Facial Anthropometry and Intelligence Quotient among Students in Some Nigerian Lower Education Institution in Kano

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Abstract

This study was designed to find the relationship between facial anthropometry and intelligence quotient (IQ). The study was conducted on 389 students in Primary School pupils in fagge local government Kano. This number of subject consists of males and female whose face were measured using anthropometric method. The relationship between facial Anthropometry with intelligence quotient was assessed using person correlation. The result of the study indicated statistically no significant relation between facial Anthropometry and IQ at p < 0.05. Also the males were represented on all the intelligence quotient score groupings than the females. A T-test of male and female study variables showed the evidence of sexual dimorphism in all variables with the males having higher values. In conclusion, there is no relationship between facial anthropometry and intelligence quotient.

Keywords: Intelligence Quotient (IQ); Facial Anthropometry; Students

Introduction

The ability to accurately assess another person's intelligence has a place in everyday social interaction and should have important evolutionary implications. Intelligence is defined as the set of cognitive or intellectual abilities required to acquire knowledge and apply that knowledge effectively to solve problems with a well-defined goal and structure [1]. It is more than just book learning, a narrow academic skill, or test taking smart; rather, it reflects a broader and deeper capability for comprehending, catching on, making sense of things, or determining what to do [2]. Individuals differ in their ability to comprehend complex ideas, adapt effectively to their surroundings, learn from experience, engage in various forms of reasoning, and overcome obstacles through thought [3]. Humans can experience and think because they have intelligence [4]. An intelligence quotient, or IQ, is a score derived from one of several different standardized intelligence tests. The scoring of modern IQ tests, such as the Wechsler Adult Intelligence Scale, is now based on standard scoring of the subject's rank order on the test item content, with the median score set to 100 and a standard deviation of 15, though not all tests adhere to that standard deviation of 15 IQ points [5]. IQ scores have been shown to be associated with morbidity and mortality, parental social status, and, to a lesser extent, parental IQ [5]. It has been observed that the average IQ is steadily increasing year after year and all over the world (tendency known as the Flynn effect) [6]. The IQ score is the criterion for assessing and judging individual students' academic achievement and learning outcomes in studies [7].

Anthropometry is the study of measuring the human body in terms of bone, muscle, and adipose (fat) tissue dimensions (Ulajaszek, 1994). It encompasses a wide range of human body measurements. This includes weight, stature (standing height), recumbent length, skinfold thicknesses, circumferences (head, waist, limb, etc.), limb lengths, and breadths (shoulder, wrist, etc.).

Some researchers have discovered a strong link between general cognitive ability and academic achievement. While others reported that prenatal and early nutrition are linked to brain structure, behavior and intelligence [8]. According to a study by Ian., *et al*. (2006), there is a gender gap in educational outcomes. Despite similar cognitive test scores, boys perform worse in school assessments than girls [9]. Age, gender, race, and ethnicity all have an impact on the appearance of the face, which is the most variable part of the human body [10]. Obtaining measurements of the soft tissues of the face is important in terms of achieving aesthetic criteria [11]. One of the most important aspects of facial sexual dimorphism is the area of the face between the eyes [12]. In contrast to several sexually dimorphic facial characteristics such as large jawbones, prominent cheekbones, and longer faces in general, which can be attributed to testosterone activities [13]. The feminine 'full lips' of females with a distinctive high, reddish vermilion zone are considered a marker of high oestrogens to testosterone ratio (Penton-Voak, 2000).

There is a scarcity of data on the relationship between facial Anthropometry and Intelligence Quotient among primary school students in Fagge, Kano State.

Purpose of the Study

The purpose of this study was to collect reference data for facial anthropometry and intelligence quotient among school-aged children in Kano state's Fagge local government area

Materials and Methods

Study area

The research was carried out in Kano state's Fagge local government area. Fagge is a local government area in Kano State, Nigeria, part of the larger Kano area. Its headquarters are in the Waje suburb. It has a land area of 21 km2 and a population of 198,828 people according to the 2006 census.

Study population

A total of 389 students were chosen from various primary schools, both male and female.

Study design and subject selection

Some primary schools were chosen at random. Prior to sampling, the population choose were divided into homogeneous groups based on the sex of the subjects, from which the sampling unit of 389 subjects who met the inclusion criteria and included both males and females were selected.

Inclusion criteria

All male and female Fagge primary school students were eligible to participate in the study.

Exclusion criteria

Students with disabilities, head deformities, and ages below or above the study's target age were excluded from the study.

Ethical approvals

The management of Yusuf Maitama Sule University's faculty of basic medical science in Kano granted ethical approval. After being fully informed about the study, participants were asked to sign an information consent form prior to the start of data collection.

Sample size estimation

The sample size was calculated using a standard formula that takes into account the total population, precision level, confidence interval, and standard deviation.

$n = Z^2PQ/d^2$

Where:

n = Sample size

z = Normal distribution tabled value (1.96)

 d = Detection level considered to be important 5% (0.05)

p = 50% of the total population

Q = 1-P

1 - 0.5 = 0.5

(Biostatistics and Microbiology: A survival manual 2008).

Demographic data collection:

During the course of this study, the following interments were used:

1. Questionnaire

2. Sliding vernier caliper.

3. Cotton

4. Methanol sprit.

Facial anthropometry

The vernier caliper was used to take measurements of facial parameters in order to determine a factor unit, which are special facial height, forehead height, nose length, lower face height, special upper face height, inter ocular distance, nasal width, upper face width, lower face width, mouth height, mouth width, orbital width, orbital length, and biocular width.

Intelligence quotient test

The subject's intelligence quotient (IQ) was assessed using (IQ) test questions, which required the subject to respond to ten sets of questions. The questionnaire includes spaces for bio data such as age, tribe, sex, school, class, and result, as well as a set of ten intelligence questions designed by IQtestexpert.com. The questions were graded and recorded.

Facial linear distances measurement

The facial linear distances were calculated by measuring the distance between two anatomical landmarks. The facial linear distances are shown in the table below.

Statistical analysis

The data was presented as Mean + Standard Deviation using the SPSS version 20.0. To determine the difference between the means, an independent t-test was used. The person correlation method was used to determine the strength of the relationship between the variables. At p0.005, the level of significance was deemed acceptable.

S/no	Facial Linear Distance	Landmark
1	special facial height	en-gn
2	Forehead height	tr-n
3	Nose length	n-sn
4	Lower face height	sn-gn
5	Special upper face height	g-sn
6	Inter ocular distance	en-en
7	Nasal width	al-al
8	Upper face width	zy-zy
9	Lower face width	go-go
10	Mouth height	ls-li
11	Mouth width	ch-ch
12	Orbital width	ex-en
13	Orbital length	ps-pi
14	Biocular width	ex-ex

Table A

Results

Descriptive statistic of age and facial anthropometry

The minimum and maximum age of female subjects were 8 and 14 years respectively, while the minimum and maximum age of male subject were 8 and 15 years respectively. It was observed that there is higher mean value in Upper face width (zy-zy) was observed to have the highest mean value score of 110.9836 ± 51.564, while orbital length (ps-pi) have the lowest mean value score of 15.45 ± 1.83 (Table 1).

Variable	Minimum	Maximum	Mean ± SD
en-gn	71	100	85.98 ± 6.567
tr-n	30	89	52.22 ± 5.633
n-sn	28	73	36.67 ± 3.509
sn-gn	33.00	62.00	47.95 ± 4.91
g-sn	44	83	54.83 ± 4.39
en-en	22	36	27.86 ± 2.39
al-al	23	40	30.53 ± 3.14
zy-zy	10.00	117.00	110.98 ± 51.56
go-go	18	95.48	37.72 ± 43.44
Is-li	12.00	30.00	21.96 ± 3.41
ch-ch	24	98	42.13 ± 4.63
ex-en	20.00	28.94	35.30 ± 145.35
ps-pi	10.00	21.00	15.45 ± 1.83
ex-ex	43.00	110.00	93.66 ± 4.85

Table 1: Descriptive statistic of Age and Facial Anthropometry.

N = 389; en-gn=Special facial height; tr-n= Forehead height; n-sn= Nose length; Sn-gn= Lower face height g-sn= Special upper face height; en-en= Inter ocular distance; al-al= Nasal width zy-zy=Upper face width; go-go= Lower facial width; Is-li= Mouth height; ch-ch= Mouth width; ex-en= Orbital width; ps-pi= orbital length; ex-ex= biocular width.

Descriptive statistic of intelligence quotient

Table 2 show the frequency distribution of pupil's intelligence quotient after the administration of IQ test. It was discovered that the student with low intelligence quotient are about 27.5 percent, those with average intelligence quotient are about 45.2 percent, while those with high intelligence quotient scores are 27.2 percent.

Variables	Frequency (N)	Percent (%)
Average	176	45.2
High	106	27.2
Low	107	27.5

Table 2: *Frequency of intelligent quotient (N = 389).*

Sexual dimorphism in intelligence quotient and facial anthropometry

Table 3 displays the independent sample t-test for the variable's sexual dimorphism. There is a significant difference in en-gn, en-en, al-al, and intelligence quotient.

Variable	Female	Male	t-value	p-value
en-gn	85.07 ± 6.394	86.88 ± 6.63	-2.740	0.006
tr-n	52.75 ± 5.571	51.69 ± 5.66	1.862	0.63
n-sn	36.79 ± 3.852	36.56 ± 3.13	0.645	0.520
sn-gn	47.82 ± 4.90	48.07 ± 4.93	-0.497	0.619
g-sn	54.96 ± 4.92	54.70 ± 3.88	0.586	0.558
en-en	27.54 ± 2.24	27.54 ± 2.24	-2.665	0.008
al-al	30.23 ± 3.18	30.84 ± 3.07	-1.903	0.058
zy-zy	113.31 ± 72.89	108.65 ± 4.49	0.891	0.375
go-go	583.81 ± 6848.59	92.90 ± 4.93	0.998	0.319
Is-li	21.74 ± 3.63	22.18 ± 3.17	-1.272	0.204
ch-ch	41.86 ± 5.43	42.41 ± 3.67	-1.169	0.244
ex-en	42.48 ± 205.81	28.16 ± 3.44	0.972	0.334
ps-pi	15.55 ± 15.56	15.36 ± 15.36	1.041	0.299
ex-ex	93.34 ± 93.34	93.98 ± 93.98	-1.293	0.197
IQ	1.83 ± 0.78	1.99 ± 0.75	2.036	0.042

Table 3: *Sexual dimorphism in intelligent quotient and facial anthropometry.*

N = 389; en-gn= Special facial height; tr-n= Forehead height; n-sn= Nose length; Sn-gn= Lower face height; g-sn= Special upper face height; en-en= Inter ocular distance; al-al= Nasal width; zy-zy= Upper face width; go-go= Lower facial width; Is-li= Mouth height; ch-ch= Mouth width; ex-en= Orbita; ps-pi= Orbital length; ex-ex= Biocular width; IQ= Intelligence Quotient.

Relation between intelligence quotient and facial anthropometry

Table 4 show the relationship between intelligence quotient and facial anthropometry in the subjects. There was no significant relationship between intelligence quotient and facial anthropometry.

Variable	r-value	P- value
en-gn	-0.083	0.102
tr-n	0.026	0.612
n-sn	0.40	0.437
sn-gn	-0.002	0.659
g-sn	0.030	0.559
en-en	0.033	0.511
al-al	-0.099	0.510
zy-zy	0.062	0.221
go-go	-0.060	0.239
Is-li	0.065	0.203
ch-ch	0.002	0.971
ex-en	0.073	0.148
ps-pi	-0.006	0.902
ex-ex	0.032	0.528

Table 4: Relation between intelligence quotient and facial anthropometry.

N = 389; en-gn= Special facial height; tr-n= Forehead height; n-sn= Nose length; Sn-gn= Lower face height; g-sn= Special upper face height; en-en= Inter ocular distance; al-al= Nasal width; zy-zy= Upper face width; go-go= Lower facial width; Is-li= Mouth height; ch-ch= Mouth width; ex-en= Orbital width; ps-pi= orbital length; ex-ex = biocular width; Correlation is significant at p < 0.05.

Discussion

The current findings support the findings of Porter., *et al*. [14] who discovered that African American males had shorter nasal length and wider alar width than white men. The mean mouth width for both genders is similar to that obtained by Ngeow and Aljunid [15], but lower than that observed by Farkas., *et al* [16]. Males were found to have higher IQs than females, though the differences were found to be statistically insignificant. Similarly, Habibollah., *et al*. (2011) found a significant relationship between IQ and gender difference, with males having higher IQ than females. Females, on the other hand, outperformed males in terms of academic performance. Joseph., *et al*. [17] reported similar findings. However, Dania., *et al*. [18] reported contradictory findings, stating that there was no significant difference in academic achievement based on student gender.

The current study found evidence of sexual dimorphism in the population studied. The male population's mean IQ score is higher than the female population's, implying that male children are more brilliant than female children. This is consistent with the findings of Dana., *et al*. [18], Joseph., *et al*. [17] and Zubaidi., *et al*. (2013). There was no link found between intelligence quotient and facial anthropometry. As a result, facial characteristics are not directly related to a high level of intelligence. The findings of this study are similar to those of a previous study conducted by Kleisner., *et al*. [19] which found no correlation between morphological traits and real intelligence as measured by an IQ test, in either men or women. They have argued, however, that the faces of supposed high and low intelligence are most likely nothing more than a cultural stereotype because these morphological traits do not correlate with the subjects' true intelligence.

Conclusion

Based on the findings of this study, there is no relationship between facial anthropometry and Intelligent Quotient. However sexual dimorphism exists intelligence quotient with males having more IQ than females.

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