

Differentiation between Eye Shape Database of the males and female's population in Beni-Suef "Egypt"



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Abstract

Background

Face recognition is an enormous field comprised of huge processes of investigation and examination-based methods. Every year the endeavored arrangements develop in multifaceted nature and execution times. Methods: A sum of 100 subjects (49males and 51 females) ranging from 15 to 30 years old were randomly chosen from the population of faculty of medicine, Beni Suef University, Egypt. The eye width and intercanthal distance of each subject were measured for eye shape classification. SPSS analysis suggested that there was significant differences in the types of inter eye distance ($p < 0.05$) amongst the males and females.

There was a statistically significant difference between males and females regarding the mean width of fissure (P -value=0.017) however no statistically significant linear correlation between age and the other estimated measures as width of fissure, interpalpebral distance and intercanthal distance. Also, there was a statistically significant linear positive moderate correlation between width of fissure and interpalpebral distance and intercanthal distance. This study also highlighted that gender plays a significant role across the types of inter eye distance.

Conclusion: An eye shape database representing the males and female's population in Egypt is possible and can be used for forensic identification purpose.

Keywords: Eye Shape, Database, Sex, Egypt

Background

In most recent years, the utilization of observer recognizable proof has assumed an imperative job in catching criminal sunder police examination. With the absence of physical evidence, eyewitness identification and testimony has become a strongly favorable form of evidence in the court of law [1]. During the investigation process involving eyewitness, the eyewitness testimony is required, with the assist of a forensic artist, to make a facial composite of the perpetrator for facial or photographic identification. Facial identification is a process whereby matching is conducted between the composite constructed according to eyewitness description and facial photographs obtained from the criminal database. Before, forensic artists with refined meeting and drawing skills are assigned to do this [2].

Face recognition is a massive field comprised of huge processes of investigation and examination-based methods. Every year the endeavored arrangements ascend in trouble and affecting occasions. Most hard field in the image processing is face detection and recognition system, many methods and techniques have been projected and developed in this regard, but still there is a huge room for new and effective work [3].

The use of eye recognition as biometric identification is often preferred due to its accuracy and reliability. Another advantage is the eyes are protected and remain reliably unchanged for decades as compared to fingerprints that are constantly exposed and liable to damage. As one of the most important features of the human face, eye detection plays an important role in face

recognition and facial expression analysis. As compared to other facial features, eyes are relatively stable feature and thus it is important to notice eyes before the detection of other facial features.

In latest years, extensive amount of research has been carried out to detect, analyze and recognize different human faces and their features. Eye detection applications are used for eye-gaze tracking, iris detection, video conferencing, auto-stereoscopic displays, face detection and recognition, etc. Aside from this, eye recognition can likewise be utilized in the field of security for login purposes and furthermore by police for criminal records. Research in the field of biometrics and particularly in the field of facial recognition have made it computationally attainable to define and carry out eye recognition scientifically, computerize the procedure and thus scan large volume of facial images in brief time frame for simple and brisk recovery of data/features [4].

There are numerous kinds of eyes; shape like wide set eyes which have the inter canthal distance (distance between the eyes) that is bigger than the width of one eye [5]. Previously, contrast, close-set eyes are named those whereby the width of one eye is bigger than the intercanthal distance [6]. Prominent or protruding set eyes are eyes that bulge out far forward from the eye socket and tend to dominate the whole facial component of the individual [7]. The inverse is noted for profound set eyes where the eyes are pushed over into the orbital cavity and gives off an impression of being indented internal [8]. If the eyelid covers with the crease or eye socket of an individual, the individual is said to have hooded eyes [9].

In Malaysia, the utilization of photofit was made known when it was connected on account of hijack, rape and murder of Nurin Jazlin in 2007 and, in the UK, it was utilized in the kidnapping of banker Peter Shaw's case in 2002 [10]. This research looked into gender and age parameters; eye shapes across both genders and also the eye shapes from population ranging between 15 and 30 years old.

Aim of Study

The aim of this work is to study the difference in eye shape between males and females in Egypt in order to establish a primary a database to help in sex identification in the age group

Material and Methods

A total of 100 subjects, 49 Male and 51 females were included in the study. Sample size was calculated and determined from PASS 2008 (platform as a service [11], sample size calculator. Subjects were randomly selected from ophthalmology clinic-faculty of medicine- Beni Suef University ranging from 15-30 years old. Subjects were also required to be of good health with the absence of any hereditary anomalous influencing the eye and have never experienced any eye plastic surgery that could influence the appearance of the original eye shape. During the collection of samples, subjects were required to remove any eye frill, for example, eyeglasses and contact lenses. They were also required to remove any eye make-up. This was to ensure that such artificial accessories do not affect the original appearance of the eye.

Once the subjects had fulfilled all the inclusive factors, they were obligatory fill in a consent letter. After removal of all eye accessories, subjects were then asked to sit upright on a chair with no humpback. A scale measurement ruler was held by the subject's dominant hand beside his/her own eyes to be as a calibrator. Subjects were then asked to be relaxed, ensuring no facial expression that could modify the original eye shape [12].

Eye spacing or intercanthal distance and width of both eyes were measured using a scale measurement ruler for calibration purposes. The measurements were taken in inches (inch) to two decimal places. Measurements were repeated twice, and an average reading was taken. One observer was involved for the measurements as to prevent any inter-values errors. Similar instruments and protocols were applied throughout to amplify consistency of the measurements. The measurements were: Pupillary distance (1), Intercanthal distance (2) and eye width (3) are illustrated in Figure 1.

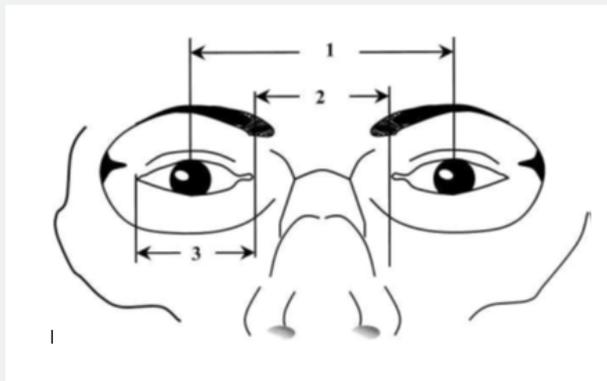


Figure 1: Inter palpebral distance (1), Intercanthal distance (2) and Eye width (width of fissure) (3).

All measurements were recorded in the form of numerical data and displayed in the form of a table. Percentage of each eye shape were calculated and illustrated in the form of a graph. Results were then recorded as nominal data and transferred into SPSS 12.0 [13] for statistical analysis. Normality distribution of the data was tested before parametric tests were conducted. Chi square test of independence ($p < 0.05$) was then used to test the types of inter eye distance among races, sexes and age. Independent t-test was used to evaluate the inter eye distance measurement among sexes.

Results

A total of 100 subjects (49males and 51 females) ranging from 15 to 30 years old were randomly chosen from the population of faculty of medicine, Beni suef University, Egypt.

The eye width and intercanthal distance of each subject were measured for eye shape classification. The mean of the width of fissure was 11.37 with standard deviation 2.8, the mean of the inter palpebral distance was 62.58 with standard deviation 2.76 and the mean of the intercanthal distance was 32.57 with standard deviation 2.48.

Across sex, this study showed that there was a statistically significant difference between males and females regarding the mean width of fissure ($P\text{-value}=0.017$) as shown in Table 1. There was no statistically significant linear correlation between age and the other estimated measures as width of fissure, inter palpebral distance and intercanthal distance. There was a statistically significant linear positive moderate correlation between width of fissure and inter palpebral distance and intercanthal distance as shown in Table 2.

Table 1: comparison between males and females regarding their measured parameters.

		N	Mean	Std Deviation	P-value	t	95% Confidence Interval for Mean		Minimum	Maximum
							Lower Bound	Upper Bound		
Width of fissure	Males	49	30.69	2.7	0.017*	2.42	29.8	31.4	25	35
	Females	51	32.01	2.6			31.2	32.7	28	35
Inter pabepral distance	Males	49	62.34	2.6	0.411	0.83	61.5	63.1	57	68
	Females	51	62.8	2.8			62	63.5	58	70
Intercanthal distance	Males	49	32.43	2.4	0.62	0.5	31.7	33.1	28	39
	Females	51	32.68	2.4			31.9	33.3	29	40

Table 2: Correlations between age, width of fissure, Inter palpebral distance and Intercanthal distance.

		Age	Width of Fissure	Inter pabepral distance	Intercanthal distance
Age	r	1	-0.11	0.008	0.043
	P-value		0.275	0.938	0.672
Width of fissure	r	-0.11	1	.462**	.457**
	P-value	0.275		0	0
Inter pabepral distance	r	0.008		1	.357**
	P-value	0.938			0

Table 3: binary logistic regression model for prediction of sex from Width of fissure.

Independent variable	B	Wald	P-value	OR	95% C. I for OR	
					Lower	Upper
Width of fissure	-0.178	5.4	0.020*	0.837	0.72	0.972
Constant	5.5	5.3	0.021	254.9		

This study featured the types of inter eye distance across sexes (male and female) and age range (15 to 30). It was recognizable that there was no difference in types of inter eye distance between male and female, but they do differ in measurement even within the same type of inter eye distance. Because of presence a statistically significant difference between males and females regarding the mean width of fissure, binary logistic regression was run to predict sex from width of fissure as shown in Table 3 that female is the reference category. Inverting the odds ratio for width of fissure one unit increase in fissure

width will increase the presumption of being female by 1.2. (By another words one unit decrease of the fissure width make the presumption, of being male equal 0.837).

Discussion

Across sex, this study showed that there was a statistically significant difference between males and females regarding the mean width of fissure ($P\text{-value}=0.017$). While in another study there was no significant result for types of inter eye distance between males and females [12].

This was explained by, since the genes that are associated with skin pigmentation in homo sapiens are located on chromosomes 1, 2, 3, 5, 6, 7, 9, 13, 14, 15, 16, 17, 20, 22; and the 23rd pair is the sex chromosome, this could likely indicate that the genes controlling the types of inter eye distance is not present in the sex chromosome. It is likely present in the autosome or even in the Mitochondrial DNA (mt DNA). The absence of correlation of types of inter eye distance between sexes is supported by previous studies that looked into the different loci on the sex chromosome X and Y. For example, hemophilia, high blood pressure, congenital night blindness, Glucose- 6-Phosphate-Dehydrogenase (G6PD) deficiency and color blindness loci was only found in chromosome X, whereas, the Y chromosome contains the loci of the Sex Determining Region Y (SRY) gene [14].

The distinction noted here could be because of hereditary varieties. There are around 3 billion nucleotides in a human body and each individual differs by an average of 2 to 3 million base pairs. Such huge contrasts in the hereditary pool definitely cause some type of varieties among people [15,16] upheld this finding as in their study, 88%-90% of hereditary variety between every person and 10%-12% of variety among various populaces were distinguished. This suggests that the differences in inter eye distance measurement among genders were valid and justified.

Conclusion

Based on the results, these measurements could potentially be a useful tool in the face mapping process during facial reconstruction. The data collected from this study can be used as a preliminary database for further research in the field and Female is the reference category.

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