photometry follows some stages. In first place, they were scanned and saved the pictures of the document official-wallet of Identity of the State of Goiás (Pattern Image) and retreat a picture of the three individuals' front face in the Institute of Identification of Goiás (Questioned Image) in posture previous pattern, demarcated the floor with a parallel line, 100 centimeters ahead of the individual photographed in position sat down, with leaning feet in the ground, with the head in natural position, with occluded lips and bite in occlusion centrical. In second place, with the help of the computer and of the software photoshop, it was proceded to the laser scanning and treatment of the images. And in third place, it was accomplished the demarcation of the points and the calculations of the lengths and angles intended under the analysis of the software Radiocef Studio 2, edited in millimeters for decision of computerized cephalometry.

The results will be presented in descriptive analysis (absolute numbers and measures of central tendency) and application of normality criterion, according to Suguino[11-15] to verify possible associations among variables.

The used statistical test was it of association of the qui-square that allows to observe two groups they behave in a similar way or not. Such likeness is happened the differences between the observed frequencies and the expected ones, in each category, they go very small, close to zero.

RESULTS

Foram retiradas e analisadas as fotografias dos documentos de identificação oficial denominadas, neste trabalho, de imagem padrão (I.P) e as fotografias retiradas com câmera digital, denominadas imagem questionada (I.Q) de três indivíduos do sexo feminino com idade de 14 a 43 anos. Em seguida, realizou – se a digitalização e tratamento (nitidez e tamanho) das imagens no software Abobe Photoshop CS5 de forma a não alterar suas características fundamentais.

They were removed and analyzed the pictures of the documents of official identification denominated, in this work, of image pattern (I.P) and the retired pictures with digital camera, denominated

questioned image (I.Q) of three individuals of the feminine sex with age from 14 to 43 years. Soon after it accomplished the laser scanning and treatment (clearness and size) of the images in the software Adobe Photoshop CS5 in way to not to alter your fundamental characteristics.

After the overlapping and measured exact interpupil, it inserted the images in the software Radiocef Studio 4 (Dentistry). The software accomplished the tuning. The demarcation of the points anthropometricals was accomplished manually in the own program and the distances calculated for this they were: Facial proportion (Table 1); Medium Facial Third (Table 2); Inferior Facial Third (Table 3). The values between image pattern and questioned image of each subject were compared.

Table 1 – Evaluation of the facial proportion

DISTANCES	I.P 1	I.Q 1	X^2	I.P 2	I.Q 2	X^2	I.P 3	I.Q 3	X^2
Facial Height	157,5	157,4	0	196,5	190	0,0011	203,2	204,5	0,00004
Widht	156,8	161,5	0,0009	199,3	192,1	0,0014	221,7	213,3	0,0015
Facial Proportion	1,39	1,37	0,002	1,41	1,40	0,00005	1,22	1,25	0,0005
Superior Third	60,2	64,3	0,0040	85,3	79,2	0,0059	68	61,6	0,0108
Medium Third	76,2	76,5	0,00001	96,9	98,8	0,0003	112,4	113,4	0,0088
Inferior Third	81,2	80,9	0,00001	99,5	91,1	0,0084	90,7	91,1	0,00001
Medium Third+Inferior Third	157,5	157,5	0	196,5	190,05	0,0011	203,21	204,5	0,00004

Legend 1 I.P - Pattern Image I.Q - Question Image X^2 – Pattern Deviation

Table 2 – Evaluation of the medium thirds

DISTANCES	I.P 1	I.Q 1	X^2	I.P 2	I.Q 2	X^2	I.P 3	I.Q 3	X^2
Intercanthal Distance	48,10	46,40	0,0013	49,07	46,74	0,0024	56,96	54,88	0,0014
NostrilBase	45,77	42,34	0,006	48,29	48,13	0,00001	60,30	63,67	0,0028
Proporcion (IC/BA)	1,00	1,00	0	1,00	1,00	0	1,00	1,00	0
Interpupil Distance	81,96	78,59	0,0018	88,71	87,79	0,0001	105,04	105,43	0,00001
Mouth Width	58,25	59,29	0,0003	74,56	70,10	0,0040	77,23	79,26	0,0006
Proporcion (IP/LB)	1,41	1,33	0,0036	1,19	1.25	0,0023	1,36	1,33	0,0005

Legend 2 I.P- Pattern Image I.Q- Question Image IC- Intercanthal BA- NostrilBase
IP- Interpupil X^2 – Deviation Pattern

Table 3 – Evaluation of the inferior third

PROPORTION	I.P 1	I.Q 1	X^2	I.P 2	I.Q 2	X^2	I.P 3	I.Q 3	X^2
CLs	24,72	23,75	0,0017	29,81	27,78	0,0053	32,18	32,18	0
Cli	52,84	52,84	0	66,04	59,33	0,0127	55,90	55,55	0,00003
CLs/Cli	0,47	0,45	0,0020	0,45	0,47	0,0017	0,58	0,58	0

Legend 3: I.P - Pattern Image I.Q – Question Image CLs- Superior Lip Cli- Inferior Lip X^2 – Deviation Pattern

DISCUSSION

In a general way, the Prosopográfica Expertise has the purpose of basing the compatibility attribution or incompatibility anthropometrical and appearance among an individual's image whose identification is ignored or questionable, in relation to the image of other, whose identity is known[10].

The Prosopográfico Investigation is divided in three parts (morphologic anthropometrical and the overlapping). In this study the measures and proportions anthropometricals of known images were compared with the purpose that when gathered Prosopográfico's Investigation three parts it can be affirmed that belong to the same individual.

It is important to point out that, instead of the picture, the video can be used, for which is requested a video camera, the markers and the computer evidently as for the photometrical, still, a plate of image acquisition to transfer the image for the software.

The first part of the exam happens observing the face as a whole (height and width), which in the group to the calculation of the Index of facial Proportion. When comparing the facial proportions (1A-1B; 2A-2B; 3A-3B) with the normality presented in the cephalometry, it is observed that all present similar values, and when comparing the facial proportions of Pattern Image in relation to the Questioned Image in each one of the subjects, likeness can also be observed sees that the statistical value came close of zero.

When comparing the values of Proportion of the thirds of the face[11-14](vertical proportionality - balance of the thirds superior, medium and inferior of the face) with the normal[11,12,14-16] it can be observed that the images 1A and 1B present tendency to the long face (inferior thirds come larger than the medium third); the images 2A and 2B present tendency to the medium face (proportional thirds) and the images 3A and 3B present tendency to the short face (smaller inferior third than the medium third). When the Pattern Image is compared with the Image Questioned in each one of the subjects, likeness of proportions is observed, because the statistical value came close of zero.

The second part of the exam happens when it is observed in the Medium Third the Ideal Proportion Frontal[11] (width of the base of the nose with the distance intercanthal and width of the mouth with distance interpupil). When comparing the front ideal proportions (1A-1B; 2A-2B; 3A-3B) with the normality[11,12,14-16](they should present close values) it is observed that all present similar values, and when comparing Pattern's Image proportions ideal frontals in relation to the Questioned Image, in each one of the subjects, likeness can also be observed, because the statistical value came close to zero.

The third part of anthropometrical exam happens when it is analyzed the Proportions of the Inferior Third (vertical proportion of the subnasale to the stomion of the superior lip). When comparing those proportions with the normality [11,12,14-16] (they should present proportion of 1:2), it is observed that all present similar values, and when comparing Image Pattern's proportions in relation to the Questioned Image, in each one of the subjects, she can also observe likeness, because the statistical value came close of zero.

In this study compatibilities were observed in all the individuals' anthropometricals measures known analyzed, and it happened satisfactory correspondence when comparing the faces in the measures obtained through the cephalometry of soft fabrics, what corroborates with the scientific based of the Expert. When concluding that known individuals possess the same anthropometricals measures or you provide among the principal elements of the face, the Prosopográfico Investigation becomes I aim at. It is important to tell that the portrayed individuals possess difference of age and, by virtue of that, each one preserves inherent particularities to the development apprenticeship or aging. The analysis of the data should also take in consideration eventual factors that you/they influence the observed results, such as resolution and clearness of the images, differentiated conditions of brightness and eventual perspective differences and angulation of the face in the moment of execution of the photos[17-21]. Those factors were considered during the exam and they justify the likeness observed among the images.

It was not possible to compare those discoveries (Pattern Image in relation to the Questioned Image) in the literature, because it was not found, in the researched references, any study as that. The two analysis forms (picture and cephalometry) they should be used jointly. In that way, it is believed that this analysis should be one more tool to contribute with the Identification of subjects. Though, it should not be used of form isolated[15]. It is fundamental that the morphologic analysis, the analysis of the overlapping of the bony structures and the supreme analysis of the expert happen in way the power to affirm that the images compiled in the exam they refer to the same subject.

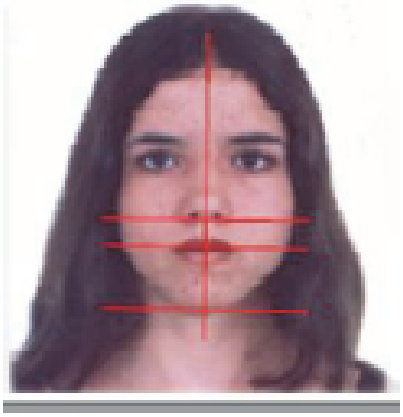
More researches are necessary due to the vast universe of the facial analysis. It is also necessary the study with individuals of the masculine sex. This study presents great progress for the development of new technologies to the Criminal Investigation.

CONCLUSION

In what refers to the conclusions of the present study it is observed that the facial analysis for the identification of subjects through picture and cephalometry was considered reliable sees that there was not it differentiates significant statistics between the measures anthropometrical and proportions orofacials of the known subjects.

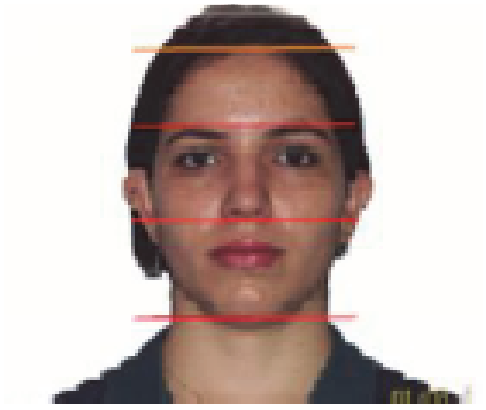
	Value	Normal %
Facial height	218.12 mm	
Facial width	156.81 mm	
Facial proportions	1.39	1.30
Height of upper third	60.62 mm	
Height of third Middle	76.21 mm	
Height of Bottom third	81,29 mm	

Evaluation Middle Third	Value	Normal %
Distance Intercantal	48.10 mm	
Alar Base	45.77 mm	
Proportion (IC/BA)	1.00	1.00
Distance Interpupilar	81.96 mm	
Mouth Width	58.25 mm	
Proportion (IP-LB)	1.41	1.00

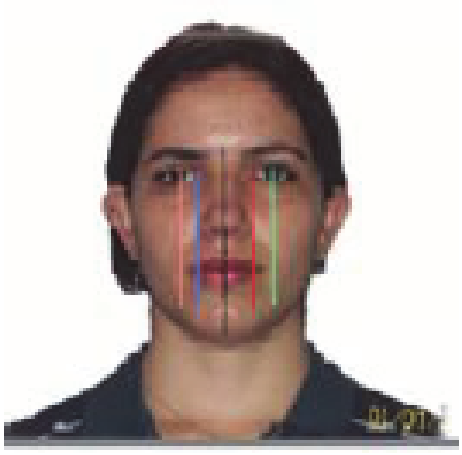


Evaluation of the Rosary bottom:	Value	Normal %
Length of the upper lip	24.73 mm	
Length of lower lip	52.84 mm	
Proportion Lip	0.47	0.50

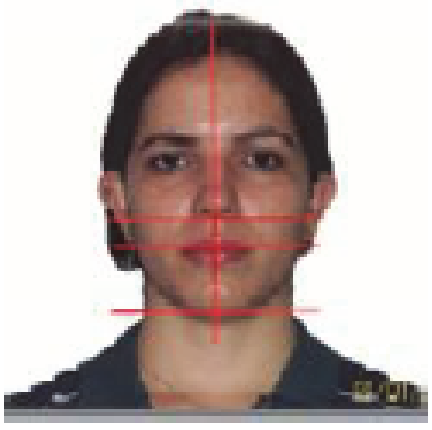
Figure 1A - Computerized cephalometry / front facial analysis



	Value	Normal %
Facial height	221.83 mm	
Facial width	161.55 mm	
Facial proportions	1.37	1.30
Height of upper third	64.35 mm	
Height of third Middle	76.54 mm	
Height of Bottom third	80.95 mm	

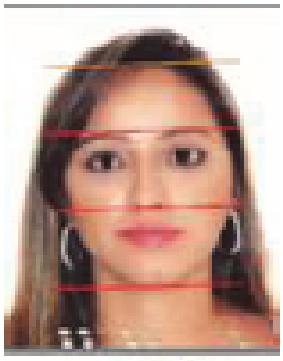


Evaluation Middle Third:	Value	Normal %
Distance Intercantal	46.40 mm	
Alar Base	42.34 mm	
Proportion (IC/BA)	1.00	1.00
Distance Interpupilar	78.59 mm	
Mouth Width	59.29 mm	
Proportion (IP-LB)	1.33	1.00

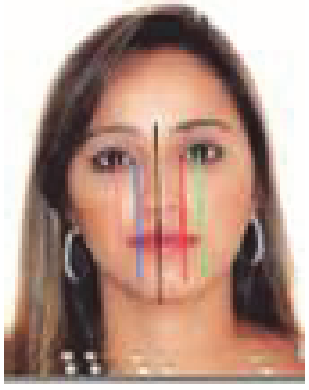


Evaluation of the Rosary bottom:	Value	Normal %
Length of the upper lip	23.75mm	
Length of lower lip	52.84mm	
Proportion Lip	0.45	0.50

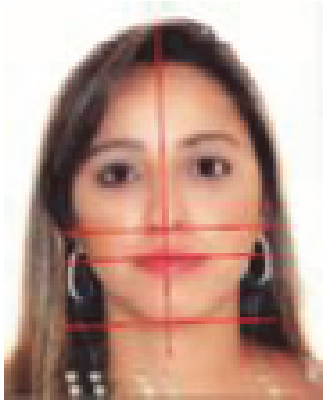
Figure 1B – Computerized cephalometry /frontal facial analysis



	Value	Normal %
Facial height	281.87 mm	
Facial width	199.32 mm	
Facial proportions	1.41	1.30
Height of upper third	85.39 mm	
Height of third Middle	96.92 mm	
Height of Bottom third	99.58 mm	



Evaluation Middle Third:	Value	Normal %
Distance Intercantal	49.07 mm	
Alar Base	48.29 mm	
Proportion (IC/BA)	1.00	1.00
Distance Interpuliar	88.71 mm	
Mouth Width	74.56 mm	
Proportion (IP-LB)	1.19	1.00



Evaluation of the Rosary bottom:	Value	Normal %
Length of the upper lip	29.61 mm	
Length of lower lip	66.04 mm	
Proportion Lip	0.45	0.50

Figure 2A – Computerized cephalometry / front facial analysis

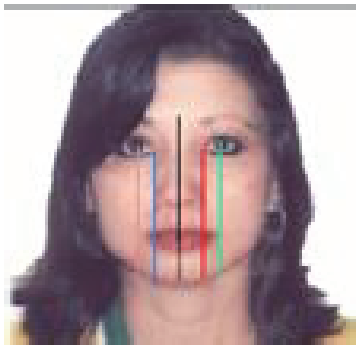
	Value	Normal %
Facial height	269.28 mm	
Facial width	192.12 mm	
Facial proportions	1.40	1.30
Height of upper third	79.26 mm	
Height of third Middle	98.89 mm	
Height of Bottom third	91.16 mm	

Evaluation Middle Third:	Value	Normal %
Distance Intercantal	46.74 mm	
Alar Base	48.13 mm	
Proportion (IC/BA)	1.00	1.00
Distance Interpulla r	87.79 mm	
Mouth Width	70.10 mm	
Proportion (IP-LB)	1.25	1.00

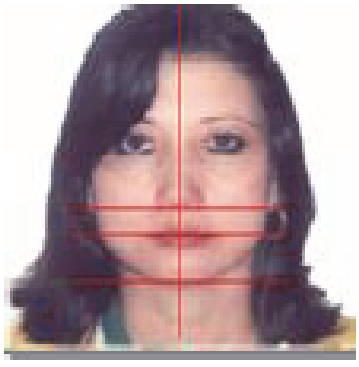
Evaluation of the Rosary bottom:	Value	Normal %
Length of the upper lip	27.78 mm	
Length of lower lip	59.33 mm	
Proportion Lip	047	050

Figure 2B – Computerized cephalometry / front facial analysis

	Value	Normal %
Facial height	271.27 mm	
Facial width	221.71 mm	
Facial proportions	1.22	1.30
Height of upper third	68.08 mm	
Height of third Middle	112.44 mm	
Height of Bottom third	90.77 mm	



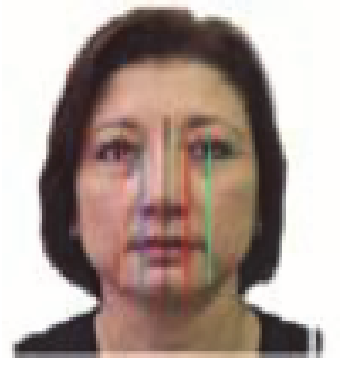
Evaluation Middle Third:	Value	Normal %
Distance Intercantal	56.96 mm	
Alar Base	60.30 mm	
Proportion (IC/BA)	1.00	1.00
Distance Interpupilar	105.04 mm	
Mouth Width	77.23 mm	
Proportion (IP-LB)	1.36	1.00



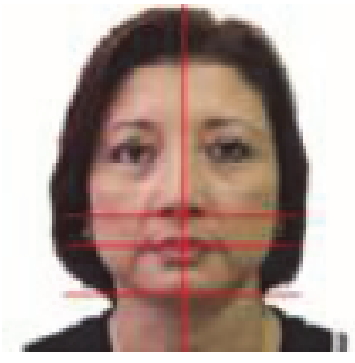
Evaluation of the Rosary bottom:	Value	Normal %
Length of the upper lip	32.18 mm	
Length of lower lip	55.90 mm	
Proportion Lip	058	0.50

Figure 3A - Computerized cephalometry / front facial analysis

	Value	Normal %
Facial height	266.20 mm	
Facial width	213.39 mm	
Facial proportions	1.25	1.30
Height of upper third	61.64 mm	
Height of third Middle	113.46 mm	
Height of Bottom third	91.10 mm	



Evaluation Middle Third:	Value	Normal %
Distance Intercantal	54.68 mm	
Alar Base	63.67 mm	
Proportion (IC/BA)	1.00	1.00
Distance Interpullar	105.43 mm	
Mouth Width	79.26 mm	
Proportion (IP-LB)	1.33	1.00



Evaluation of the Rosary bottom:	Value	Normal %
Length of the upper lip	32.18 mm	
Length of lower lip	55.55 mm	
Proportion Lip	0.58	0.50

Figure 3B – Computerized cephalometry / front facial analysis

RESUMO

Objetivo: comparar os resultados das medidas das faces conhecidas com a finalidade de comprovar os fundamentos das medidas e proporções existentes nos conceitos das ciências utilizadas pela Prosopografia. **Métodos:** a coleta desta pesquisa foi composta por três sujeitos. Coletaram-se fotografias dos documentos de Identificação Civil, retirou-se fotografia da face frontal, tratou-se em computador, retiraram-se as medidas e ângulos para a comparação. **Resultados:** realizou-se a identificação de sujeitos conhecidos em imagens em diferentes idades; **Conclusão:** constatou-se que o método quantitativo proposto apresenta-se efetivo para comprovar a compatibilidade de faces conhecidas.

DESCRITORES: Face; Antropometria; Ortodontia; Identificação Biométrica

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Received on: August 15, 2012
Accepted on: March 02, 2013

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