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An Odontometric Investigation of the Affinities of the Nazlet Khater Specimen to Prehistoric, Protohistoric and Modern African Populations

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ABSTRACT This study scrutinizes the affinities of a 33,000-year-old skeleton from Nazlet Khater, Egypt, to various prehistoric African populations. The comparative material consists of 231 individuals, ranging in time from the Middle Pleistocene to recent and restricted in space to the African continent and Southern Levant. Possible affinities were first examined with the application of univariate, and bivariate, statistics. Subsequently, principal components analysis and cluster analysis are performed on mean data from 29 populations, utilizing a selected set of tooth dimensions. The results indicate a strong association between some of the sub-Saharan Middle Stone Age (MSA) specimens and the Nazlet Khater skeleton. No clear discrimination was reached between the various African and Levantine populations. The significant differences between male and female mean data factor scores on the first principal component indicate that sexual dimorphism accounts for a large portion of the observed variability in size.

INTRODUCTION

Comparative studies which attempt to discriminate between human populations on the basis of odontometric data are generally unsuccessful (Kieser, 1990). Comparisons on a tooth-to-tooth basis cannot transcend intra-population variability. Univariate and bivariate statistical analyses that operate on one and two dental measurements, respectively, fail to provide clear discrimination between the populations being studied. However, the introduction of multivariate statistical techniques granted researchers improved methods with which they can: 1) discriminate between populations and individuals based on a large set of dental measurements, 2) allocate a given individual to a specific group/population, 3) study the relationship between the various dental dimensions, and 4) study the role and extent of sexual dimorphism on certain teeth.

This study scrutinised the affinities of a 33,000-year-old specimen from Nazlet Khater, Egypt, to prehistoric, protohistoric and modern African populations based on an extensive set of odontometric data. The analysis was conducted in two steps. First, univariate, and bivariate statistics were applied to a data set of 231 protohistoric and historic specimens from Africa and Southern Levant. The specimens were divided into ten groups based on geographic and temporal criteria. Second, principal components analysis and cluster analysis were performed on calculated mean data for three of the groups and published mean data for 26 African and Levantine populations. The analysis utilized a set of variables (tooth dimensions) that were chosen on the basis of results obtained from the univariate and bivariate analyses. Lastly, this study investigated the effect of sexual dimorphism on the first and second principal components.

MATERIALS AND METHODS

The Nazlet Khater Skeleton

The Nazlet Khater skeleton was found in a narrow grave at the summit of the Nazlet Khater 2 site, during the 1980 excavation season (Vermeersch *et al.*, 1984c). The skeleton was found on its back in an extended position with a bifacial axe underneath its cranium. During the following season, Vermeersch and his team discovered the nearby Upper Paleolithic mining site of Nazlet Khater 4. In 1982, nine C^{14} dates, ranging between 35,100 to 30,360 yrs.

were obtained from hearth structures and four samples from dispersed charcoal (Vermeersch et al., 1984b,c). According to Vermeersch and co-workers (1984a,b,c) the bifacial axe found in the grave of the skeleton is typologically identical to some of the bifacial axes recovered from the nearby Upper Paleolithic mining site of Nazlet Khater 4. Based on such typological association and the obtained C14 dates from the Nazlet Khater 4 site, the skeleton was assigned an age of 33,000 years. Attempts to directly date the skeleton were futile as no collagen was preserved in the bones (Vermeersch, 1984a,c).

COMPARATIVE MATERIAL

The comparative material consists of over 231 individuals, ranging in time from the Middle Pleistocene to recent and restricted in space to the African continent and the Central and Southern Levant. The majority of dental dimensions were collected from the literature. The author measured the teeth of the Nazlet Khater, Ishango B, and Ein-Gev 1 specimens. The Ohalo I, and II measurements were given by Prof. Hershkovitz (1997, pers. comm.).

SELECTION CRITERIA

The main aim was to gather a statistically significant sample of Middle/Upper Pleistocene and Early Holocene specimens from Africa and the Southern Levant (Israel and Sinai) with which the Nazlet Khater specimen may be associated. Lower Pleistocene and early to mid Middle Pleistocene hominids were excluded, as the Nazlet Khater is indisputably anatomically modern *H. sapiens*. The temporal boundary for the inclusion of specimens was set at less than 500 kya (500,000 B.P.). All specimens are either *H. sapiens* or late *H. erectus*. The study also excluded specimens from non-African or non-Levantine geographic locations. In the case of specimens that lacked a secure date, selection was based solely on geographic location.

When possible, specimen measurements were compared between various publications. However, in most cases only one set of measurements were taken and published in the original fossil description or site report. Thus, it was necessary to be as critical as possible in regards to the published measurements. Any published measurements of doubtful accuracy and precision were excluded.

METHODS OF DENTAL MEASUREMENTS

A review of the prevalent odontometric literature indicates the existence of a number of methods of taking tooth size measurements. The most commonly applied technique is that proposed by Moorrees (1957), according to which the greatest mesiodistal dimension of the crown is measured parallel to the occlusal and labial surfaces. The buccolingual distance is then taken as the maximum dimension in a plane perpendicular to the plane in which the mesiodistal diameter was measured (Kieser, 1990). Hillson (1996) points out that this definition is unclear for the

TABLE 1. Measurements of the Nazlet Khater teeth from the original and casts (in mm).

	Mesial-Distal			Buccal-Lingual		
Maxilla	Fossil	Cast	% Difference	Fossil	Cast	% Difference
Central	7.42	7.35	0.94	6.11	5.98	2.13
Lateral incisor	7.16	6.79	5.17	6.27	6.20	1.12
Canine	6.36	6.37	0.16	8.72	7.63	12.50
First Premolar	6.71	6.64	1.04	9.93	9.53	1.04
Second	5.93	6.84	15.35	9.65	9.80	1.55
First Molar	10.53	10.22	2.94	11.93	11.89	0.34
Second Molar	9.60	9.99	4.06	13.01	12.77	1.84
Third Molar	9.60	9.59	0.10	12.70	11.46	9.76
Mandible						
Central	5.02	5.74	14.34	6.55	6.00	8.40
Lateral Incisor	6.21	6.40	3.06	6.46	6.26	3.10
Canine*	5.26			8.34	8.02	3.84
First	6.82	7.22	5.87	8.44	8.26	2.13
Second	6.51	7.21	10.75	8.66	8.84	2.08
First Molar *	11.71	10.29	12.13	11.73	11.88	1.28
Second	11.17	11.52	3.13	11.06	10.92	1.27
Third Molar*	11.16	11.95	7.08	11.16	11.27	0.99

* indicates left tooth measured

case of rotated teeth. In such cases, the measurement of the crown should be taken as though it were in normal anatomical position (Wolpoff, 1971; Hillson, 1986).

The above measuring technique was applied to the Nazlet Khater (original and cast), Ishango B, and the Ein-Gev 1 cast. Measurements were always taken three times in order to reduce intra-observer error. Each of the reported measurements is, therefore, the mean of the three trials. In instances where the difference between the three measurements was considered too large, tooth dimensions were re-measured. Only right dental diameters were used in order to standardize the compiled set of data. In cases in which the right tooth dimensions were unavailable or inaccurate due to the fragmentary condition of the reported fossil or other skeletons or a high degree of dental attrition, the corresponding left tooth dimensions were used instead.

LEVEL OF MEASUREMENT ERROR

A great contention exists regarding the level of error in teeth measurements. Authors, such as Hillson (1996) and Calcagno (1989), suggest an error figure around 0.1 mm, while Wolpoff (1971) argues for a much higher figure of 0.5 mm. However, the level of error is significantly higher in the case of severe occlusal and/or interproximal attrition. Calcagno (1986) noted in his study of dental metric trends of Post Pleistocene Nubian populations, a higher

TABLE 2. Sources of mean-score data utilized in the principal components analysis.

Sample	Location	Period, absolute date	Reference
Sub-Sahara			
Mapungubwe	South Africa	Iron Age	Wolpoff (1971)
Bambandtanalo	South Africa	Iron Age	Galloway (1959)
Sanga	Zaire	Iron Age	Orban *et al.* (1988)
Late Stone Age	sub-Sahara	Late Stone Age	Present data
Middle Stone Age	sub-Sahara	Middle Stone Age	Present data
Teso	Teso, Uganda	Contemporary	Barnes (1969)
Griqua	South Africa	Contemporary	Keiser (1985)
San	South Africa	Contemporary	Keiser (1985)
South African Negro	South Africa	Contemporary	Keiser (1985)
Egypt, Sudan			
Site 117	Jebel Sahaba, Sudan	Late Paleolithic, 12,000 BP	Anderson (1968)
Wadi Halfa	Wadi Halfa, Sudan	Late Paleolithic 8,000-11,000 BP	Green *et al.* (1967)
Late Paleolithic, Nubia	Northern Sudan	Late Paleolithic 12,000-9,000 BP	Calcagno (1986)
Agricultural Nubia	Northern Sudan	A and C groups and Pharonic Horizon 5,000-3,100 BP	Calcagno (1986)
Intensive Agricultural Nubia	Northern Sudan	Merotic, X, and Christian Periods 2,000-600 BP	Calcagno (1986) Rousset (1981-1982)
Soleb	Soleb, Sudan	4065-1,700 BP	Rousset (1981-1982
Mirgissa	Northern Sudan	Middle Kingdom	Rousset (1981- 1982)
Upper Egypt Neolithic	Upper Egypt	Neolithic	Rousset (1981-1982)
North Africa, Sahara			
Afalou-bou Rhumel	Algeria	Epipaleolithic	Caillard (1978)
North Africa Middle Paleolithic	Morocco	Late Pleistocene	Present data
Modern Moroccans	Northern Algeria	Contemporary	Gambarotta (1987)
Upper Capsian	Northern Algeria	Epipaleolithic	Present data
Neolithic Sahara	Sahara	Neolithic	Present data
Near East			
Hatoula	Israel	Neolithic	Smith &Verdene (1994)
Abou Gosh	Israel	Neolithic	Arensburg *et al.* (1978)
T. Mureybeit	Syria	Neolithic	Arensburg *et al.* (1978)
Jerico	Israel	Neolithic	Arensburg *et al.* (1978)
Natufian	Israel	Epipaleolithic	Smith &Verdene (1994)
Levant-Bronze Age	Israel	Bronze Age	Smith *et al.* (1984)
Qafzel	Israel	Middle Paleolithic	Vandermeersch (1981)
Skuhl	Israel	Middle Paleolithic	McCown & Keith (1939

level of observer error for the mesiodistal diameters than for the corresponding buccolingual dimensions. In comparing his results to the previously published measurements by Greene and co-workers (1967), he found an average difference of 1.7% for the buccolingual measurements as opposed to 4.4% for the corresponding mesiodistal dimensions. Calcagno suggested that such variability is the result of different standards regarding the degree of wear between the teeth.

A similar trend was observed in this study in regards to the dental dimensions of the Nazlet Khater specimen. The original measurements were compared to the cast and results are given in Table 1. The percentage of difference is given for each pair of measurements. The average level of error for the maxillary teeth is 3.72% for the mesiodistal diameter, and 3.79% for the corresponding buccolingual diameter. The mandibular teeth have a high average level of error for the mesiodistal diameter (8.05%) and a lower corresponding level of error for the buccolingual diameter (2.88%). The greatest difference is 15.35% for the mesiodistal diameter of upper fourth molar, followed by 14.34% for the mesiodistal measurement of lower central incisor. High differences were also found between the dimensions of the original and cast for the mesiodistal diameters of lower fourth premolars and first molars, and buccolingual diameters of lower fourth molars and upper third molars.

Such discrepancies are the result of one or more of the following factors. Firstly, all the specimen's teeth were in a severe state of attrition. Thus, it often difficult to locate two reliable points on the crown from which the mesiodistal dimension could be measured. Secondly, all of the posterior teeth were subject to dental crowding. Therefore, in the case of some posterior teeth, placement of the sliding calipers between the adjacent teeth was impossible. This resulted in a high level of error for the mesiodistal dimensions of certain teeth. Thirdly, the cast teeth dimensions may be inexact due to their low quality. Therefore, the possibility exists that 1) a much higher level of error occurred for mesiodistal measurements than the level of error for the buccolingual dimensions due to dental crowding and inter-proximal attrition; and 2) the level of measurement error in the case of severely worn teeth fluctuates between 0.3 to 1.4 mm, with an average which is close to the estimate of 0.5 mm proposed by Wolpoff (1971).

STATISTICAL METHODS

The dental metric data set is divided into the following ten groups: Group 1: Africa Middle Stone Age (MSA), Group 2: North African Middle Paleolithic, Group 3: sub-Saharan Late Stone Age (LSA), Group 4: sub-Saharan Iron Age, Group 5: Late Paleolithic / Neolithic Egypt, Group 6: Levant Late Paleolithic / Neolithic, Group 7: Levant Early Moderns, Group 8: North Africa Epipaleolithic / Neolithic, Group 9: Neolithic Sahara, Group 10: Protohistoric Sahara.

Univariate analyses were performed on the groups prior to the application of principal components analysis and cluster analysis. The univariate analyses consist of 1) analysis of variance - One-way and Scheffe Range tests, and 2) non-parametric test - Kruskal-Wallis. Subsequently, the mesiodistal and buccolingual dimensions for a specific tooth were plotted in a bivariate scatter plot. The position of the Nazlet Khater specimen, and other individuals was then marked, and the spread pattern and similarities within and between the various groups were analyzed.

The last and central part of the analysis involved the application of principal components and cluster analyses. The multivariate technique of principal components analysis is usually applied for the purpose of data reduction and decorrelation of the variables. However, principal components analysis can also be applied as an exploratory tool in the search for underlying "latent" structures (Harris and Bailit, 1988). In this study principal components analysis is utilized as an exploratory tool for the detection of affinities between the studied individuals/populations. Based on the results of the univariate and bivariate analyses it was possible to choose a subset of teeth

TABLE 3. Mean scores and standard deviations obtained from the principal components analysis.

Tooth*	Dimension	Mean	Standard Deviation
First premolar	Mesial-distal	7.230	0.421
Second premolar	Mesial-distal	9.239	0.414
First molar	Mesial-distal	11.397	0.571
Canine	Bucco-lingual	7.841	0.541
First premolar	Bucco-lingual	8.281	0.547
Second premolar	Bucco-lingual	8.548	0.528
First molar	Bucco-lingual	10.975	0.575

*All lower teeth

TABLE 4. Eigenvalues

Principal Component	Eigenvalue	% total variance	Cumulative Eigenvalue	Cumulative %
1	5.58	79.67	5.58	79.67
2	0.64	9.13	6.22	88.81

TABLE 5. Factor Loadings (unrotated)

Tooth*	Dimension	Factor 1	Factor 2	Factor 3
First premolar	Mesial-distal	0.891	-0.307	-0.237
Second premolar	Mesial-distal	0.891	-0.365	-0.102
First molar	Mesial-distal	0.925	-0.172	0.157
Canine	Bucco-lingual	0.829	0.446	-0.283
First premolar	Bucco-lingual	0.921	0.250	-0.005
Second premolar	Bucco-lingual	0.949	0.0045	0.113
First molar	Bucco-lingual	0.913	0.125	0.316
Explained variance		5.712	0.536	0.284
Proportion of total		0.816	0.077	0.041

*All lower teeth

dimensions (variables), and as a consequence the dimensions of certain teeth, such as the second and third molars, were excluded due to their poor value as population discriminators. Various trials were conducted on the available subset in order to choose the most powerful discriminatory set of measurements. It was clear from the univariate analysis that only independent variables should be applied since redundancy would increase noise and decrease discrimination between the individuals. Important to note is that maximal discrimination can be best reached in as few variables as possible. The inclusion of a large set of variables increases the role of adverse sampling effects and noise, reducing the discriminatory power of the analysis (Van Vark and Schaafsma, 1992). The final set of variables was selected, as it is believed to provide the best discrimination between individuals from specific geographic locations.

No clear pattern of segregation or clustering was detected among the specimens. However, a large amount of bias was detected in the structure of the data set and is believed to be the consequence of the following factors: 1) The sample size for particular measurements (e.g. incisors) was too small. 2) There is unequal contribution of certain groups to the sample size of a specific tooth dimension. For example, there is hardly any data for the maxillary teeth of the MSA group. Similarly, due to the common practice of dental mutilation among Northwest African prehistoric cultures, no data was available for the central incisor dimensions for the Epipaleolithic/Neolithic North African group. 3) Certain groups were under-represented due to the scarcity of finds. Unfortunately, this difficulty could not be overcome, as the addition of individuals to under-represented groups was not possible.

The best solution was to conduct the statistical analysis on available mean-score data. Mean-score data includes mean scores for three of the groups (North African Middle Paleolithic, Late Stone Age, Middle Stone Age) pooled with mean scores for 26 African and Levantine populations. The archaeological period, absolute date (when available) and geographic location for the various mean scores is given in Table 2. Unfortunately, mean scores for the three groups and the majority of the pooled data is not sexed. Including only sexed data was unfeasible since it would have resulted in a drastic reduction in the number of available mean-scores. Moreover, many of the 'North African Middle Paleolithic', and 'Middle Stone Age' specimens consist of a partial mandible/maxillae which could not be sexed by any reliable sexing technique. However, sexed data was available for seven of the 29 populations and was incorporated into the principal components and cluster analyses.

Subsequently, various trials were conducted on the data set using principal components analysis. The most useful dimensions were found to be those of the lower canine, premolars, and first molar. Including the corresponding upper teeth reduced the effectiveness of the analysis by lowering the cumulative percent of the total variance each component accounted for. As the Nazlet Khater mesiodistal lower canine dimension was unavailable due to the fragmentary condition of the tooth, this variable had to be excluded. At first glance, the buccolingual dimensions seemed more effective than the corresponding mesiodistal dimensions for the detection of variability between the groups, while the mesiodistal dimensions were more sensitive to intra-population variability of size. Notwithstanding, previous results from univariate and bivariate analyses on dental dimensions indicate that mesiodistal dimensions are equally as important for the analysis as buccolingual dimensions, and that the exclusion of mesiodistal variables will diminish the discriminatory power of the analysis.

Several trails were performed utilizing various combinations of variables in a hierarchical cluster analysis. The hierarchical cluster method was the one of Average Linkage (Between Groups), using the Squared Euclidean distance option. Results suggests that the inclusion of a set of variables different than the one applied in the principle components analysis, did not yield better discrimination between the populations. The principal components analysis and cluster analysis on teeth is therefore based on the buccolingual dimension of the lower canine, and the mesiodistal and buccolingual dimensions of the two premolars, and first molar.

RESULTS

Results of the one way analysis of variance and Scheffe test indicate most of the group means for a given tooth measurement were not significantly different at the 95 percent confidence interval level. The only group that appears consistently different than the rest is Group 2. This coincides with the fact this group is the only one that possesses specimens that are not anatomically modern H. sapiens. Results of the Kruskal-Wallis analysis indicate that mean scores for most of the teeth dimensions are different at the 95 percent level of confidence interval. However, the mesiodistal diameter of lower and upper first incisors, second incisors, and third molars, and of the upper third molar, as well as the buccolingual diameter of the upper first incisor are not significantly different at the given confidence interval level.

Tables 3, 4, and 5 provide a summary of the statistical results obtained from the principal components analysis. It should be noted that out of the three components that were extracted, component 2, and 3 have eigenvalues below 1.0. Certain statisticians do not recommend the extraction of components with low eigenvalues. However, since the principle components are only used as an exploratory tool and not for data reduction, the low eigenvalues of these components have little effect on the efficiency of the analysis.

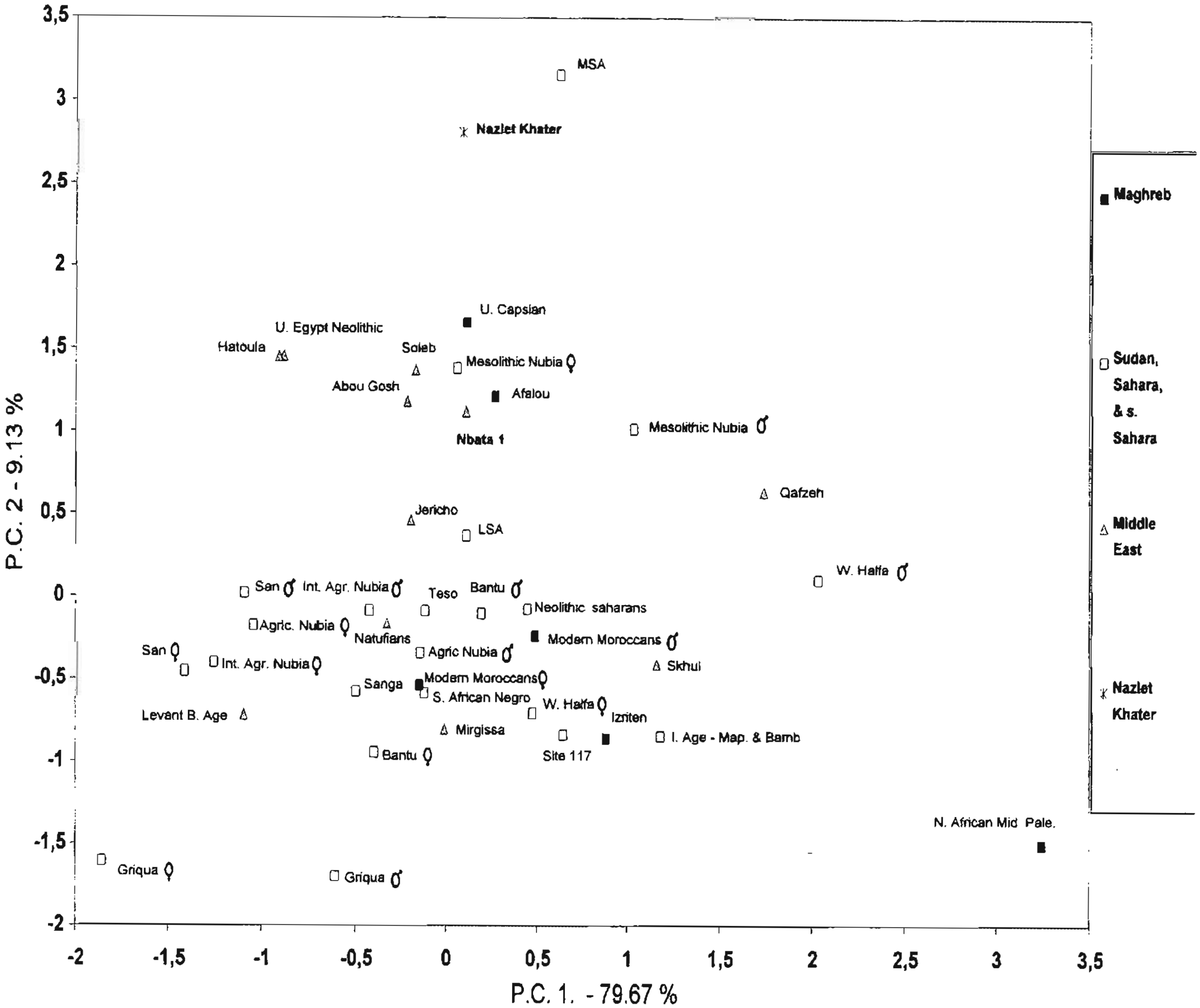

Fig. 1. Principal components analysis of dental dimensions (component 1 and 2).

Figure 1 is the scatter plot of the first and second principal components. In addition to the mean scores, individual data (as opposed to mean-data) for the Nazlet Khater and a Neolithic skeleton from the Egyptian Western Desert - Nabta E-75-8, were incorporated in the analysis. The individual measurements for these specimens were transformed to factor scores through the application of the mean and standard deviations of the factor loadings. The results indicate that factor scores on the first and second principle components (henceforth PC1, PC2, PC3 etc.) of the Nazlet Khater places the specimen close to the mean scores for the MSA group, at the higher end of the graph. The position of Nabta E-75-8 in the center of the graph, far from Nazlet Khater, suggests that the two are not closely associated.

The first principle component mainly accounts for variability in size. The largest mean score on PC1 belong to the North African Middle Paleolithic group (PC1 scores larger than 3.0), while small mean scores for PC1 are those of the Levant Bronze Age and the San female group (PC1-scores smaller than –1.0). The Middle Paleolithic specimens are very robust in their morphology and large in size, while Bronze Age Levantine individuals and contemporary San females are generally gracile and have small dimensions. The second principal component is the shape component. However, it only accounts for a small part of the total variability (9.13%) and does not reveal any clear discrimination or clustering among the studied populations.

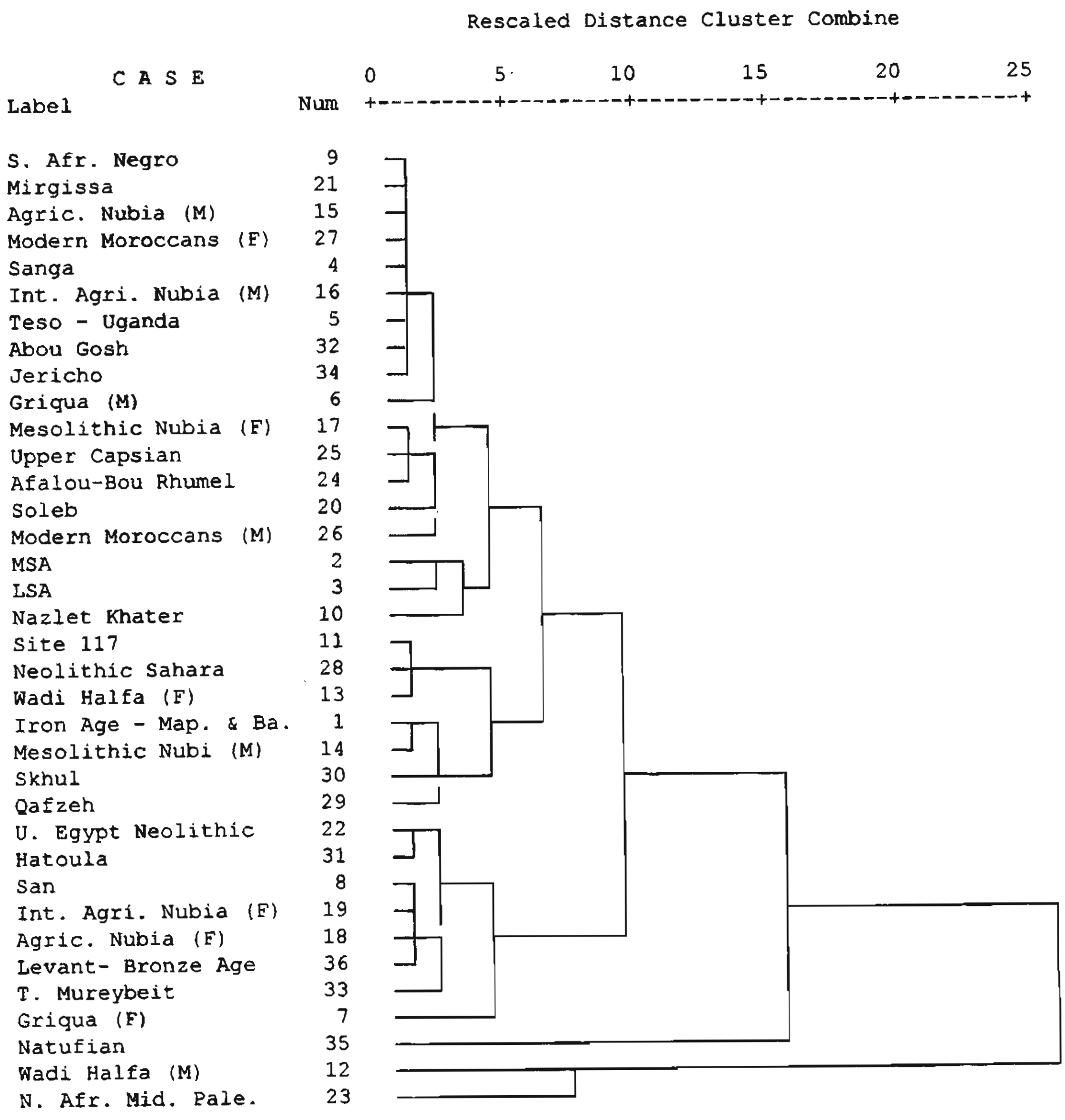

Fig. 2. Results of the hierarchial cluster analysis.

Results of the cluster analysis are presented in Figure 2. It is evident that no clear discrimination was reached between the various populations. Nonetheless, the Nazlet Khater specimen is clustered with the Late Stone Age (LSA) and Middle Stone Age (MSA) mean-scores. This result is in accord with the results of the principal components analysis, since in both analyses the Nazlet Khater specimen is clearly associated with the MSA group.

SEXUAL DIMORPHISM

Figure 3 demonstrates the effects of sexual dimorphism on the first component (size) and the obtained statistical results. The difference between the sexes is clearly noticed along the axis of the first principle component. All male means have higher factor scores than the corresponding female means. Differences between corresponding male and female factor scores, on the second principal component, vary among the populations. Thus, distance between male and female means is large for the Late Paleolithic Nubians, while very small in the case of the modern San people. Altogether, horizontal (PC1 or first principal component) differences are significantly greater than vertical (PC2 or second principal component) differences, indicating that PC1 is the size component and PC2 is the shape component.

DISCUSSION

The results obtained from the principal components and hierarchical cluster analyses indicate that the various African populations cannot be discriminated on the basis of teeth dimensions alone. Falk and Corruccini (1982)

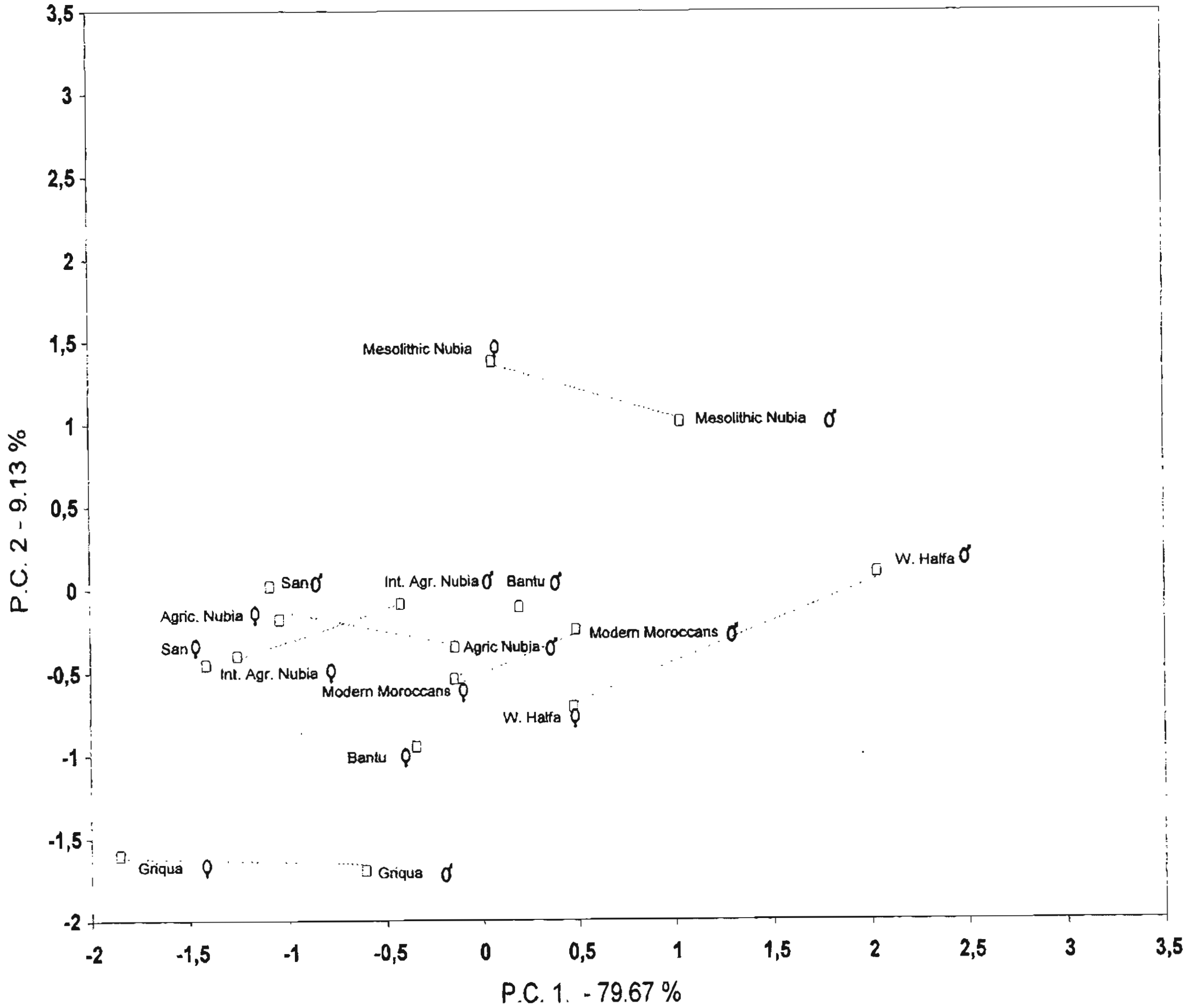

Fig. 3. Sexual dimorphism among some of the studied populations.

obtained similar observations. Falk and Corruccini compared the efficiency of 'traditional' and 'non-traditional' cranial measurements to that of measurements of length and breadth of crown and root dimensions for upper canine, second premolar, and first molar (C, P4, and M1, respectively). Their statistical sample included one hundred skulls (in total), consisting of five major populations: blacks and Caucasians from the Terry collection, and Inuit, Mongolians, and Amerindians all housed in the U.S. National Museum of Natural History. According to Falk and Corruccini cranial measurements are far more effective for the analysis of population affinities. Consequently, Falk and Corruccini propose the following speculations: 1) tooth information may be more redundant because of correlation; 2) tooth size may be less heritable than generally thought; 3) perhaps teeth are less indicative of the major processes which enable the differentiation of races; and 4) teeth may be subject to a higher level of error than cranial measurements due to their ill-defined landmarks.

Some of the above speculations may be correct. Yet, this study yields a clear separation between the MSA and Nazlet Khater on one hand and the rest of the studied populations on the other. Moreover, identical separation was reached with the utilization of mandible measurements (Pinhasi, 1996). The strong association between the Nazlet Khater and MSA specimens is thought provoking. Thoma (1984), who originally studied the skeleton, was unable to pinpoint the specimen's affinities. However, Thoma did state that many of the morphological features of the Nazlet Khater are found among the Late Paleolithic Nubian skeletons from Wadi Halfa and Jebel Sahaba. Yet, Thoma did not further investigate possible affinities with sub-Saharan specimens and his argument relies on general morphological features that are present among any prehistoric population.

Bräuer and Rimbach (1991) attempted to affiliate the Nazlet Khater specimen with late archaic and modern H. sapiens from sub-Saharan Africa, Upper Paleolithic Europe, and Northern Africa, based on two discriminant analyses of craniometric variables. The first discriminant analysis was based on eight facial variables. In this analysis the Nazlet Khater is positioned within the 90% ellipse of the North African group, but closer to the sub-Saharan circle than to the European Upper Paleolithic circle. In the second analysis, which was based on vault variables, the Nazlet Khater is placed within the sub-Saharan 90% circle. Bräuer and Rimbach (1991) assert that while such a position is remarkable, one should not overlook the fact that there is a great area of overlap between the Upper Paleolithic European and the sub-Saharan samples for the vault variables. However, the inability to successfully discriminate between the three groups may be affected by small sample sizes (N (12 for the face and N (16 for the vault analysis). Moreover, it is questionable whether individuals from Morocco, Chad, Sudan and Egypt, could have ever belonged to a common ancestral stock. The Sahara would have restricted the possible amount of gene flow between Northwest Africa, and the Nile Valley and it is therefore highly unlikely that the observed overlap between the groups is any indication of the true range of variation within and between European, North African, and sub-Saharan populations.

CONCLUSIONS

In sum, no clear discrimination pattern was achieved between the various populations. Nonetheless, the position of the Nazlet Khater next to the MSA group and away from the rest of the mean scores is thought provoking. Similar results were obtained from the principal components analysis of the affinities of the Nazlet Khater specimen, based on a large set of mandibular dimensions (Pinhasi, 1996). As the Nazlet Khater was only indirectly dated, it is possible that the individual is from the last interglacial period (125-60 kya) and thus much older than its assigned age of 33 kya.

Finally, the statistical results imply that multivariate analysis on odontometric data should take into consideration the impact of sexual dimorphism on intra-population variability. It is not always possible to successfully sex prehistoric specimens, mainly because they are usually in an incomplete and fragmentary condition. Nonetheless, skeletons should be sexed when possible. Studying sexed, rather than unsexed data, will reduce the intra-population variability of size, and increase the discriminatory power of the statistical analysis.

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Another Talon Cusp: What Does It Mean?

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Recently, Triona McNamara (1997) published in *DENTAL ANTHROPOLOGY* an interesting note on a rare feature she had found on the labial surface of a lower central incisor in a young Caucasian male. In her communication she also solicited comment on this feature, called talon cusp, which is the reason for the present note. I have seen several of these incisor labial structures during my on-going world survey of modern human crown and root morphological variation, but only rarely did I take the time to photograph any examples, nor have I systematically made observations on their occurrence and form. This note provides one of my very few such photographs, which I will discuss in a moment.

In McNamara's literature review of talon cusps, she found that they occur most often on the permanent upper lateral incisors, and based mainly on two articles, that they seem to be associated with incisor shoveling, peg-shaped lateral incisors, unerupted canines, three-rooted lower first molars, impacted mesiodens, and odontomes (McNamara, 1997:19).

Studies of worldwide human dental variation have shown that shoveling, three-rooted lower first molars, and odontomes are characteristically found in Asians and populations of relatively recent Asian-derivation such as Native Americans, Polynesians, and Micronesians (Scott and Turner, 1997). Peg-shaped incisors are probably more common in Western Eurasians than in other modern human groups. The frequencies of unerupted canines and impacted mesiodens around the world and in the past are largely unknown. Hence, the associations of incisor talon cusps would suggest they are perhaps more likely to be found in Sino-Americans and Sunda-Pacific populations than in other dentally-defined major human groups (Scott and Turner, 1997). As the dental pattern associated with Sino-Americans seems to have evolved by at least the time of the Chinese Choukoutien Upper Cave skeletons (ca. 30,000 B.P.), then incisor talon cusps might also be expected to be found in late Pleistocene examples of Sinodont teeth. As there are