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RESEACH ARTICLE

FACIAL WIDTH-HEIGHT RATIO AND ITS INFLUENCE ON ACADEMIC PERFORMANCE: A STUDY OF THE NIGERIAN POPULATION

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Abstract
Background: Facial Width-Height Ratio (FWHR) is one of the key elements of facial traits which correlate with general intelligence. The aim of this study is to determine facial width-height ratio and its influence on academic performance of the Nigerian population. **Materials and Methods:** Students from the College of Health Sciences, Bayero University Kano Nigeria were used in the study with sample size of 180. A simple random sampling technique was employed to select the students and their faces were photographed based on the standard protocol and saved in a computer. The photos were later used to measure the facial width and facial height; FWHR was calculated for each subject. The Cumulative Grade Point Average (CGPA) of each student was obtained from the department and was recorded. Pearson's correlation analysis was used to determine the correlation between the FWHR and the CGPA. **Results:** The results showed a negative correlation between FWHR and CGPA with p-value greater than 0.05, thus, indicating that no correlation exists between the FWHR and CGPA. **Conclusion:** Lower facial width to height ratio and relative facial width to height ratio have no significant correlation with student's CGPA.
Keywords: Facial width, Facial height, Cumulative Grade Point Average, Correlation, Students

Introduction

A prolonged face and a broader distance between eyes are some of the key facial elements that were linked to high intelligence. Similarly, broader, and more rounded faces were among facial features linked to low intelligence (Kleisner *et al*., 2014). Lee *et al*. (2017) also found that intelligence and judgements were associated with both stable (e.g., face height) and unstable facial traits (e.g., eyelid openness).

The facial width-to-height ratio (FWHR), i.e, bizygomatic width (facial width) divided by the distance between eyebrows and upper lip (facial height), was reported to be positively correlated with the measures of aggressive behaviour (Třebický *et al*., 2014). However, its relation to the Cumulative Grade Point Average (CGPA) was not known. Facial-width-to-height ratio is a kind of facial feature that is based on the overall facial information and can be specifically measured.

Most of the researchers around the world consider GPA to be the indicator of student performance, over the period of a semester or an academic program (Galiher, 2006).

Anthropometry, especially facial, has been found to correlate with many human behaviors such as aggressiveness, trustworthiness, and others; but whether FWHR correlates with academic performance or not is yet to be documented. There are several factors or traits that affect academic performance of any individuals. For example, gender (Braddock, 1981 Lao, 1980 Abdullah *et al.*, 2008), poor health (Hammer *et al.*, 1998), location (Glass *et. al*., 1982), parents' educational achievements (Washburne 1959, Durden

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and Ellis, 1995), personal behaviour of students towards the studies (Brooks and Rebeta, 1991), past academic performance, age, work done at home, time spent reading in the library, and students' behaviour toward school were found to be the significant factors in the determination of student's performance. A studious effort and a proper use of facilities provided by institutions, effective learning styles, all positively affect the student's performance (Ali *et al.*, 2009).

Despite the old adage not to 'judge a book by its cover', facial cues often guide first impressions, and these first impressions guide our decisions.

This study is aimed at measuring the facial width-height ratio in relation to academic performance of students from the College of Health Sciences, Bayero University Kano (aged from 16-35years). Anthropometric data of the students' faces and their end of session results, CGPA, were obtained to find out if there was any relationship between CGPA and FWHR among the students.

MATERIALS AND METHODS

STUDY POPULATION

A total of 180 students from the College of Health Sciences, Bayero University, Kano (Fig, 1) were used in the study. Apparently, healthy individuals within the study population with no facial deformity or pathological changes were included. Individuals between the age ranges of 18-35 were considered in order to eliminate the effect of age on facial parameters.

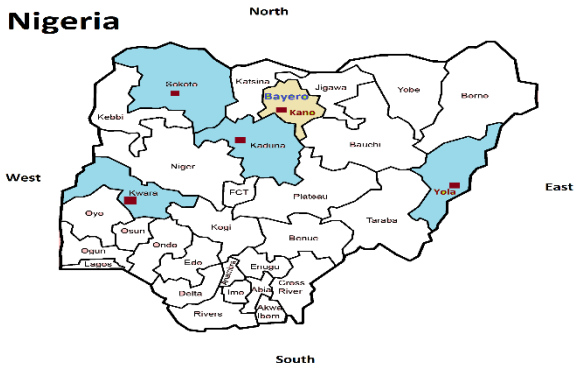

Fig.1: Map of Nigeria showing the location and position of Bayero University, Kano.

FACIAL PHOTOGRAPH

The photographs of face of the subjects were taken using a digital camera (Olympus VG145, China). The camera was mounted on the tripod stand (WT3570, China) for adjustment of the camera according to the height of the subject and to prevent its undesirable movement (Adamu *et al.,* 2017). A chair was then placed in front of the tripod stand at the distance approximately 100 cm and the centre of the chair was directly perpendicular to the centre of the tripod stand (Fig. 2E). These distances were determined by setting the camera to ¾ zoom and adjusting the distance so that a large face was fitted into the shot. Before the photograph was taken, the subject's name, level of study and registration number were recorded, and identification number was given to each subject. Any objects that can interfere with the measurements such as glasses as well as caps were removed from the subject. The subject was then asked to sit on the chair in a comfortable upright position, looking straight ahead, with the head in Broca's natural head position (Ferrario *et al.,* 1993). The captured images were then transferred to personal computer for processing and analysis.

Facial Landmarks, Measurements, and Ratios

Four anatomical landmarks (Table 1) were used for the measurement of both facial width and facial height (Table 2).

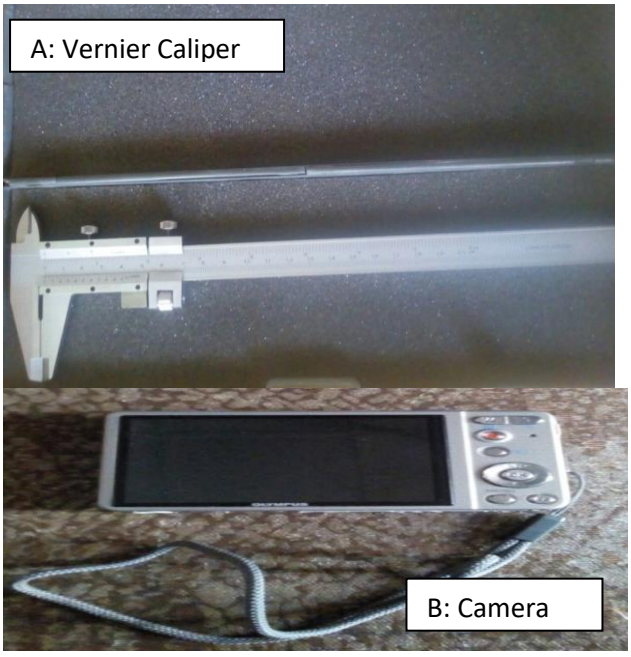

Fig. 2: Materials and Sitting Arrangement

Table 1: Anatomical Landmarks Used for the Measurement of Facial Dimension

S/N	Landmarks	Abr	Anatomical description
1.	Gnathion	gn	It is the lowest point on the lower border of the chin, in the midline.
2.	Nasion	n	This is the midpoint of the nasofrontal suture.
3.	Subnasale	sn	It is the junction between the lower border of the nasal septum and the cutaneous portion of the upper lip, in the midline.
4.	Zygoma	zy	This is the most lateral point on the zygomatic arch.

Statistical Analysis

The data were expressed using mean ± standard deviation. The test for the correlation between LFWHR (Lower Facial Width to Height Ratio) and RFWHR (Relative Facial Width to Height Ratio) and student's CGPA was done using Pearson's correlation. SPSS version 20 statistical software (IBM Corporation, Armonk, NY) was used for the statistical analysis and $P < 0.05$ was set as the level of statistical significance.

RESULTS

The descriptive statistics revealed the mean and standard deviation of each of the measured variables. The means were recorded as follows: lower face height (Sn-gn) was 65.10±7.14, upper facial width (zy-zy) was 120.0±10.9, and the relative face height (n-gn) was 108.1±9.17. (Table 2)

Table 2: Descriptive Statistic of Facial Linear Distance (n=180)

	N	Min.	Max.	Mean ± SD
sn-gn	180	44.770	81.970	65.10±7.14
zy-zy	180	95.390	150.680	120.0±10.9
n_gn	180	82.580	126.670	108.1±9.17

The descriptive statistics revealed facial width to height ratio measurements. The lower facial width to height

ratio wasmeasured as LFWHR=Zy-Zy/Sn-gn (upper facial width over lower face height), and relative facial width to height ratio measured as RFWHR=Zy-Zy/n-gn (upper facial width over relative facial height =where n-gn=n-sn+sn-gn) (Table 3).

Table 3: Descriptive statistics of FWHR measurements (LFWHR and RFWHR) (n=180)

		CGPA	RFWHR
CGPA	Pearson Correlation	1	-.034
	Sig. (2-tailed)		.662
	N	172	172
RFWHR	Pearson Correlation	-.034	1
	Sig. (2-tailed)	.662	
	N	172	180

Pearson Correlation revealed no correlation between RFWHR and the student's CGPA(Table 4). Similarly also, no correlation existed between LFWHR and the student's CGPA (Table 5).

Table 4: Correlation between RFWHR with CGPA

		CGPA	RFWHR
CGPA	Pearson Correlation	1	-.034
	Sig. (2-tailed)		.662
	N	172	172
RFWHR	Pearson Correlation	-.034	1
	Sig. (2-tailed)	.662	
	N	172	180

Table 5: Correlation Between LFWHR with CGPA (p>0.05)

		CGPA	LFHWR
CGPA	Pearson Correlation	1	-.047
	Sig. (2-tailed)		.542
	N	172	172
LFHWR	Pearson Correlation	-.047	1
	Sig. (2-tailed)	.542	
	N	172	180

DISCUSSION

Trait evaluations are connected to a person's facial structure (Wolffhechel *et al.*, 2014). Similarly, intelligence impression was shown to be partially mediated by attractiveness, but independent effects of eyelid-openness and subtle smiling were found to enhance intelligence ratings independent of attractiveness (Talamas, 2016). Previous studies have investigated facial traits and their associations with academic performance and have implicated face height, inter-pupillary distance, nose size, and chin pointedness, as well as eyelid openness (Todorov, 2011).

Theories in both evolutionary and social psychology suggest that a positive correlation should exist between facial attractiveness and general intelligence, and several empirical observations appear to corroborate this expectation. Using highly reliable measures of facial attractiveness and IQ in a large sample of identical and fraternal twins and their siblings, no evidence was discovered for a phenotypic correlation between these traits (Mitchem *et al*., 2015)

The present study does not find relationship between any of the facial traits with academic performance. This is in line with the study of Kleisner *et al*. (2014), who found no association between measured intelligence with some facial traits (face height and inter-pupillary distance). It is known that certain disorders that can involve intellectual impairment are also associated with facial abnormalities (Hammond & Suttie, 2012).

Baldoma *et al.* (2012), in their comparative study of intelligence with facial parameters of Lwama and Pvotta ethnic groups, found no correlation in both ethnic groups, with only nasal length that shows a positive correlation in Pvotta ethnic group. Their findings, therefore, were similar to the findings of the current study which shows no correlation existing between CGPA and measured facial parameters despite the use of CGPA in the current study instead of intelligence in their own study.

However, contrary to the findings of the present study, Helmonth (2007) in Ottawa University found a positive correlation between academic performance of the 2nd year students of the University and their facial anthropometry, even though he argued that facial parameters are highly correlated with the nutritional status which, in turn, correlated with the academic performance, since subjects with a good nutritional status have greater facial height and width and have greater academic performance compared to under-nourished people.

CONCLUSION

The present study conducted to find a correlation between LFWHR (Lower Facial Width to Height Ratio) and RFWHR (Relative Facial Width to Height Ratio) and student's CGPA does not show any correlation between the 2 facial width to height ratios (LFWHR and RFWHR) and academic performance (CGPA).

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Authors' Contributions:
HA; Conceptualization, data collection, drafting of manuscript. SN; Critical appraisal of the manuscripts, MMM; Critical appraisal of the manuscripts, IYA; Data analyses and interpretation

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