Photo identification: facial metrical and morphological features in South African males

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Abstract

Personal identification of individuals is very important in forensic sciences. Facial identification is becoming even more relevant with increasing crime rates, problems with access control and terrorist attacks. To make facial identification more accurate, an in depth knowledge of the common and rare facial characteristics seen in various populations is needed. This will be advantageous when comparing facial photographs. Currently very little data is available on the facial variation of South Africans. Therefore the aim of this study was to analyse the facial features of a group of South African Bantu-speaking men, to determine the common and rare facial features seen in the group. Facial photographs were taken of 200 volunteers from the Pretoria Police College, in the norma frontalis position. The subjects were between 20 and 40 years of age, with no facial deformities. Thirteen measurements were taken directly from the photographs and used in 12 indices. Eight morphological features were also analysed on each face. Each feature was divided into different categories, which described variants of that feature. The metrical and morphological data were then used to create various combinations of facial characteristics that described different regions of the face. The frequency of occurrence of these combinations was calculated for the study population. The most common features were oval or inverted trapezoid facial shapes, intermediate size noses with a down-turned septum tilt and intermediate size mouths with a flat V-shaped upper lip notch (cupid's bow). The eyes were mostly situated closely together. Some of the rare or absent features included round or square facial shapes and narrow noses with an upturned septum tilt. Matching these rare features on facial photographs will be useful during cases of disputed identification.
Key words: Facial identification; photo comparison; facial morphology; combination analysis; photo anthropometry

1. Introduction

People easily recognise each other based on facial characteristics. However, when the identification of a person in a forensic situation is done based on facial features, the situation becomes complex. The immense variation in faces, the difficulty in providing evidence that would stand up in court and inter-observer repeatability are only some of the problems that makes this a very difficult task.

Even as early as the 16th century, phrenologists studied facial morphology in order to identify wrongdoers. The scientists of this century believed that the bumps, shallows and shape of the skull reflected the individual's thoughts, therefore putting the mental and moral standing of the individual under scrutiny. In May 1924 these scientific theories were used in the case against Leopold and Loeb, who killed a 14-year old boy [1]. According to the investigating scientists, 10 "criminal" characteristics were identified on the face of Richard Loeb, leading them to believe that he was, in fact, guilty. Today this line of thinking has, of course, been recognised as totally unscientific.

Facial identification in a modern context involves the study of the face for forensic purposes, using different analytic techniques such as metrical analysis (measurements) [2,3],

morphological analysis (shape of the features) [2-4] and superimposition (e.g., [2-6]). These techniques can be used for comparisons between two facial photographs, or between an actual face and a photograph. The dimensions and characteristics of the face on the two photographs are compared to investigate if it belongs to the same person, or if it can be excluded from being that person. A well-known application regarding this technique is access control systems. These programmes use combination facial analysis (metrical and morphological) to compare an individual to a database of individuals approved to enter a certain area [7].

Another common forensic application for combination facial analysis is with identikit, where a victim or eyewitness compiles the face of a suspect, using morphological as well as metrical characteristics of the face. Photo identification can also be appropriate when using a surveillance camera and facial photograph as comparison. In South Africa, one of these cases involved public violence. In 1998, 2500 people protested outside a building in Sandton, Johannesburg. Damages estimated at R6 million were done to public property, as the crowd got violent. Surveillance cameras in front of the building captured the faces of the unidentified individuals who started the revolt. The individuals were identified from these photographs and 13 were found guilty of public violence.

South Africa is currently plagued by crime and violence, and therefore identification from a photo is a commonly performed procedure in, for example, cases of fraud involving false identity books, bank robberies, etc. From around the period 1994 – 2005 about 253 cases, consisting of a minimum of 628 comparisons, were done (pers comm. Inspector JE Naudé) [8].

Throughout the years research has been done on various faces over the world (e.g., [9-11]). To date, two studies were done on facial morphology in Southern Africa. In the first case facemasks were used to analyse the facial features of the Kuanyama Ovambo and Heikum Bushmen, both found in South West Africa [12]. The second study was done on the urban and rural Venda male population [13]. Here facial morphology was investigated for applications other than classification or identification.

The aim of this study was to analyse the facial photographs of a group of South African males in order to identify common and rare features seen in this population. These features may then be used in cases of disputed identity. Both morphological and metric features are included [8].

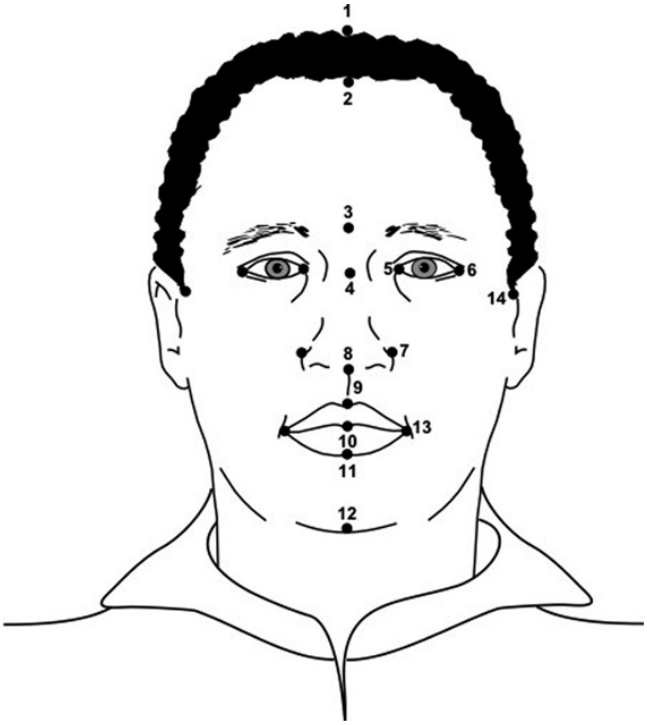

Figure 1 *Biometric landmarks of the face (1=vertex, 2=trichion, 3=glabella, 4=nasion, 5=endocanthion, 6=exocanthion, 7=alare, 8=subnasale, 9=labiale superius, 10=stomion, 11=labiale inferius, 12=gnathion, 13=cheilion, 14=zygion)*

2. Materials and methods

To analyse the facial features of a group of South African males, facial photographs were taken of 200 volunteers. All individuals indicated that their home language was one of the Bantu languages used in South Africa. This was used as an inclusion criterion, to ensure that all participants were black South Africans, and that no Khoisan, Indian or South African white individuals were included. The volunteers were from the Pretoria Police College, coming from all parts of the country, thus theoretically all "ethnic" groups should be represented. All individuals were between the ages of 20 and 40 years. Subjects younger than 20 years were excluded due to continuing growth, while those older than 40 years were excluded because of changes related to old age. People with visible facial deformities were also excluded.

Informed consent was obtained from all subjects. Facial photographs were taken of each of the participants, in the frontal position (norma frontalis), which is also used as a standard for identity documents. To create a standard position for all the photos, the participant's head was orientated in the Frankfurt plane. All the facial photographs were taken in the same conditions, with the camera positioned on a tripod at a fixed distance of 1 m from the backboard. The distance of 1 m was chosen to allow enough space for the participant to move in front of the camera, and is also similar to the distance that is used to take identity book photographs, making the photos comparable. This distance provides a good image of the face, without having to use a zoom function, and also keeps the distortion of the face to a minimum [2]. The photos were taken with a digital camera, at a high resolution.

Table 1

Metrical features (indices) used for facial analysis (gn=gnathion, v=vertex, g=glabella, tr-trichion, n=nasion, zy-zygion, ex=exocanthion, en=endocanthion, sn=subnasale, al-alare, ls=labiale superius, li=labiale inferius, ch=cheilion, sto=stomion)

Index	**Classifications**
Forehead size index 100*g-tr/gn-v	(1) Low ≤21.9 (2) Intermediate 22-28 (3) High ≥28.1
Facial index 100*gn-n/zy-zy	(1) Short, wide ≤78.9 (2) Intermediate 79-92.9 (3) Long, narrow ≥93
Intercanthal index 100*en-en/ex-ex	(1) Close ≤36.9 (2) Intermediate 37-46 (3) Far apart ≥46.1
Nasal index 100*al-al/n-sn	(1) Narrow ≤54.9 (2) Intermediate 55-99.9 (3) Wide ≥100
Nasofacial index 100*n-sn/gn-n	(1) Short ≤37.9 (2) Intermediate 38-46 (3) Long ≥46.1
Nose-face width index 100*al-al/zy-zy	(1) Narrow ≤31.9 (2) Intermediate 32-36 (3) Wide ≥36.1
Lip index 100*ls-li/ch-ch	(1) Thin ≤34.9 (2) Intermediate 35-44.9 (3) Thick ≥45
Vertical mouth height index 100*ls-li/gn-n	(1) Low, thin ≤15.9 (2) Intermediate 16-22 (3) High, thick ≥22.1
Upper lip thickness index 100*ls-sto/ls-li	(1) Thin ≤31.9 (2) Intermediate 32-44 (3) Thick ≥44.1
Lower lip thickness index 100*li-sto/ls-li	(1) Thin ≤51.9 (2) Intermediate 52-62 (3) Thick ≥62.1
Mouth width index 100*ch-ch/ex-ex	(1) Narrow ≤54.9 (2) Intermediate 55-66 (3) Wide ≥66.1
Chin size index 100*li-gn/gn-n	(1) Short ≤19.9 (2) Intermediate 20-29 (3) Long ≥29.1

Table 2

Morphological features used for facial analysis

Morphological features	Facial shape	Jaw line	Chin shape	Upper lip notch	Philtrum	Septum tilt	Nasolabial fold	Nose bridge height
Classifications	Oval (1) Round (2) Square (3) Rectangular (4) Trapezoid (5) Inverted trapezoid (6)	Round pointed (1) Round globular (2) Angular narrow (3) Angular broad (4)	Dimpled (1) Concave mental sulcus (2) Convex mental sulcus (3) None of above (4)	V-shaped (1) Flat V (2) Absent (3)	Deep (1) Shallow (2) Absent (3)	Upturned (1) Intermediate (2) Down-turned (3)	Short (1) Long (2) Absent (3)	Flat (1) Intermediate (2) Ridge (3)

Table 3
Combination facial analysis for the various regions of the face

Region of the face	Metric and non-metric characteristics
Complete face	Facial index Nose bridge height Lip index Jaw line
Upper region of the face (Forehead and nose)	Forehead size index Nose bridge height Nasal index Nasofacial index Septum tilt
Middle region of the face (Nose and mouth)	Nose-face width index Philtrum Upper lip notch Mouth width index
Lower region of the face (Mouth and chin)	Upper lip thickness Lower lip thickness Chin shape Chin size index Jaw line

For the analysis of the photographs, measurements were taken between standard biometric landmarks of the face [8-10;14]. These landmarks are shown in Figure 1. The measurements were taken directly from the photograph, using a digital sliding calliper. They were used as indices, which described the proportions of the face and included the shape of the forehead, nose etc. (Table 1). The way in which the ranges of the indices were determined is described in more detail in Roelofse [8], but broadly speaking existing ranges were used where possible, otherwise the range of the values of the whole study population was divided into equal thirds for each of the indices.

Various morphological characteristics were also assessed on the photographs [3,4,9,11,15]. Each feature was subdivided into different morphological categories as can be seen in Table 2. For example, the nose bridge was classified into flat, having a ridge or being intermediate and the philtrum under the nose as deep, shallow or absent. Where possible, known standards for each of the morphological characteristics were used. Characteristics of the ears and eyes were excluded, because the eye size (opening) was found to be unreliable and the ears could not be clearly visualized on an anterior view. Only features that could be grouped into definite categories, with no overlapping of characteristics, were included. This ensured a better chance of repeatability.

A numerical classification was given to the categories of each of the features (metrical and morphological) to simplify the statistical analyses (Tables 1 & 2). For example, 6 categories were identified for the facial shape (from oval to inverted trapezoid), while the profile of the jaw line had 4 categories (Table 2).

The occurrence of certain combinations of characteristics (metrical and morphological) in the population was investigated. This was done by simply assessing the frequency with which a specific characteristic, or combination of characteristics, occur in this particular population.

Three different regions of the face were investigated separately, namely the upper region of the face (forehead and nose), the middle region of the face (nose and mouth) and the lower region of the face (mouth and chin). This was done so that the data can also be usable should part of the face be obscured.

Table 4

Combination analysis for the complete face. Facial index is represented by the first number in the left hand column, nose bridge height by the second, lip height by the third and jaw line by the fourth

Facial index Nose bridge height Lip index Jaw line	n	%
1123	2	1.00
1211	1	0.50
1221	2	1.00
1222	2	1.00
1223	2	1.00
1224	5	2.50
1322	1	0.50
1323	2	1.00
1324	1	0.50
2111	1	0.50
2112	1	0.50
2121	3	1.50
2122	4	2.00
2123	2	1.00
2124	3	1.50
2131	1	0.50
2211	4	2.00
2213	3	1.50
2214	2	1.00
2221	18	9.00
2222	16	8.00
2223	26	13.00
2224	17	8.50
2231	13	6.50
2232	7	3.50
2233	5	2.50
2234	4	2.00
2311	1	0.50
2312	3	1.50
2313	1	0.50
2314	1	0.50
2321	4	2.00
2322	4	2.00
2323	6	3.00
2324	1	0.50
2331	3	1.50
2332	1	0.50
2333	3	1.50
2334	2	1.00
3111	1	0.50

3123	1	0.50
3124	2	1.00
3134	1	0.50
3221	1	0.50
3222	1	0.50
3223	3	1.50
3224	1	0.50
3231	3	1.50
3233	3	1.50
3314	1	0.50
3321	1	0.50
3323	1	0.50
3332	1	0.50
3333	1	0.50
Total	200	100.00

Metric and non-metric characteristics pertaining to a particular part of the face were thus grouped together in order to assess a specific part of the face (Table 3). The three regions were chosen to ensure that every feature of the face would be analysed. The face as a whole was also analysed.

To investigate intra-observer reliability, a total of 30 randomly chosen photographs were re-measured. Inter-observer repeatability was assessed by another individual/researcher, trained in the field of facial identification, measuring the same 30 photographs. An experienced photographic analyst from the South African Police Service was used. In both cases the data was compared to the initial values and the reliability calculated. Only the measurements were tested for repeatability, as non-continuous data cannot be used for this purpose.

3. Results

The intra-observer reliability for the measurements was calculated using the intra class correlation (ICC) which is bounded by one, thus the closer to one the higher the reliability. The ICC for both the first author (MMR) and the independent researcher varied between 0.8389 and 0.9989, which are all within acceptable limits. Measurements that showed the least reliability were the thickness of the upper lip (ls-sto) and the length of the nose (n-sn). The most reliable measurements were the height of the head (gn-v) and the width of the face (zy-zy).

The inter-rater agreement was calculated to analyse the repeatability between observers. This method calculates the bias by which measurements consistently differ between MMR and the independent observer. Three measurements, namely gn-v (height of the head), zy-zy (width of the face) and al-al (width of the nose) correlated very well between the two observers. Measurements that proved to be the least reliable, again within acceptable limits, included some around the eye (en-en and ex-ex), mouth (ch-ch) as well as the gn-n (morphological height of the face) distance.

As explained above, the frequencies of occurrence of various metric and morphological characteristics of the face were assessed in three different regions of the face (upper, middle,

Table 5

Combination analysis for the upper region of the face. Forehead index is represented by the first number in the left column, nose bridge height by the second, nasal index by the third, nasiofacial index by the fourth and septum tilt by the fifth

Forehead size index Nose bridge height Nasal index Nasofacial index Septum tilt	**n**	**%**
11212	1	0.62
12212	1	0.62
12222	3	1.86
12223	3	1.86
12233	1	0.62
12312	1	0.62
12313	1	0.62
12323	1	0.62
13222	1	0.62
13232	1	0.62
13233	1	0.62
21213	1	0.62
21222	1	0.62
21223	4	2.48
21232	1	0.62
21233	1	0.62
21313	2	1.24
21322	1	0.62
21323	1	0.62
22221	1	0.62
22222	13	8.07
22223	24	14.91
22231	1	0.62
22232	3	1.86
22233	12	7.45
22312	3	1.86
22313	4	2.48
22322	2	1.24
22323	3	1.86
23213	1	0.62
23222	1	0.62
23223	5	3.11
23231	1	0.62
23232	1	0.62
23233	4	2.48
23313	2	1.24
23322	1	0.62
31222	2	1.24
31223	1	0.62
32213	1	0.62
32222	9	5.59
32223	12	7.45
32232	1	0.62
32233	2	1.24
32312	1	0.62
32313	1	0.62
32322	6	3.73
32323	2	1.24
32332	1	0.62
33222	4	2.48
33223	5	3.11
33233	1	0.62
33312	1	0.62
33322	1	0.62
33323	1	0.62
Total	161	100.00

Table 6

Combination analysis for the middle region of the face. Nose-face width index is represented by the first number in the left column, philtrum by the second, upper lip notch by the third and mouth width index by the fourth

Nose-face width index Philtrum Upper lip notch Mouth width index	n	%
1122	1	0.50
1132	1	0.50
1211	2	1.01
1221	8	4.02
1222	4	2.01
1223	1	0.50
1232	2	1.01
1311	3	1.51
1321	2	1.01
1322	7	3.52
1323	1	0.50
1331	1	0.50
1332	2	1.01
2112	1	0.50
2121	2	1.01
2122	1	0.50
2211	3	1.51
2221	24	12.06
2222	15	7.54
2231	1	0.50
2232	1	0.50
2311	6	3.02
2312	3	1.51
2321	22	11.06
2322	22	11.06
2331	7	3.52
2332	6	3.02
3122	1	0.50
3131	1	0.50
3211	2	1.01
3212	2	1.01
3221	6	3.02
3222	9	4.52
3311	1	0.50
3312	2	1.01
3321	14	7.04
3322	8	4.02
3332	4	2.01
Total	199	100.00

Table 7

Combination analysis for the lower region of the face. Upper lip thickness is represented by the first number in the left column, lower lip thickness by the second, chin shape by the third, chin size index by the fourth and jaw line by the fifth.

Upper lip thickness Lower lip thickness Chin shape Chin size index Jaw line	n	%
13312	1	0.54
13321	1	0.54
13323	1	0.54
13411	1	0.54
13412	1	0.54
13413	3	1.61
13414	2	1.08
13421	5	2.69
13422	1	0.54
13423	2	1.08
13424	1	0.54
21222	1	0.54
21414	1	0.54
21421	1	0.54
22113	1	0.54
22124	1	0.54
22133	1	0.54
22212	1	0.54
22214	1	0.54
22222	1	0.54
22223	1	0.54
22311	2	1.08
22312	2	1.08
22313	3	1.61
22321	1	0.54
22322	1	0.54
22323	2	1.08
22324	4	2.15
22411	5	2.69
22412	5	2.69
22413	9	4.84
22414	3	1.61
22421	15	8.06
22422	7	3.76
22423	15	8.06
22424	13	6.99
22432	1	0.54
22433	1	0.54
22434	1	0.54
23111	1	0.54
23223	1	0.54
23312	1	0.54
23321	2	1.08
23323	2	1.08
23411	3	1.61
23413	3	1.61
23421	5	2.69
23422	5	2.69
23423	2	1.08
23424	2	1.08
23433	1	0.54
31331	1	0.54
31334	1	0.54
31412	2	1.08
31421	8	4.30

31422	2	1.08
31423	2	1.08
31424	1	0.54
31431	1	0.54
31432	1	0.54
32324	1	0.54
32412	1	0.54
32414	2	1.08
32421	4	2.15
32423	6	3.23
32424	1	0.54
32433	1	0.54
32434	4	2.15
Total	186	100.00

lower), as well as for the whole face. The frequencies of the various permutations are seen in Tables 4 – 7. Many permutations did not occur at all, and are not shown in the tables.

For assessing the whole face, two indices and two morphological features were used. These include in order, from left to right in Table 4, left column, the facial index, nose bridge height, lip index and jaw line. The most common permutation was 2223 (13%; 26/100) while 9% (18/200) had a 2221 permutation, which was thus the second most frequent permutation. The only difference between these two permutations is in the jaw line. In both permutations the facial index was mesoproscopic (intermediate) and the nose bridge and lip index intermediate. For the 2223 permutation the jaw line was classified as angular narrow and for the 2221 permutation as round pointed. Not all the possible permutations are shown in Table 4. A total of 53 permutations were not present in the study population at all, and can thus be seen as rare combinations of facial characteristics. Mesoprosopic (intermediate) faces with intermediate nose bridges and lip indices (thus combinations starting with 222) were very common and accounted for 38.5% of the whole sample.

Three indices and two morphological features were chosen to assess the upper region of the face (Table 5). These include the size of the forehead, nose bridge, nasal index, nasofacial index and the septum tilt. Only 161 subjects could be classified using the upper region of the face, as the size of the forehead could only be measured from 161 subjects due to a receding hairline. From Table 5 it can be seen that a large group of the population had a 22223 permutation (14.9%; 24/161). This means that all the features were classified as "intermediate" except the septum tilt, which was classified as down-turned. For this region of the face a total of 185 permutations were not present in the study population and these can once again be seen as rare combinations for this region.

To classify the middle part of the face, two indices and two morphological features were chosen (Table 6). These include the nose-face width index, philtrum, upper lip notch (cupid's bow) and the lip index. Only 199 subjects could be classified as one subject had a moustache. The most common permutation for the population was a 2221 combination (12.1%; 24/199), closely followed by 2321 and 2322 permutations (both 11.1%; 22/199). The first permutation (2221) means that the width of the nose is intermediate in relation to the width of the face, the philtrum is shallow, the upper lip notch is flat V-shaped and the relationship between the width of the mouth and the biocular diameter of the eyes is narrow. The 2321 permutation differs from the previous combination as the philtrum is now classified as being absent. The 2322 combination differs from the former combinations, as the

relationship between the width of the mouth and the biocular diameter of the eyes are now intermediate. For this region 43 combinations were not present, thus being rare.

Three indices and two morphological features were chosen to assess the lower part of the face (Table 7). These include the thickness of upper and lower lip, the morphology of the chin, the size of the chin and the jaw line. Only 186 subjects were classified with this combination, as the morphology of the chin was included. The morphology of the chin could not be determined in 14 subjects, due to receding chins and shadows on the relevant area. Permutations starting with 2242 were very common, and accounted for 26.9% of the population. This means that many people have average (intermediate) sized lips, no distinctive morphology on the chin and an intermediate size chin.

4. Discussion

The presence or absence of a combination of characteristics as described in this study can be used when the need arises to positively link a photograph of a suspect with the photograph or facial image of a known individual. This is similar to the concept of pattern association used by forensic dentists in bite mark analysis (e.g., [16]). If an unusual or rare combination of characteristics is seen on both the photograph and in the suspect, it can be said with a fair degree of certainty that this is the same individual. Conversely, if all the observed characteristics are deemed to be "common" in this population group, no decision can be made with regards to the identity. Of course, this method should be used in conjunction with other methods such as detailed morphological analysis, and can never be as accurate as when a specific factor of individualization is found. It would also be better for exclusion that inclusion. It is also necessary that these morphological and metric descriptions be tested on photographs with the head in different orientation, to see which of these characteristics are repeatable in conditions which are not ideal.

The sample size in this study was 200, but it is quite possible that not all of the human variation seen in African males is represented in this group, and the data base should be expanded.

Throughout the analyses it was sometimes difficult to exactly locate the landmarks. The shape of some of the participants' faces obscured certain landmarks, due to shadows. Other landmarks in the study were either concealed or destroyed by the presence and absence of hair respectively. These included the philtrum, where the presence of hair (moustache) made the classification of the feature (landmark) impossible. The trichion, on the other hand, could not be identified due to the absence of hair.

The use of indices rather than actual measurements minimizes the effects of distortion in photographs [10], differences in size between images, and measurement errors as it is only necessary to place the individual in one of three categories. Thirty photographs were re-measured by the same and another researcher, and the measurements were found to be repeatable. The ideal way in which to assess repeatability would, of course, be to obtain another photograph of the same individual taken at a different occasion and at different facial angles.

When considering the morphological analysis of the face, the most common facial shapes for the study population were oval (30%), inverted trapezoid (29%) and rectangular (25%) shapes. When analysing the chin, it was found that with most of the subjects (81%), none of the special morphological features described for the chin area was present. Only 14% of the study population had a convex mental sulcus present on the chin area. Looking at the septum tilt, it was found that a large group of the study population had a down turned septum tilt (62%). In most of the subjects the philtrum was absent (56%).

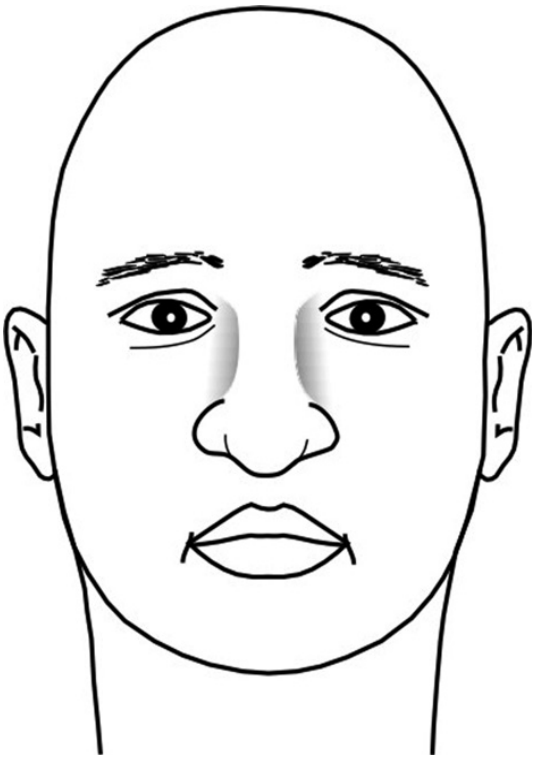

Figure 2 *Reconstruction of a face with common characteristics. Note the oval face, no special morphological features for the chin, down turned septum tilt, absent philtrum, flat V-shaped upper lip notch, absent nasolabial fold (76%) and intermediate nose bridge.*

Other common morphological features included a flat V-shaped upper lip notch (74%), an absent nasolabial fold (76%) and an intermediate nasal bridge (69%). The most variable feature for the morphological analysis was the jaw line. A reconstruction of a face with common characteristics is seen in Fig. 2. Unfortunately ethic clearance for this study prohibits the publication of any actual photographs. Some of the rare morphological characteristics included a round (1%) and square (5%) facial shape, dimpled chin (2%) and an upturned septum tilt (3%). A deep philtrum (4%) as well as a long nasolabial fold (9%) were also rare features for the study population. A reconstruction of a face with uncommon features is seen in Fig. 3. Looking at the combination analysis, the most common features for the study population included a mesoproscopic (intermediate) face, flat V-shaped upper lip notch, a shallow to absent philtrum and a down turned septum tilt. These features were thus common.

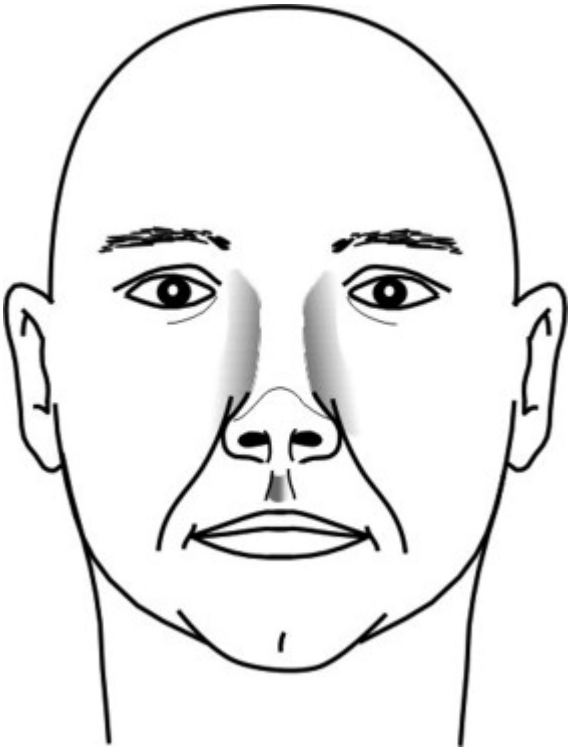

Figure 3 *Reconstruction of a face with uncommon characteristics. Note the round facial shape, dimpled chin, upturned septum tilt, deep philtrum and long nasolabial fold.*

Other combinations that were present in the study population, but not as common as the previously mentioned, were an intermediate size forehead, mesorrhine (intermediate) nose, an intermediate length and width nose in relation to the length and width of the face, intermediate lips in relation to the width of the mouth, intermediate upper lips and intermediate to thick lower lips. Less common combinations included a narrow to intermediate relation between the width of the mouth and the lateral distance between the eyes, as well as an intermediate size chin. These features were thus uncommon.

The rare combinations in the population, some not present at all in the study population, were an euryproscopic (short, wide) or a leptoproscopic (long, narrow) face, a low forehead, a leptorrhin (narrow), long nose and a deep philtrum. Other rare combinations also included thin lips in relation to the width of the mouth as well as very thick lower lips. Very thin upper lips with an absent upper lip notch and long chin were also uncommon.

At present facial identification is mostly used for purposes of exclusion, rather than as a positive identification method. Due to the huge facial variation seen in humans, changes in facial morphology with age, problems with facial expression, often poor quality of photographs etc., this procedure will probably stay problematical. With continuous research in the field, it may eventually be developed to provide positive identification for all disputed cases, but more research is needed.

5. Conclusion

In this paper the rare and common facial characteristics in a group of Bantu-speaking South African men were identified. Although this will, without doubt, not provide the final solution to the problem of facial identification, it does provide a platform from where to analyse facial photographs in an orderly fashion. It will help the analyst to work from more common to less common facial characteristics, in order to isolate the strong points in such a comparison. A larger database and relevant case studies are now needed in order to take this method forward.

Acknowledgements

The authors would like to thank the South African Police Service and the Pretoria Police College for permission to conduct this study. We are also especially indebted towards the volunteers who allowed us to take and use their photographs. Their anonymity will be ensured by not publishing any photographs. M Loots and AE van der Merwe assisted with the photographs. We are also very grateful for the help and advice of Insp Jeanette Naudé of the SAPS. Funding was through Navkom and the NRF.

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