Use of Facial Dimensions in Prediction of Stature

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Abstract

In the present study an attempt has been made to explore the correlation between stature, and the two facial measurements, i.e. nasal height and ear length among the male and female Rajputs of Himachal Pradesh. Secondly to observe if these facial measurements could be used to reconstruct stature, under the circumstances when only head of an individual is recovered from a remote area and the complete identity is not possible through visual examination. A total of 165 Rajputs (89males and 76 females) in the range from 20 to 40 years were measured for the nasal height and ear length besides stature in accordance with the standard measurement technique (Martin and Saller, 1959). Analysis of data reveals that males have significantly taller with longer nose and ear than the females Both nasal height and ear length have a relatively low correlation with stature for either sex .Ear length among males exhibit greater correlation than the nasal height while among females nasal height exhibits higher correlation than the nasal height. However the error of estimate is greater for both the measurements with females exhibiting lesser error than the males.

Introduction

Stature or body height is one of the most significant and functional anthropometric parameter which determines the physical distinctiveness of an individual. Most of the studies pertaining to estimation of stature have considered long bone lengths only. However there are certain studies reported from different parts of the world on use of other body dimensions than the long bone lengths, like hand length, foot length, palm length and mid-finger length (Allbrook, 1961; Bhavna and Nath, 2006; Nath, 1997; Sethi and Nath, 2001; Singla et. al., 2005; Majumdar et. al., 2006; Sarajlic et al., 2007)

Some researchers have taken into consideration the head and face dimensions for reconstruction of stature, for example head length, head breadth, morphological facial height, total facial height, nasal height and ear length (Kler, et al. 1992; Miyashita and Takahashi, 1971; Jain and Nath, 1999; Krishnan and Kumar, 2006, Tiwary and Nath, 2005; Devi and Nath, 2001). Keeping this in view an attempt has been made to determine the level of relationship between nasal height and ear length with stature and formulate prediction equations for estimation of stature among male and female Rajputs of Himachal Pradesh.

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Material and Methods

Data for the present study comprises of a total of 165 Rajputs (89 males and 76 females) ranging in age from 20-40 years. All the subjects included in the present study belonged to the middle socio-economic status, inhabiting the nearby villages. Following measurements have been obtained on each subject using the standard measurement techniques recommended (Martin and Saller, 1959).

1. Stature (S): It is obtained as the projective distance between the standing surface and the highest point on the head (vertex), using anthropometre rod.

2. Nasal Height (NH): It measures the straight distance between the nasion and subnasion, using sliding caliper.

3. Ear Length (EL): It measures the straight distance between superaurale to suburale, using sliding caliper.

Data were subjected to statistical treatment for assessing the sex differences in the body measurements as well as for computing Multiplication Factors (MFs) for estimation of stature on the basis of these facial measurements

for both the male and the female Rajputs .Subsequently the data on facial dimensions were treated for correlation and regression analysis to formulate sex specific prediction equations for estimation of stature.

Results and Discussion

Nasal height and ear length are not commonly used measurements for reconstruction of stature as both these measurements can be obtained on dead bodies that are not old and the facial skin has not degenerated and the morphology of the face is partly recognizable. Nasal height has been used by a couple of researchers earlier for this purpose bur the ear length is being used perhaps for the first time as a parameter to formulate means of stature estimation.

Table 1 presents the basic statistical constants for stature, nasal height and ear length for male and female Rajputs of Himachal Pradesh. It is apparent from the table that males are not only taller than the females but they have longer nose and ear dimensions too.

On subjecting the data to test of significance (t-test) it is exposed that the sex differences in all the three body dimensions are highly significant (at 0.01% level of significance).

On observing highly significant sex differences data on male and female Rajputs have been treated separately for further analysis.

TABLE 1: Sex differences in different facial dimensions and stature among the Rajputs males and females of Himachal Pradesh

S. No	Body Dimensions	Males(89)		Females(76)		t-Value
		Mean ($\overline{X}$) (cm)	Standard Error Of Mean (S.E.)	Mean ($\overline{X}$) (cm)	Standard Error Of Mean (S.E.)	
1.	Stature (S)	169.19	0.75	156.26	0.65	12.70*
2.	Nasal Height (NH)	5.13	0.04	4.78	0.03	5.96*
3.	Ear Length (EL)	6.08	0.04	5.83	0.03	4.46*

significant at 0.01% level

Table 2 presents the mean M.F. values of nasal height and ear length computed for estimation of stature among male and female Rajputs. It is evident from the table that males exhibit greater M.Fs than the females for both the facial dimensions Females show higher value for nasal height while for ear length males exhibit greater value of multiplication factor.

The different values of multiplication factors for males and females Rajputs of Himachal Pradesh clearly reflect variation in their physique

TABLE 2: Multiplication Factors (M.F.) for estimation of stature through different facial measurements of Rajput males and females

S. No	Body Dimensions	Males	Females
1.	Nasal Height (NH)	33.14	32.82
2.	Ear Length (EL)	27.92	26.83

The regression equations formulated for prediction of height from these two facial dimensions for male and female Rajputs are presented in Tables 3 and 4 respectively. it is evident from these tables that the value of correlation between ear length and stature is greater for males as compared to the females, while the error of estimate (SEE) is lower for females than that of the males.

TABLE 3: Regression Equations for estimation of stature from different facial measurements among male Rajputs

S. No	Body Dimensions	Equations	Standard error of Estimate (SEE)	Correlation value (r)
1	EL	S = 148.67 + 3.37(EL)	±7.03	0.18
2	NH	S = 158.93 + 1.99(NH)	±7.10	0.11

In case of nasal height the situation is reversed as the females express a higher value of correlation with stature than the males, thereby suggesting that the nasal height may be a better indicator for prediction of stature among female Rajputs of himachal Pradesh. This fact is further supplemented by the relatively low value of the error of estimate (SEE) for females than the males.

TABLE 4: Linear Regression Equations for estimation of stature from different facial Measurements among female Rajputs

S. No	Body Dimensions	Equations	Standard error of Estimate (SEE)	Correlation value (r)
1	NH	S =141.9 + 3.0(NH)	±5.67	0.18
2	EL	S =138.3 + 3.0 (EL)	±5.69	0.16

It may be inferred from the present study that both the facial dimensions,, i.e., could be used for prediction of stature under the circumstances when only chopped out head of an individual is recovered from a scene of crime and all the facial features are not indistinct but it is beyond recognition .

Under such circumstances one should conduct the relevant measurements on nose height and ear length and enter these values into concerned prediction equations or use multiplications for reconstruction of stature.

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