UNIVERSIDADE ESTADUAL DE CAMPINAS

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VIVIANE ULBRICHT

DETERMINAÇÃO DO SEXO EM AMOSTRA BRASILEIRA: METODOLOGIA QUALITATIVA OU QUANTITATIVA?

SEX DETERMINATION IN BRAZILIAN SAMPLE: QUALITATIVE OR QUANTITATIVE METHODOLOGY?

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Dissertação apresentada à Faculdade de Odontologia de Piracicaba da Universidade Estadual de Campinas como parte dos requisitos exigidos para obtenção do título de Mestra em Biologia Buco-Dental, na Área de Odontologia Legal e Deontologia

Dissertation presented to the Piracicaba Dental School of the University of Campinas in partial fulfillment of the requirements for the degree of Master in Oral and Dental Biology in Legal Dentistry and Deontology area.

Orientador: Prof. Dr. Eduardo Daruge Junior.

ESTE EXEMPLAR CORRESPONDE À VERSÃO FINAL DA DISSERTAÇÃO DEFENDIDA PELA ALUNA VIVIANE ULBRICHT E ORIENTADA PELO PROF. DR. EDUARDO DARUGE JUNIOR.

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PROF. DR. EDUARDO DARUGE JUNIOR

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PROF. DR. LUIZ FRANCESQUINI JÚNIOR

A Ata da defesa com as respectivas assinaturas dos membros encontra-se no processo de vida acadêmica do aluno.

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” Conhecimento não é aquilo que você sabe, mas o que você faz

com aquilo que você sabe ”

(Aldous Huxley)

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"Ao curvar-te com a lâmina rija de teu bisturi sobre o cadáver desconhecido, lembra-te que este corpo nasceu do amor de duas almas; cresceu embalado pela fé e esperança daquela que em seu seio o agasalhou, sorriu e sonhou os mesmos sonhos das crianças e dos jovens; por certo amou e foi amado e sentiu saudades dos outros que partiram, acalentou um amanhã feliz e agora jaz na fria lousa, sem que por ele tivesse derramado uma lágrima sequer, sem que tivesse uma só prece. Seu nome só Deus o sabe; mas o destino inexorável deu-lhe o poder e a grandeza de servir a humanidade que por ele passou indiferente."

Karl Rokitansky (1876)

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Viviane Ulbricht

RESUMO

O presente estudo mediu 185 crânios secos do Biobanco Osteológico e Tomográfico Prof. Eduardo Daruge da FOP/UNICAMP, com a finalidade de verificar a existência de dimorfismo sexual, bem como estabelecer um modelo matemático para determinar o sexo. As medidas lineares foram realizadas em crânios humanos, sendo 101 do sexo feminino e 84 sexo masculino, na faixa etária dos 22 aos 65 anos, sem anomalias morfológicas, sem traumatismos extensos e/ou quaisquer outras alterações que pudessem prejudicar a realização das medidas. Calibrada a pesquisadora, mediu-se Zigio-Zigio; Zigio – Glabela (direito/esquerdo); Rinio – Espinha Nasal Anterior; Largura Nasal; Násio – Espinha Nasal Anterior; Glabela – Espinha Nasal anterior; Glabela – Próstio. Houve distribuição normal e igualdade de variâncias (homoelasticidade) das variáveis estudadas, pelos testes estatísticos de Shapiro-Wilk e Levene; houve equilíbrio quanto ao sexo, pelo Qui-quadrado ($p=0,24$); verificou-se medidas com maior valor no sexo masculino ($p<0,01$); o teste de Hosmer& Lemeshow evidenciou que o modelo de regressão logística se ajustou adequadamente aos dados e que a variáveis são responsáveis por 52,6% da variação encontrada com relação ao sexo. Foi possível criar um modelo matemático para determinação do sexo de regressão logística (logito: **Sexo = – 33.6 + (0.15 x Zi-Zi) + (0.21 x Ri-ENA) + (0.16 x Na-ENA))** para determinar o sexo em medidas cranianas, resultando em 85,2% de sensibilidade, 76,2% de especificidade e 81,1% de acurácia, sendo eficaz na predição do sexo.

Palavras chave: Identificação humana; Antropologia forense; Odontologia legal.

ABSTRACT

The present study measured 185 dry skulls from the Osteological and Tomographic Biobank Prof. Eduardo Daruge of FOP / UNICAMP, with the purpose of verifying the existence of sexual dimorphism, as well as establishing a mathematical model to determine sex. Linear measurements were performed on human skulls, 101 females and 84 males, ranging from 22 to 65 years of age, without morphological abnormalities, without extensive trauma and / or any other alterations that might impair the measurements. When the researcher was calibrated, Zigio-Zigio was measured; Zigio - Glabela (right / left); Rinio - Anterior Nasal Spine; Nasal Width; Násio - Anterior Nasal Spine; Glabela - Anterior Nasal Spine; Glabela - Próstio. There were normal distribution and equality of variances (homoelasticity) of the studied variables, by the statistical tests of Shapiro-Wilk and Levene; There was gender balance, by Chi-square ($p = 0.24$); There were higher values in males ($p < 0.01$); The Hosmer & Lemeshow test showed that the logistic regression model adjusted adequately to the data and that the variables are responsible for 52.6% of the variation found in relation to the sex. It was possible to create a mathematical model to determine the logistic regression (logit: Sex = -33.6 + (0.15 x Zi-Zi) + (0.21 x Ri-ENA) + (0.16 x Na-ENA)) to determine sex in measurements Resulting in 85.2% sensitivity, 76.2% specificity and 81.1% accuracy, being effective in predicting sex.

Keywords: Human identification; Forensic Anthropology; Legal dentistry.

SUMÁRIO

1. INTRODUÇÃO

A Interpol em 2014, padronizou o processo de identificação humana, dividindo-os em métodos primários e métodos secundários. Os primeiros possibilitam indicar o nome do indivíduo e os segundos apenas facilitam o processo, porém não permitem estabelecer o nome, pois não individualizam as características encontradas.

São conhecidos como métodos primários, quando encontra-se no mínimo 12 pontos individualizadores na Datiloscopia/poroscopia. O exame dos caracteres sinaléticos dentários e radiográficos, também são considerados métodos primários, porém não pode haver nenhuma discordância.

Também a análise do DNA e das placas ortopédicas, são consideradas como método primário. As placas/pinos trazem consigo o número original inserido pelo fabricante, ficando registrado no prontuário do paciente no hospital onde foi realizada a cirurgia reabilitadora.

Como métodos secundários a Interpol definiu a antropometria física e a reconstituição facial (bi, tridimensional e tridimensional computadorizado).

Na antropometria física obtém-se a espécie animal, o sexo, a idade, a ancestralidade e a estatura.

A reconstituição facial é um método secundário, e se divide em ordem crescente de dificuldade em bidimensional (superposição de foto de crânio e foto do indivíduo desaparecido suspeito), tridimensional (reposição da máscara facial, baseado nas medidas de espessura facial previamente definida pelo sexo e ancestralidade, havendo o método russo e o método americano) e finalmente o método tridimensional computadorizado, onde a máscara facial é inserida por meio digital gerando a face com o menor número de erros e sem qualquer vicitude do escultor.

Nenhum desses métodos deve ser descartado, pois em geral eles facilitam a identificação humana e permitem uma ampla divulgação pela mídia desta face, para que seja encontrado o ente querido desaparecido.

Em uma situação real quando há o encontro de um indivíduo em fase de esquelitização, procede-se a verificação das características da causa da morte e faz-se a higienização dos ossos, seguindo-se os preceitos estabelecidos por Francisco et al. (2011). Findo esta etapa, procede-se o exame antropométrico físico (nesta ordem), fazendo-se medições lineares e angulares. Com estes dados, busca-se modelos matemáticos desenvolvidos em coleções de ossos brasileiros para realizar-se a análise das medidas determinando-se o sexo, a ancestralidade, e estimando-se a idade e a estatura.

Com estas informações, pode-se proceder a reconstituição facial e divulgar por meio da mídia. Tal atitude leva a busca de familiares, cujos dados se assemelham aos obtidos e estes trazem os prontuários odontológicos realizados em vida que são confrontados com os dados obtidos do esqueleto. Não havendo discordância pode-se estabelecer a identidade, ou seja, atribuir um nome ao mesmo.

Caso os dados obtidos do confronto apresentem uma única discordância, deve-se seguir as orientações de Vanrell (2009) e Daruge et al. (2017), ou seja deve-se solicitar a análise do DNA com o confronto com os descendentes e ou ascendentes do indivíduo esqueletizado.

A Antropometria Física Forense brasileira tem buscado durante os últimos anos o desenvolvimento de novos modelos matemáticos, bem como a validação de modelos matemáticos em amostras brasileiras recentes.

Ainda hoje, no Brasil, utilizam-se modelos matemáticos obtidos de indivíduos europeus e de coleções ósseas muito antigas. Tais modelos não são representativos da população brasileira, a qual é extremamente miscigenada e podem gerar muitos riscos de erro para o perito antropologista, quando da afirmação do sexo, idade, ancestralidade e estatura.

O uso da antropometria forense permite ganho de tempo no processo de identificação, pois permite associação de metodologias qualitativas e quantitativas

O uso da padronização da Interpol (2014) visa principalmente a reprodutibilidade dos mesmos por qualquer nação e devem ser utilizados em situações de catástrofes, desastres de grandes proporções (acidentes rodoviários e aéreos, grandes incêndios) e nos casos de investigações criminais (Kanthens, 2015).

O ato de estabelecer a identidade de uma pessoa permite o resguardo dos direitos cíveis (herança, seguros, etc), administrativos, trabalhistas e previdenciários (recebimento de pensões e auxílios pelos familiares, etc) (Carvalho et al., 2009).

Desta forma, faz-se necessário nas situações descritas acima o atuar rápido, seguro e eficaz do perito, no sentido de conseguir estabelecer a identidade de uma determinada ossada e ou parte dela, para que os familiares possam se resguardar quanto aos seus direitos, bem como, possam ter o direito de velar e enterrar os seus entes queridos.

2. ARTIGO: “SEX DETERMINATION IN BRAZILIAN SAMPLE: QUALITATIVE OR QUANTITATIVE METHODOLOGY?”

Artigo aceito, submetido ao periódico Brazilian Journal of Oral Sciences (anexo 1)

Abstract

Aim: This study carried out cranial measurements (in mm) [Zygion-Zygion (Zy Zy); Zygion-Glabella-right side (Zy-Ga-right); Zygion-Glabella-left side (Zy-Ga left); Zygion-Glabella-mean (Zy-Ga-mean); Rhinion-Anterior Nasal Spine (Rhi ANS); Nasal Width (Na Wid); Nasion-Anterior Nasal Spine (Na-ANS); Glabella Anterior Nasal Spine (Ga-ANS); Glabella-Prosthion (Ga-Pr)], to verify whether they are dimorphic. Methods: We used skulls from the Eduardo Daruge Laboratory of Forensic Physical Anthropometry, which did not present growth abnormalities and belonged to the age range of 22 to 65 years. Linear measurements were performed by digital caliper, properly calibrated. Inter and intra-calibrator calibration was performed by obtaining as result the value of 0.98 (considered excellent). Results: We found that all measures carried out are dimorphic, and we were able to create a logistic regression model (logit: Sex = −33.6 + (0.15 × Zy-Zy) + (0.21 × Rhi-ANS) + (0.16 × Na-ANS)) to determine the sex. Conclusions: We concluded that the developed quantitative method results in 85.2% sensitivity, 76.2% specificity, and 81.1% accuracy, being, therefore, more effective in the prediction of sex than the mere random hit.

Keywords: Forensic Dentistry. Forensic Anthropology. Sex Characteristics.

Skull.

Introduction

The identification process has forensic physical anthropometry as its tool, which, although not permitting to establish the identity of a corpse (bones), allows to determine sex[1] and ancestry and estimate age and height[2]. Although the international literature recommends that ancestry must be established before sex, in Brazil, such rule has been modified, due to the large number of miscegenation in the Brazilian population growth[2]. Based in the publications review of the last fifteen years[3] on the methods of anthropometric identification used by various authors, researchers have found a distribution in six categories: visual examination of bones; anthropometric measurements of bones; anthropometric measurements with subsequent statistical analysis in the form of discriminant function analysis; time and sequence of teeth eruption; radiographic examination of the internal structure of bones; and microscopic examination of the inner structure of the bone.

Reviewing the situations that created the need for performing bone anthropometry, from 1971 to 1981, authors4 have verified that the bones most found in disaster situations and/or mass accidents were the skull, femur, and jaw.

In situations with large number of bones, such as: explosions, wars, other mass disasters, and aviation accidents, the sex determination (separation into male and female) allows a considerable time gain in the process of identity establishment1, which is important in the daily activities of an Institute of Medicine, Legal Dentistry, and Forensic Physical Anthropometry.

Sex determination is a primary component for identifying skeletonized individuals in Forensic Physical Anthropology[5]. It can be qualitative and/or quantitative (using logistic regression mathematical formulas), and both must be done judiciously, considering the ethnic or regional group of the sample, the time period in which it was held, among other situations. For the qualitative method, a study6 evaluated the conduct of several authors and stated that the bizygomatic width, mastoid length, zygomatic process width, and mastoid height, in that order, are the most important features for sex determination. Rogers[7] (2005) studying 17 qualitative characteristics to determine sex, authors have concluded that the anterior nasal aperture, zygomatic

extension, size and roughness of the maxilla and supraorbital ridge are the most dimorphic ones, followed by the mentum and nasal crest shapes and mastoid size.

Verifying the sex in known population groups by qualitative methodology is possible, provided that the Expert has prior knowledge of the population group to which this belongs[8]. Currently, several authors[9,10] have reported in their studies that the metric method (qualitative) cannot be replaced only by the visual method (qualitative), but, in practice, some mathematical models that were created by national sample do not faithfully reproduce the results found by its idealizers, which puts the expert in state of alert, because one can make mistakes in the application of such regression models[2].

By the quantitative method, one can determine the sex in the skull by numerous structures and several linear measures, namely: - bicondylar width, mandibular angle, minimum ramus width[11]; - bizygomatic width, ramus height, face depth[12];

However, the mandibular angle is not very useful for determining the sex of Africans from Pretoria[13].

Because of the miscegenation that occurred per region in our population, we think that the mathematical models created should be properly validated in other samples of population groups by Brazilian geographic region, to verify the real hit and viability of using this technique in the Brazilian territory.

In the same research line, one should also look at cases in which the Deoxyribonucleic Acid (ADN) testing does not allow to establish the identity of a corpse. A study[14] analyzed mandibles of pre-Hispanics from the Canary Islands using three identification methods, namely:

- visual inspection;

- osteometric measures;

- analysis of DNA amelogenin.

They obtained, respectively, 66.04% hit, followed by 72.2% and 73.78%.

From this result, one can infer the need to associate methodologies, depending on the financial availability, to achieve greater security in the identification process.

Material and methods

This study is in accordance with the Brazilian Resolution no. 466/12 of the National Health Council, Ministry of Health, which regulates research involving human beings, and had prior approval of the Research Ethics Committee at the Piracicaba Dental School, University of Campinas (CAAE: 38522714.6.0000.5418).

This is a cross-sectional analytical observational study based on file of human bones of both sexes, with 136 from females and 184 from males, aged between 18 and 100 years, and races.

To start the measurements, we promoted inter and intra-examiner calibration. Linear measurements were performed (Zygion-Zygion; Zygion Glabella-right side; Zygion-Glabella-left side; Zygion-Glabella (mean); Rhinion Anterior Nasal Spine; Nasal Width; Nasion-Anterior Nasal Spine; Glabella Anterior Nasal Spine; Glabella-Prosthion) in three different time periods in 25 bones, with an interval of a month between them.

The choice for linear measures used bone structures that are indicated in the literature[10,15] as dimorphic. Ended this step and with tools duly calibrated, we measured the rest to reach 185 skulls of the Eduardo Daruge Laboratory of Forensic Physical Anthropology, with known sex, age, and race.

To carry out the measurements, we used a digital caliper (StainlessHardened® - 150 mm, Mauá, São Paulo, Brazil)

Data were submitted to the Shapiro–Wilk and Levene's tests to assess, respectively, the distribution and equality of variances (homoscedasticity) of the variables under study. Student's t test and Chi-squared test also were conducted, as well as logistic regression (backward stepwise – Wald), Hosmer– Lemeshow and Nagelkerke tests.

Results

Table 1 shows the means (± standard error) of the variables studied according to the sexes and races.

There was normal distribution ($p>0.05$), and variances were similar ($p>0.05$) for all variables.

Data analysis showed balance in the number of male and female samples (Chi-squared, $p=0.24$), and race did not differ between sexes.

However, all measures were significantly ($p<0.01$) higher in males.

To observe if there was dependency between sexes with the other measures, a logistic regression (backward stepwise – Wald) was performed, considering males as "1" and females as "0" for calculation purposes, as Table 2 shows. At random, the chance to correctly predict the sex in the study sample would be 54.6%. The proposed model was significantly (Chi-squared=94.5; $p=6.4\times10-20$, for cutoff value of 0.5) better than chance to predict sex. Hosmer–Lemeshow test showed that the model was properly adjusted (Chi-square=6.12, $p=0.63$) to the data. In addition, the Nagelkerke R2 showed that the variables account for 52.6% of the variation found in sex.

The logit was, therefore: $Sex = -33.6 + (0.15 \times Zy\text{-}Zy) + (0.21 \times Rhi\ ANS) + (0.16 \times Na\text{-}ANS)$.

Values higher and lower than 0.5 (cutoff), respectively, would be regarded as "male" and "female." Table 3 shows the prediction considering this relationship.

Table 3 shows that the method results in 85.2% sensitivity, 76.2% specificity, and 81.1% accuracy, being, therefore, more effective in the prediction of sex than the mere random hit.

The regression also showed that the variables race ($p=0.64$), Zy-Ga-right ($p=0.35$), Zy-Ga-left ($p=0.46$), Zy-Ga-mean ($p=0.34$), Na Wid ($p=0.40$), Ga-ANS ($p=0.49$), and Ga-Pr ($p=0.55$) were not relevant for the model.

Discussion

It was verified that all linear measurements were dimorphic and it was possible to create a logistic regression model [logit: Sex = - 33.6 + (0.15 x Zi-Zi) + (0.21 x Ri-ENA) + (0.16 x Na-ENA)]; to determine the sex obtaining 85.2% of sensitivity, 76.2% of specificity and 81.1% of accuracy.

Brazilian anthropometry only gained prominence in the nineteenth century, where Rodrigues began studies in Brazilians in order to prove the superiority of races (greater intellect, better strength and general health, besides anthropometrically determining the criminality of each individual)16. It was intended to predict the possibility that some item of the phenotype (skin color, hair type, etc.) and anatomical aspects (broad and low head, etc.) could indicate whether or not an individual would be a criminal[16]. These studies[16] have proved imprecise and even prejudiced, and are not, in fact, studies that prove the Brazilian reality. According to Penna[16] (2002), this fact was studied by Roquete Pinto, who analyzed Brazilian mixed-race individuals (white individuals x black individuals x aborigens individuals), proved that they were intelligent, strong and healthy.

This fact breaks the theory of the superiority of the "races", which considered the Brazilian " mixed-race individuals" to be "unfeasible" as part of a promising nation, recommending the whitening of the population, seeking the incorporation of attributes of the white individuals.

In Brazil, only after 1990, began anthropometric studies of real interest to identify a particular bone9. However, these studies occurred in a sparse way, with different methodology and the mathematical models obtained were in small, old samples, which could present a large margin of error when applied9.

However, the incessant quest for quality has generated the need for methodological standardization. Such a feat became world-wide by Interpol[17] (2014), who classified forensic anthropometry as a secondary method to be used in identification. This situation, according to Jurda & Urbanová[18](2016), have demanded from the experts involved in the process an analysis of the need to improve existing mathematical models through the validation of developed models, as well as more

complete qualitative evaluations and with greater reliability, and certainty about the achievement of the results (sex, age, race and height).

Anthropometric, quantitative (with linear and angular measurements) in teeth[19], skulls[20] and other bones of the human body[21] have been stimulated, mainly because they generate discriminant functions and logistic regression, which are the result of scientific research that was duly evaluated by the editorial staff. Most of the authors[9] who studied the sexual dimorphism by logistic regression indicate that the skull alone allows the establishment of sex with approximately 77% or more of certainty and if the pelvis is also used it reaches 95%.

However, it should be noted that in our country, similar to the European countries, there is a percentage of 15 to 20% of undifferentiated individuals (individuals with few differential characteristics)[10].

Another problem frequently reported by anthropologists is that the determination of sex by the qualitative method has generated the impression that these are more reliable than the quantitative method. It happens that such anthropologists forget that unintentionally, when analyzing anatomical aspects, they are actually measuring them, as an example is the pubic angle, which if open is female and if closed is male.

In this way, the performance of a qualitative evaluation can be in fact quantitative and in a certain plausible way of being measured, allowing the determination of sex in a safe way. This study has already been carried out by photogrammetry using 3D laser scanner[22].

In addition to choosing a reproducible methodology, it is also necessary to clearly specify how the sample to be evaluated will be composed, taking care to specify the age of the sample, its general race and sex. The sample studied is inserted into the bone biobank, composed of 320 complete bones, of which 184 are male and 136 are female. Of these, 58.75% are white individuals, 27.81% are mixed-race individuals, 13.12% black individuals and 0.32% (n = 1) aborigens individuals. The cause of death is still further information.

Another situation to be highlighted is the fact that it is necessary for the individual who comes to perform the measurements for anthropometric purposes to be

initially calibrated (intra and inter-examiner calibration) and the assistance of an experienced anthropologist in order to avoid problems of errors in the location of the Anthropometric points to be measured. The national literature[9,23] and international[10] are unanimous and affirm that the qualitative method when used alone is flawed, with only the exception for cases where even not measuring the structure analyzed, the evaluator can do it visually.

The result found in the present quantitative study is in agreement with the findings of other researchers[24-27] in other countries and allows the determination of sex in bones of missing individuals.

Another interesting situation is the use of computed tomography scans that allow internal structures to be measured with or without craniometric points[28,29].

Computed tomography scanners must have minimum contrast, brightness and sharpness requirements and the software should allow visualization in axial, coronal and sagittal sections. In general, these software have a high cost and depend on a minimum knowledge of sectional anatomy. It should be noted that there are 3D (three-dimensional) software that can measure even situations that are apparently immeasurable, such as rougher, more prominent, more prominent, so-called photogrammetry areas using 3D laser scanners, both of which are being developed By our group and soon the results will be released.

It was concluded that all measures performed are dimorphic and it was possible to create a logistic regression model to determine the sex. It was concluded that the developed logistic regression model obtained 81.1% accuracy, which is therefore more effective in predicting sex than a simple visual qualitative test.

Acknowledgements

The authors are thankful to the CNPq for financial support

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Tables:

Table 1. Means (± standard error) of the variables studied according to the sex.

		Female (n=84)	Male (n=101)	P – value[1]
Race	White	47 (56%)	62 (73.8%)	0.51
	Black	16 (19%)	13 (15.5%)	
	Brown	21 (25%)	26 (31%)	
Measures in mm	Zy - Zy	121.4 (±0.63)	128.7 (±0.61)	2.3×10^{-14}
	Zy – Ga - right	90.2 (±0.55)	95.5 (±0.45)	2.1×10^{-12}
	Zy – Ga - left	91.1 (±0.55)	96.6 (±0.49)	1.9×10^{-12}
	Zy – Ga (mean)	90.6 (±0.53)	96.1 (±0.45)	2.5×10^{-13}
	Rhi - ANS	29.5 (±0.37)	33.2 (±0.31)	1.2×10^{-12}
	Na Wid	24.2 (±0.23)	25.2 (±0.23)	0.0025*
	Na – ANS	47.4 (±0.34)	51.3 (±0.33)	3.4×10^{-14}
	Ga - ANS	57.9 (±0.41)	61.6 (±0.4)	1.1×10^{-09}
	Ga - Pr	71.6 (±0.67)	76.7 (±0.57)	2.6×10^{-08}

*Statistically significant difference (p-value<0.05). 1Race – Chi-squared; Measures – Unpaired Student's t test

Table 2. Logistic regression mode/for sex determination

Measures	Coefficient	Standard error	Wald	p- value	Standardized coefficient
Zy-Zy	0.15	0.035	19.3	$1.1x10^{-05}$	1.17
Rhi-ANS	0.21	0.074	8.4	0.0037	1.24
Na-ANS	0.16	0.075	4.5	0.0332	1.17
Constant	-33.6	4.91	46.7	$8.2x10^{-12}$	$2.7\times10-15$

Table 3. Prediction of sex according to the logistic regression

		Prediction by formula		
		Female	Male	Correct percentage
Real Sex	Female	64	20	76.2
	Male	15	86	85.2
		Correct overall percentage		81.1

3. CONCLUSÃO

Foi possível nesse estudo antropométrico, criar um modelo matemático para se determinar o sexo (Sexo = – 33.6 + (0.15 x Zi-Zi) + (0.21 x Ri-ENA) + (0.16 x Na-ENA)). Concluiu-se que o método quantitativo desenvolvido resulta em 81.1% de acurácia, mostrando-se, portanto, eficaz na predição do sexo.

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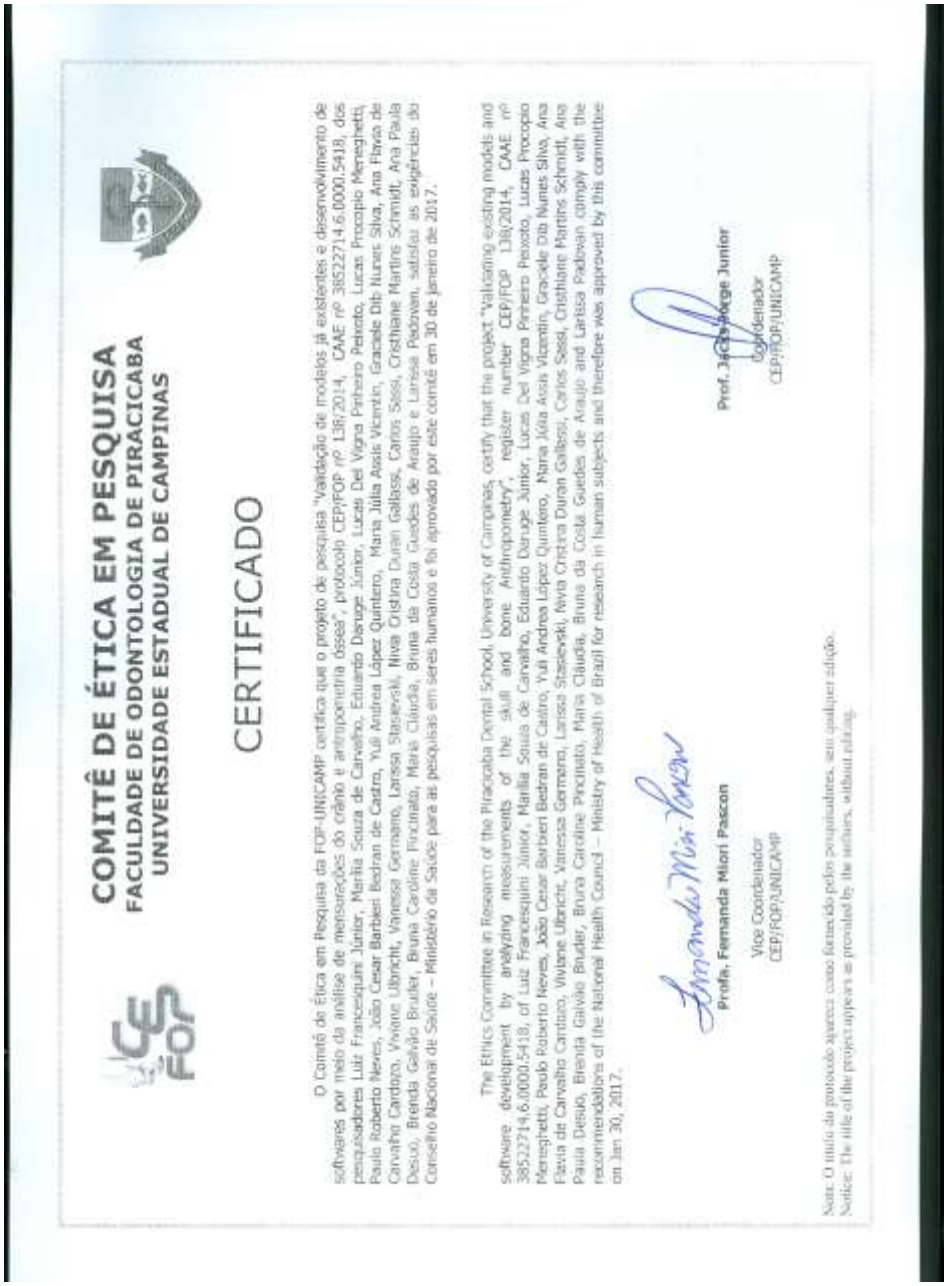
ANEXOS

Anexo 1

Parecer do Comitê de Ética em Pesquisa da FOP UNICAMP



COMITÊ DE ÉTICA EM PESQUISA
FACULDADE DE ODONTOLOGIA DE PIRACICABA
UNIVERSIDADE ESTADUAL DE CAMPINAS

CERTIFICADO

O Comitê de Ética em Pesquisa da FOP-UNICAMP certifica que o projeto de pesquisa "Validação de modelos já existentes e desenvolvimento de softwares por meio da análise de mensurações do crânio e antroposcopia óssea", protocolo CEP/FOP nº 136/2014, CAAE nº 38522714.6.0000.5418, dos pesquisadores Luiz Francesquini Júnior, Marilia Sousa de Carvalho, Eduardo Daruge Júnior, Lucas Del Virgna Pinheiro Peixoto, Lucas Procopio Meneghetti, Paulo Roberto Neves, João Cesar Barbieri Bedran de Castro, Yuli Andrea López Quintero, Maria Júlia Assis Vicentin, Gracielle Dib Nunes Silva, Ana Flavia de Carvalho Cardozo, Viviane Ulbricht, Vanessa Germano, Larissa Stasiewski, Nivia Cristina Duran Gallassi, Carlos Sassi, Cristhiane Martins Schmidt, Ana Paula Desidó, Brenda Galvão Brudler, Bruna Caroline Pinchiatti, Maria Claudia, Bruna da Costa Guedes de Araujo e Larissa Padovan, satisfaz as exigências do Conselho Nacional de Saúde – Ministério da Saúde para as pesquisas em seres humanos e foi aprovado por este comitê em 30 de janeiro de 2017.

The Ethics Committee in Research of the Piracicaba Dental School, University of Campinas, certify that the project "validating existing models and software development by analyzing measurements of the skull and bone Anthropometry", register number CEP/FOP 136/2014, CAAE nº 38522714.6.0000.5418, of Luiz Francesquini Júnior, Marilia Sousa de Carvalho, Eduardo Daruge Júnior, Lucas Del Virgna Pinheiro Peixoto, Lucas Procopio Meneghetti, Paulo Roberto Neves, João Cesar Barbieri Bedran de Castro, Yuli Andrea López Quintero, Maria Júlia Assis Vicentin, Gracielle Dib Nunes Silva, Ana Flavia de Carvalho Cardozo, Viviane Ulbricht, Vanessa Germano, Larissa Stasiewski, Nivia Cristina Duran Gallassi, Carlos Sassi, Cristhiane Martins Schmidt, Ana Paula Desidó, Brenda Galvão Brudler, Bruna Caroline Pinchiatti, Maria Claudia, Bruna da Costa Guedes de Araujo and Larissa Padovan comply with the recommendations of the National Health Council – Ministry of Health of Brazil for research in human subjects and therefore was approved by this committee on Jan 30, 2017.

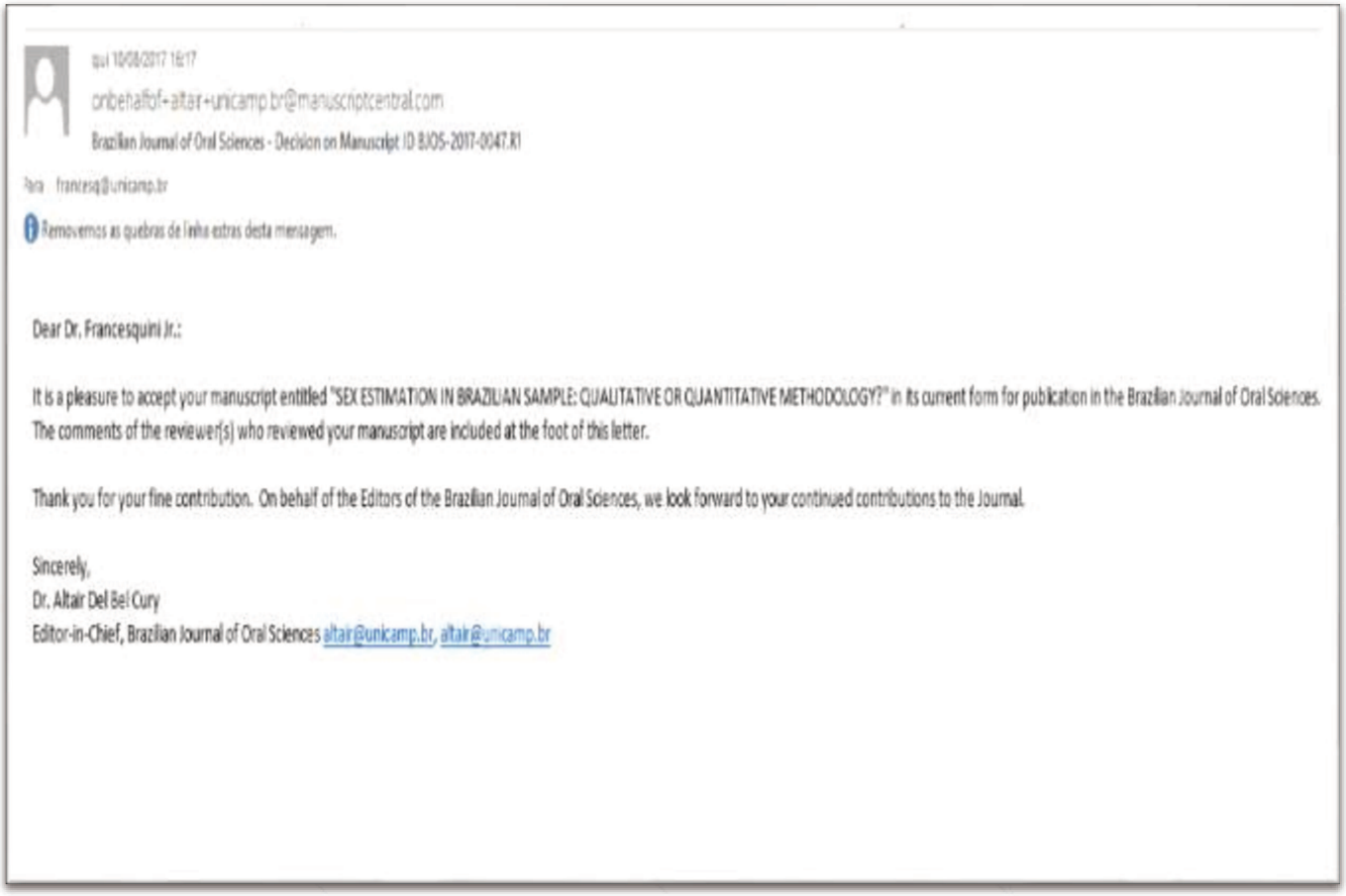
Profa. Fernanda Miori Pascon
Vice Coordenador
CEP/FOP/UNICAMP

Prof. Jacks Jorge Junior
Coordenador
CEP/FOP/UNICAMP

Nota: O título do protocolo aparece como fornecido pelos pesquisadores, sem qualquer edição.
Notice: The title of the project appears as provided by the authors, without editing.

Anexo 2:

Aceite do Artigo para publicação no periódico Brazilian Journal of Oral Sciences



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Brazilian Journal of Oral Sciences - Decision on Manuscript ID BJOS-2017-0047.R1

Para francesq@unicamp.br

Removemos as quebras de linha extras desta mensagem.

Dear Dr. Francesquini Jr.:

It is a pleasure to accept your manuscript entitled "SEX ESTIMATION IN BRAZILIAN SAMPLE: QUALITATIVE OR QUANTITATIVE METHODOLOGY?" in its current form for publication in the Brazilian Journal of Oral Sciences. The comments of the reviewer(s) who reviewed your manuscript are included at the foot of this letter.

Thank you for your fine contribution. On behalf of the Editors of the Brazilian Journal of Oral Sciences, we look forward to your continued contributions to the Journal.

Sincerely,
Dr. Altair Del Bel Cury
Editor-in-Chief, Brazilian Journal of Oral Sciences altair@unicamp.br, altair@unicamp.br