ASSESSING ANCESTRY THROUGH NONMETRIC TRAITS OF THE SKULL: A TEST OF EDUCATION AND EXPERIENCE

Presented to the Graduate Council of
Texas State University-San Marcos
in Partial Fulfillment
of the Requirements

for the Degree

Master of ARTS

by

Amber Wheat, B.A.

San Marcos, Texas
May 2009

ASSESSING ANCESTRY THROUGH NONMETRIC TRAITS OF THE SKULL: A TEST OF EDUCATION AND EXPERIENCE

Committee Members Approved:

____
Martha Katherine Spradley, Chair

____
Jerry Melbye

____
Stanley Rhine

Approved:

____
J. Michael Willoughby
Dean of the Graduate College

For Austin

You are my world!

ACKNOWLEDGEMENTS

This thesis was accomplished with the help and support of many people. Dr. Kate Spradley has served as my committee chair, and mentor. Words cannot express the appreciation I have for her guidance, advice, and most of all the knowledge I have gained from her. Dr. Michelle Hamilton encouraged me to pursue this research, and I am so grateful that she did. She also allowed me to use her own skull casts for this project. Dr. Jerry Melbye provided great advice and encouragement throughout the past two years. Dr. Stan Rhine has provided me with much advice on how to make this project better. Thanks to my fellow graduate students for your friendship over the past two years.

Thanks to all of my friends and family for your encouragement and support. I appreciate my Mom for always pushing me since childhood to go all the way with my education because as she always said, “Education and knowledge is something that no one can take away!” I am grateful for my Dad who has always taken a genuine interest in my research. Thanks to my grandparents who have offered so much guidance, support, and prayers. Lastly, I would like to thank my husband, Austin, who has continued to be my biggest supporter, and most of all he is the one who believes in me even when I don’t believe in myself.

This manuscript was submitted on March 23, 2009.

TABLE OF CONTENTS

Page

LIST OF FIGURES

Figure **Page**

I. INTRODUCTION

Forensic anthropology is part of the biological subfield of anthropology. It is defined as "the scientific discipline that focuses on the life, the death, and the postlife history of a specific individual, as reflected primarily in their skeletal remains and the physical and forensic context in which they are emplaced" (Dirkmaat et al. 2008:47). One of the most important goals of forensic anthropology is to obtain a positive identification of unknown skeletal remains. Often, the only remaining evidence from a crime scene, mass fatality or fire is the bones of the victims. Bones can provide a wealth of information about the victim and possibly lead to a positive identification. The forensic anthropologist, when confronted with skeletal remains, must create a biological profile through the analysis of the remains. The basic components of a biological profile are age, sex, height, and ancestry. Of these four characteristics, ancestry is perhaps the most difficult to assess.

The skull is considered to be the most useful part of the skeleton to utilize in the assessment of ancestry (Howells 1973; Rhine 1993). There are two widely used methods in forensic anthropology to assess the ancestry of a skull, metric and nonmetric analyses. The metric method that is the most popular is a computer-based program, FORDISC 3.0 (Jantz and Ousley 2005). Created by Richard Jantz and Steve Ousley, this program utilizes discriminate function analysis derived from the Forensic Anthropology Database (Moore-Jansen and Jantz 1988). This database contains a number of measurements that have been taken from positively identified individuals from United States forensic cases. The program was created in 1993 and has since been revised twice in 1996 and 2005. These revisions allowed for a sample reflective of people born after 1930. The forensic anthropologist takes thirty-six different measurements of a skull. These measurements are then plugged into FORDISC 3.0 (Jantz and Ousley 2005), which calculates matrices and a linear discriminate analysis. The skull is then classified into a population group. The program calculates the probability that the skull belongs to a particular population. Although this method is objective, it is important to keep in mind that there is still some inter- and intra- observer error in taking measurements (Adams and Byrd 2002; Jamison and Zegura 1974).

The other method of assessing the ancestry of a skull is the nonmetric method. The overall structure of the skull differs between ancestral groups (Berry and Berry 1967; Brace 2005; Ishada and Dodo 1997; Jantz 1970; Rhine 1990). Therefore, it can be used to assess ancestry through a visual examination of skulls. There is a number of identifying nonmetric traits that has been determined useful through the years (Birkby et al. 2008; Brooks et al. 1990; Hinkes 1990). In fact, there are many lists that have been combined which give the nonmetric traits that can be used for a particular ancestral group. Some of these are Stanley Rhine's 1990 "Nonmetric Traits of the Skull" and George W. Gill's 1998 "Craniofacial Trait Variations Common to each Geographic Region". The nonmetric method simply requires the forensic anthropologist to visually assess a skull and assess the most likely ancestry (African, Asian, or European) based upon the different morphological traits that he/she can visually observe on the skull. Many of the standards used for ancestry assessment are considered to be subjective, especially standards of nonmetric visual assessment. Although there is a subjective nature to nonmetric ancestry assessment, the nonmetric method is still important. Many times a forensic anthropologist only has fragments of a skull or a skull that portrays postmortem damage. For these types of incidents, the metric method of assessing ancestry cannot be utilized. Further, even if the anthropologist has a skull with cranial modification or skull fragments, the nonmetric method is still very useful. This is because certain features of the skull, by themselves (eye orbits, teeth, nasal region), can provide information about the possible ancestry of the individual. Furthermore, although the nonmetric method is completely visual, it is the combination of the two methods which gives the most accurate assessment of ancestry (Brues 1990). Compared to the metric method of assessing ancestry, the nonmetric method is much more subjective because its reliability lies in the eyes of the forensic anthropologist. Therefore, certain variables, for example education, experience, and geographic region, may have a big impact on the forensic anthropologist's assessment of ancestry. The purpose of this research is to determine the overall affects of these variables on the assessment of ancestry. Because the nonmetric method is simply based upon the forensic anthropologist's assessment of the skull; the education and experience the forensic anthropologist has could have some impact on their overall judgment and understanding of nonmetric assessment. Also, the place in which the forensic anthropologist was trained and has conducted the majority of their cases could have an affect on their assessment of ancestry. Although forensic anthropologists are located across the United States, there are differences in their caseloads (the majority of the skulls that they see), which is ultimately affected by the population demographics of the particular area in which they work (1990; Ramirez and Cruz 2002). Within the literature on the nonmetric method of assessing ancestry, many recognize that the nonmetric method requires “experience”. This fact is stated by a number of researchers in textbooks as well as scholarly articles written on ancestry assessment:

> “Even veteran anthropologists have difficulty in maintaining consistency in these subjective ratings and still greater difficulty in equating their standards with those of equally *experienced* observers”. (Hooton 1946:715-emphasis added)
>
> “They (nonmetric traits) are capable of classification according to presence or absence, grade of development and form, if the observer is *experienced* and is able to maintain a consistent standard for his morphological appraisals”. (Hooton 1926-emphasis added)
>
> “A skilled eye and practiced judgment are the most valuable tools for a forensic anthropologist. Increasing *experience* will allow him to make sense out of small bits of evidence”. (Hinkes 1993:52-emphasis added)
>
> “Anthroposcopy appears to be as accurate as anthropometry when in *experienced* hands and when numerous traits are used”. (Rhine 1990:19-emphasis added)
>
> “Sometimes it is only the anthropologist’s *experience* that tells him there is an undefinable “something” about the skeleton that suggests one race over another”. (Stewart 1979:231-emphasis added)

Although this recognition may not necessarily be a problem with the nonmetric method, it is stated by a number of researchers, and yet the idea that forensic anthropologists need experience in order to utilize the nonmetric method correctly has never been tested.

Also, based upon the US Census Bureau’s 1990 population density maps, the majority of Hispanic individuals live in the western states (See Figure 1), while the majority of African American individuals live in the southeastern states (See Figure 2). Therefore, a forensic anthropologist’s caseload could be affected according to the population demographics of the area in which they work and bias their assessment of ancestry. In other words, if a forensic anthropologist in the east is not used to working with Hispanic remains, will the unknown skeletal remains be correctly identified as

Hispanic? The affect of geographic region and population demographics on the assessment of ancestry has also never been tested.

Because the nonmetric method of assessing ancestry is considered subjective in nature, this proposed subjective nature needs to be quantitatively tested. Further, certain aspects, such as education, experience, and geographic region should be tested to determine whether they play a role in ancestry assessment using the nonmetric method. Thus, in order to explain this research, a review of previous research pertaining to ancestry within physical and forensic anthropology is imperative. Therefore, chapter two will discuss the history of ancestry within anthropology as well as the past research that has been conducted on the assessment of ancestry. Within this review of the literature, there will be a discussion of two terms, ancestry and race, and an explanation of which will be used throughout this paper. Chapter three will present the materials and methods of the research. Chapter four will contain the statistical results of the study. Chapter five will be a discussion of the results of the study and a conclusion.

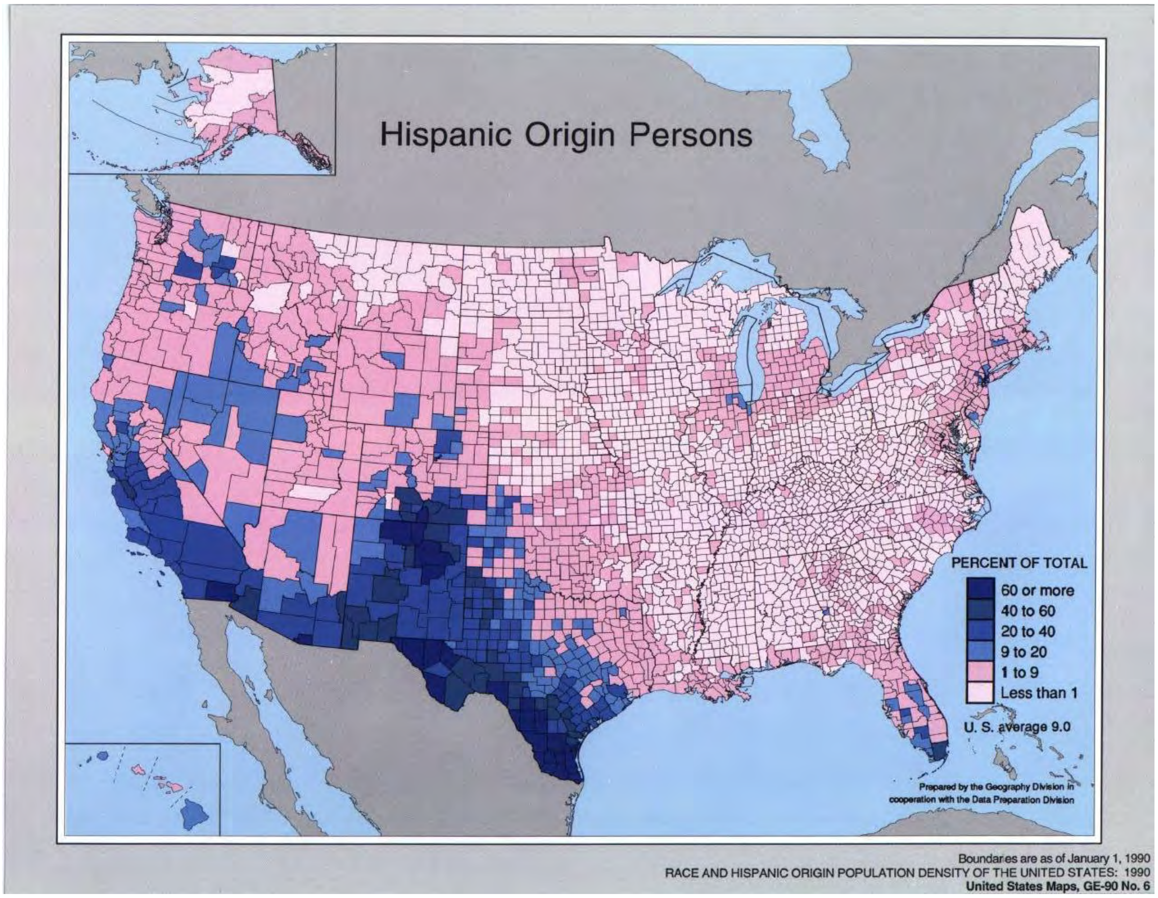

Figure 1. Hispanic Origin Map. This population density map shows that the majority of Hispanic individuals reside in the west.

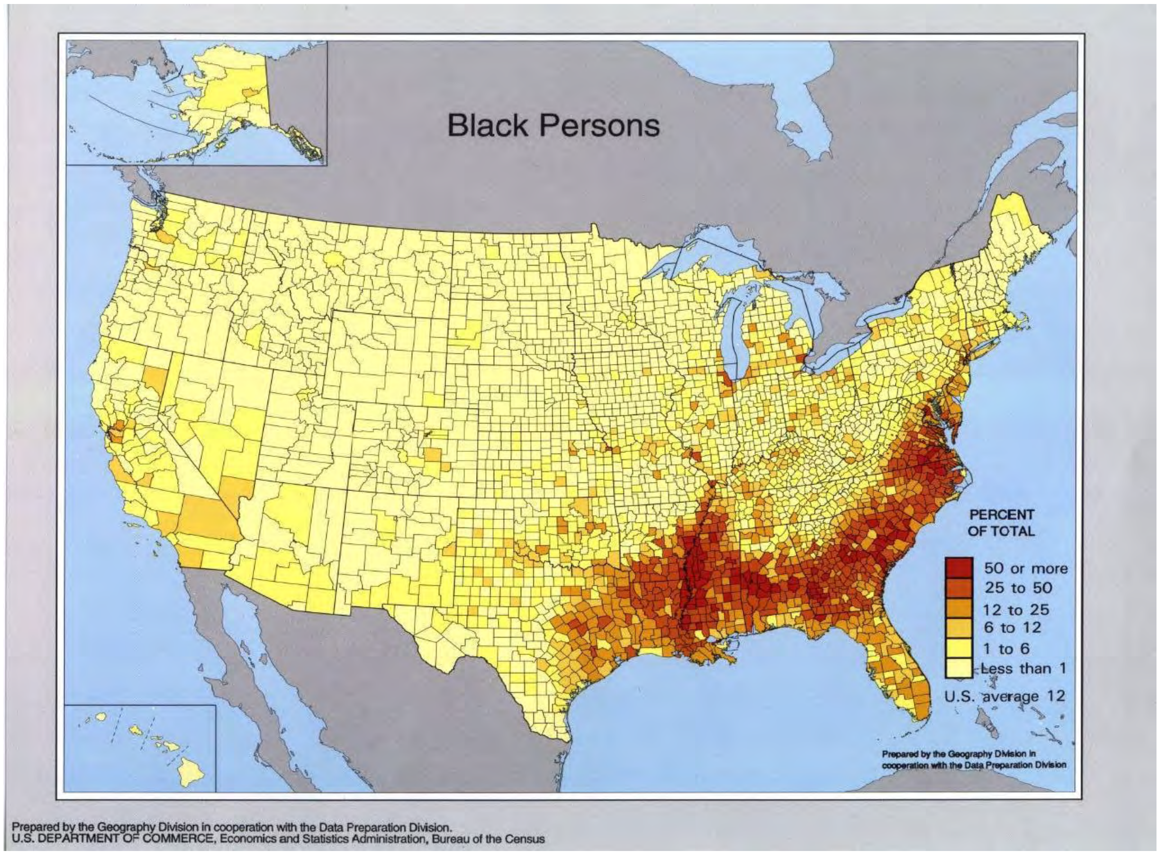

Figure 2. African American Origin Map. This population density map shows that the majority of African American individuals reside in the east.

II. LITERATURE REVIEW

Introduction

This chapter will begin with a brief overview of this history as it applies to ancestry assessment within physical anthropology. Following this will be a discussion of the two methods of ancestry assessment and the problems with the nonmetric method. The chapter will close with an explanation of the terms used throughout this research as well as a brief history of the "race debate" within physical and forensic anthropology.

The 18th & 19th Centuries

The beginnings of ancestral studies within anthropology began with the human innate desire to classify. In the 18th century, human biological variation was based upon descriptions of human populations. These were usually focused on phenotypic characteristics, visible to the eye. Linnaeus (1707-1778) was the first to classify human beings into four varieties, or as he calls them "subspecies" (Linnaeus 1759). In his famous publication, *Systemae Naturae* (Linnaeus 1759), Linnaeus describes human biological variation by dividing people into one of four classifications. These four classifications are *Homo sapiens europeaus, H. sapiens americanus, H. sapiens asiaticus,* and *H. sapiens africanus.* In other words: white, red, dark, and black. Linnaeus used no sort of anatomical differences to establish the four varieties. It was solely based upon skin color, the morphology of the soft tissue, and differences among behavior (Linnaeus 1759). He believed there was an inherent hierarchy in the world, and that each "race" or “variety” had an inherent position within the hierarchy. At this time, ancestry was being used to create biological “types” and to describe the variation seen between populations. Some accepted Linnaeus’ four-division classification, while others like Blumenbach (Blumenbach 1775), Leclere, Buffon, and Kant believed it was factors like climate and nutrition that created human biological variation (Hefner 2007). Blumenbach (1752-1840) took a different approach in describing the differences seen between populations. He argued that humans progressed through time, moving from one particular “variety” to the next (Blumenbach 1775). Therefore, in Blumenbach’s view this progression lead to a perfect form. All humans came from a single origin, but climate, nutrition, and environmental factors changed humans, creating lots of variation. Blumenbach created his own classification of humans. This classification was primarily based upon geographic origin. He classified humans into five varieties: Caucasian, Mongolian, Ethiopian, American, and Malayan (Blumenbach 1775). Unlike Linnaeus, Blumenbach (although he may not have recognized it at the time) realized that the people within a certain area resemble their ancestors (Brace 1997). He may have been on to the idea that real differences lie within and between populations, which is a useful concept within studies of human variation.

A very influential researcher for his time, Morton (1799-1851) contributed a great deal to the polygenist movement of classifying humans into distinct biological groups as well as to the “race concept” within studies of human variation (Hefner 2007). Morton was one of the first to use differences in cranial morphology as a backbone for studies of human variation. In his famous publication, *Crania Americana* (1839), he classified humans into four distinct races, which were taken from Blumenbach’s literature (Morton 1839). Although Morton's work has been attacked and discredited through the years, it is often still cited in the literature as proof of biologically distinct races (Rushton 1999).

The 20th Century

In the 20th century, there was a slight change of the "race concept". Perhaps the most influential person that brought about this change was Boas (1858-1942). Boas's work within biological anthropology affected some of the beliefs pertaining to the usefulness of race in studies of human variation. In *Changes in Bodily Form of Descendants of Immigrants* (1910), Boas presented his ideas that environment was the influential cause that created human variation. Boas showed, through the craniometric data that he collected on 18,000 immigrants from seven populations, that environment affected cranial morphology (Boas 1910). His ideas were very influential in demolishing the typological approach to race and human variation.

It seems that Boas was changing the "race concept" and its usefulness for studies of human variation. However, while Boas' ideas were refuting the typological approach to human variation, Hooton (1887-1954) and his students were trying to find evidence for the biological distinction of races (Hefner 2007). Hefner (2007) argues that his work contributed the "most important methodologies for ancestry determination" (Hefner 2007). Hooton believed there was a biologically distinct aspect of race. Therefore, the purpose of his research was to prove this without looking at environmental factors. Hooton collected nonmetric and metric data from varying populations. He divided humans into three races: White, Negroid, and Mongoloid (Hooton 1926). He referred to these as primary races, which could be broken down into secondary races. Based upon the data he collected, he was able to define eight "morphological types" (Hefner 2007). This means that those that portrayed certain morphological types could be classified into one of the primary races. Hooten compiled a list of traits to identify these morphological "types". This list became the Harvard Blanks (Brues 1990). This is the first list among many of nonmetric traits for assessing ancestry. In fact, today within the field of forensic anthropology, lists of nonmetric traits are still available (and often used) to assess the ancestry of unidentified remains (Birkby et al. 2008; Gill 1998; Rhine 1990).

Ancestry Assessment

Within forensic anthropology, there are two ways to assess the ancestry of skeletal remains: metric and nonmetric. While there are multiple metric methods used for assessing the ancestry of a skull, only a few are well-known and accepted methods.

The Metric Method

The metric measurements that are used for metric evaluations originally come from the standards set at the Frankfurter Verstandigung (1882). This was a meeting set up for the purpose of standardizing cranial landmarks to be used for anthropometric data collection, and these landmarks are still used today. One metric method that was once a popular method for assessing ancestry was the Giles and Elliot metric evaluation. In their 1962 article, "Race Identification from Cranial Measurements", they introduce the use of discriminate functions for ancestry assessment (Giles and Elliot 1962). The method was created using the Terry collection as well as prehistoric Native American skulls from Indian Knoll. It was used to differentiate between three different ancestral groups. A forensic anthropologist could use the discriminate function analysis to distinguish between Blacks and Whites or American Indians and Whites. Once the measurements were taken and the discriminate function scores were calculated, it could be plotted on a scale that would put the results into a racial category. A number of researchers have proven this method to be inaccurate (Ayers et al. 1990; Snow et al. 1979). Although the Giles and Elliot method is inaccurate, it was the first study to use discriminate function equations. The Giles and Elliot method opened the door to more research of measurements of the skeleton that can be used for ancestry assessment.

Gill and Gilbert (1990) created a metric method of distinguishing between American Blacks and Whites based upon six measurements of the mid-facial region. They found the measurements have a very high percentage of accuracy, averaging around ninety percent. Although this is an accurate metric method, it can only be used for Blacks and Whites.

The more popular metric method used within forensic anthropology is one that utilizes a computer-based program, FORDISC 3.0 (Jantz and Ousley 2005). This program also utilizes discriminate function analysis. It is a database containing a number of measurements of known skulls from twenty eight populations. After taking measurements of the skull, they are plugged into FORDISC 3.0, which calculates a matrix and a linear discriminate analysis. The skull is then classified into a population group.

Many researchers argue that FORDISC is not a valid and useful program. Some have attempted to show that FORDISC is subject to manipulation by the user (Belcher et al. 2002; Leathers et al. 2002; Williams et al. 2005). A number of studies have been conducted that find the program misclassified skulls (Belcher et al. 2002; Leathers et al. 2002; Williams et al. 2005). However, many of the studies do not follow the guidelines of the FORDISC program. For example, Belcher et al. (2002) use the program to try and classify ancient crania, when the FORDISC guidelines clearly say the program is only useful for crania from the 20th century. Although many have attempted to discredit the FORDISC program, it is still the most widely used metric method of assessing ancestry.

The Nonmetric Method

The nonmetric method of assessing ancestry has been around since Hooton's Harvard Blanks. There is a vast amount of literature on nonmetric traits of the skull. Brues (1913-2007), who was a student of Hooton's, realized the application of nonmetric traits to the forensic anthropological analysis of skeletal remains (Brues 1990). She found the nasal region of the skull to be useful in ancestral identification. She argues that the contour across the nasal root differs in morphology between Blacks, Whites, and Asians. According to Brues (1990), Blacks typically have a nasal root shape of a Quonset hut, Asians portray tented nasals, and Whites have steepled nasals.

Brooks et al. (1990) determined distinct differences in the prognathism of the maxillary alveolus region among ancestral groups (Brooks et al. 1990). They argue that the shape of the maxillary bone, between the two front canines differs among the ancestral groups. Some degree of prognathism is present in all groups except American White, and it is more pronounced in Blacks.

The presence of shovel-shaped incisors can be an indicator of Asian ancestry (or Mongoloid ancestry as used within the literature). Hinkes (1990) determined that Whites very rarely have shovel-shaped incisors while American Indians portray the shovel-shaped incisor trait eighty-five to ninety-nine percent of the time (Hinkes 1990).

Rhine's article "Non-metric Skull Racing" (Rhine 1990) is a review of the literature on nonmetric traits of four ancestral groups: Whites, Blacks, Hispanics, and Amerindians. He tests 45 nonmetric traits of the skull and concludes that the nonmetric method is useful in assessing the ancestry of a skull. He then creates a list of nonmetric traits useful in identifying the ancestry of a skull. However, he makes the four ancestral groups fall into three groups: American Caucasoid, Southwestern Mongoloid, and American Black.

The Nonmetric Literature

There are many problems with much of the past literature on the nonmetric method of assessing ancestry. First of all, the majority of the past studies focus on three main ancestral groups: Whites, Blacks, and Asians (in the literature these groups are referred to as Caucasoid, Negroid, and Mongoloid) (Brooks et al. 1990; Brues 1990; Rhine 1990). Obviously because of human variation, not every individual will fall under one of these three categories.

Another problem with the literature is the terminology used to define nonmetric differences seen between population groups. This terminology is difficult to define. For example, in describing the differences between the nasal area of Blacks, Whites, and Asians, Brues uses terms like “low and rounded”, “moderate”, and “high and somewhat pinched”. The meaning of these terms may change for different people (Brues 1990). For example, what one person says is “moderate”; another person may define as “extreme”. Another example of this can be seen in the literature describing the prognathic differences between population groups. Brooks et al. (1990) uses terms such as “slightly concave” and “light convexity”. Once again, these terms are subjective because people may have different definitions for “slight” and “light”. Furthermore, these terms are likely more useful when doing comparisons between groups.

Another problem with the nonmetric literature is that most are written by comparing skulls of different ancestral groups. For example, Rhine defines nonmetric traits that he determines to be useful after dividing the "selected" skulls into three categorical groups (Caucasoid, Mongoloid, and Negroid) (Rhine 1990:9). It is easy to see differences between ancestral groups when doing a comparison. However, when looking at an individual skull, without comparing it to other skulls from different ancestral groups, the nonmetric traits may not be as obvious.

Another problem with the nonmetric literature, one which has been pointed out by different researchers, is that ancestry is defined by a typological classification system (Armelagos and Gerven 2003; Smay and Armelagos 2000). It is apparent that there is a typological order of racial classification within the field of forensic anthropology. In most of the literature that discusses the nonmetric method of ancestry assessment, there is a typological classification. For example, Rhine discusses nonmetric traits of the skull useful for differentiating between three racial groups: Caucasoid, Mongoloid, and African (Rhine 1990). Brues (1990) also discusses the use of the nasal region in classifying Negroid, Mongoloid, and African race (Brues 1990). There is even a typological classification of ancestry in the discussion of ancestry assessment in most forensic anthropology textbooks (Burns 1999; Byers 2005; Klepinger 2006; Nafte 2000). In fact, it has been argued that forensic anthropology is "the scholarship that defines and quantifies racial characteristics and provides a kind of cookbook set of instructions for identifying them" (Smay and Armelagos 2000:21) and that students of forensic anthropology are only taught how to "pigeonhole individuals according to a list of typical racial traits" (Smay and Armelagos 2000:23). Goodman and Armelagos argue that within forensic anthropology "human variation is reduced to how well it fits ideal types" (Goodman and Armelagos 1996:177). Forensic anthropologists use these lists of traits to differentiate between ancestral groups. However, it is currently the only means of utilizing the nonmetric method.

Another problem within the nonmetric literature, and perhaps of most importance for this particular research study, is the recognition that the nonmetric method requires "experience." This fact is stated by a number of researchers in textbooks as well as scholarly articles written on ancestry assessment:

> "Even veteran anthropologists have difficulty in maintaining consistency in these subjective ratings and still greater difficulty in equating their standards with those of equally *experienced* observers". (Hooton 1946:715-emphasis added)
>
> "They (nonmetric traits) are capable of classification according to presence or absence, grade of development and form, if the observer is *experienced* and is able to maintain a consistent standard for his morphological appraisals". (Hooton 1926-emphasis added)
>
> "A skilled eye and practiced judgment are the most valuable tools for a forensic anthropologist. Increasing *experience* will allow him to make sense out of small bits of evidence". (Hinkes 1993:52-emphasis added)
>
> "Anthroposcopy appears to be as accurate as anthropometry when in *experienced* hands and when numerous traits are used". (Rhine 1990:19-emphasis added)
>
> "Sometimes it is only the anthropologist's *experience* that tells him there is an undefinable "something" about the skeleton that suggests one race over another". (Stewart 1979:231-emphasis added)

Although this recognition may not necessarily be a problem with the nonmetric method, it is stated by a number of researchers. The question then becomes, do forensic anthropologists need experience to utilize the nonmetric method correctly? Is education in forensic anthropology a necessity for correctly utilizing the nonmetric method of assessing ancestry? Hefner et al. (2007) found that education and experience in forensic anthropology increases the practitioner's ability to correctly assess the ancestry of a skull (Hefner et al. 2007). This previous research found that experience, in terms of time as a graduate student, and time of working as a professional forensic anthropologist plays a significant role in correctly assessing the ancestry of a skull (Hefner et al. 2007).

These problems within the nonmetric literature, the subjective, non-defined terminology, the comparison-based studies, the typological classification of "races", and the recognition that "experience" is needed are only four out of many problems that create (and clearly justify) the troubles with the practice of forensic anthropologists assessing the ancestry of skeletal remains. These problems have produced much controversy over whether a forensic anthropologist should be assessing the ancestry of skeletal remains. However, before delving into the literature that discusses the controversial issue of assessing ancestry, two terms used within forensic and physical anthropology must be discussed.

Race versus Ancestry

Many times in the medico-legal community the term race is employed when trying to positively identify a set of skeletal remains. This could be because of its use in society. According to Brace, "Americans assume that recognizable differences in physical appearance are an essential part of what is meant by race" (Brace 2005). Jonathan Marks argues that societies define race in a biological and cultural sense (Marks 1994). There are many others that argue that race is accepted in society as a biological concept and that it is considered to be an identifying characteristic within society (Brace 1964, Gill 1990).

The US Census Bureau's Directive No. 15 (2002) "Race and Ethnic Standards for Federal Statistics and Administrative Reporting" defines and subdivides populations into 'racial' and 'ethnic' categories (1990; Ramirez and Cruz 2002). It also states that the preferable way to collect data for cultural studies is to divide it into separate categories of race and ethnicity. This is done by a division into five races and two ethnic groups. The five races include American Indian or Alaskan Native, Asian, Black or African American, Native Hawaiian or other Pacific Islander, and White. The two ethnic groups include Hispanic or Latino, and not Hispanic or Latino There is no mention of the standards that are used to do this. Law enforcement agencies and the medico-legal community use the OMB No. 15 (2002) to report someone's race for purposes of creating a missing person's record (Ramirez and Cruz 2002). The term 'race' as opposed to ancestry is used within the medico-legal field. Because forensic anthropologists work within the legal field, they are asked to assess the race of a set of unknown skeletal remains.

On the other hand, in an anthropological sense, the term 'race' is a sociocultural concept, not a biological concept (1996; Washburn 1963). Therefore, because it encompasses the concept of variation among populations and because anthropology as a field of study does not accept the term 'race', for the purpose of this paper the term ancestry will be used. However, there are many instances within the literature that the term race is used. Therefore, if the literature that is being discussed uses the term race, then that term will be used rather than ancestry.

The Debate

There are many within the field of physical and forensic anthropology that do not support the assessment of ancestry of unidentified skeletal remains. Because “races” do not exist in a biological sense, the question that has created so much debate is that if “races” do not biologically exist, why are forensic anthropologists able to identify them (Sauer 1992)? Taking into consideration that biological “races” do not exist along with the obvious problems inherit within the nonmetric method of assessing ancestry (including the problems in the literature on this method); one can better understand why there is so much controversy.

One major contributor to this subject that has written about the ‘race debate’ is Brace. In fact, his arguments have made a dramatic impact on the terms used within forensic anthropology. Brace argues against the regional terms used to describe the race of an individual (Brace 1995). In other words, Brace argues that terms like European and African America should not be used. These terms denote a place of origin that may not be particular to the remains that are being analyzed. Therefore, such terms should not be used in forensic anthropology. Brace also argues there is no biological evidence that can be found to prove that race is a product of natural selection. However, society has created this idea that there is some biological predictor of race. Brace states that “it is the assumption that ‘there is something there’ which is the product of sociopolitical circumstances”(Brace 1995:173). Therefore, Brace argues that race, in a forensic sense, is created as a response to political correctness. It is a politically correct duty of the forensic anthropologist to report a person’s race. According to Brace, forensic anthropologists try to assess the race of an individual because it is something that is demanded by society. Sauer (1993), like Brace, has made similar arguments. Sauer agrees that races do not biologically exist (Sauer 1993). However, he argues that forensic anthropologists are asked to determine as much as they can from a skeleton to match the information to a missing person report. Sauer argues that although races do not biologically exist, it is absolutely conceivable that forensic anthropologists can accurately assess the "general area of origin"(Sauer 1993:82). He argues that assessing race is simply "translating information about biological traits to the labeling system" (Sauer 1993:82). The labeling system he is referring to is the cultural terms of identity. For example: White, Black, and Hispanic.

While most within the field of anthropology advocate that races do not biologically exist, there are some like Gill who propose that most forensic anthropologists accept the biological basis of race (Gill 2000). In fact, in his introduction to *Skeletal Attribution of Race*, he states that there is an "adaptive value of racial traits" (Gill 1998:xvi). In other words, Gill argues that there is something there influencing the biological aspects of human variation, and it seems to be congruent with race. Brues (1913-2007) is another that has contributed a great deal to the nonmetric method of assessing ancestry. Although Brues never explicitly states that biologically distinct races exist, she implies that it is useful for studies of human variation. She states that "the visible differences between different populations tell everyone that there is something there" (Brues 1993:76). She recognizes that something is there that is reliable enough to distinguish between populations.

Conclusions

It seems that the "race debate" has always been a part of physical anthropology. The controversial issue of forensic anthropologists assessing the ancestry of skeletal remains may always be a heated topic of debate. However, based upon the problems with the nonmetric method of assessing ancestry, it seems rightly so that ancestry assessment within forensic anthropology is under attack. Does the subjective terminology within the nonmetric method hinder the ability of the forensic anthropologist to get a correct assessment of ancestry on a set of skeletal remains? Because the literature in scholarly articles, as well as forensic anthropology textbooks, define nonmetric traits according to three primary races, is the forensic anthropologist “pigeonholing” a person into a particular ancestral group and not taking human variation into account? Because of the subjectivity of the method, many anthropologists recognize that the nonmetric method of assessing ancestry requires “experience” to utilize correctly. Does the forensic anthropologist need experience to utilize the nonmetric method correctly? If so, how much experience is necessary? This research is a step towards answering the last two questions, but more importantly it is a step towards bettering the nonmetric method of assessing ancestry within forensic anthropology.

III. METHODOLOGY

Materials and Methods

In order to determine the role that education, experience, and geographic region play in the accuracy of ancestry assessment from nonmetric traits, a survey was provided to individuals with varying levels of experience and education within the field of forensic anthropology. This survey was presented to professionals and students at two different forensic anthropological meetings in different regions of the United States. The participants completed a survey and then assessed the ancestry of eight skull casts. The surveys and answers were then used to statistically determine the affects of education, experience, and geographic region. Participant selection, data collection, and data analysis is described in detail in this chapter.

Selection of Participants

In order to obtain responses from those familiar with the nonmetric method, two tests were conducted at separate forensic anthropological meetings. To compare the differences between geographic regions, tests were conducted at two separate forensic anthropology meetings. The first occurred at the Mountain, Desert, and Coastal meeting in Nevada on May 22, 2008. This meeting was comprised of forensic anthropology professionals and students who live and work in the southwestern regions of the United States. From this meeting, there were a total of twenty-eight participants. Of the twenty-eight participants, six were in the Ph.D. level, nine in the Master's level, ten in the Bachelor's degree level, two were currently in their undergraduate year studying physical anthropology and one participant had no degree in anthropology (see Figure 3). The second test was conducted at the Mountain, Swamp, and Beach meeting in Evansville, Indiana on August 30, 2008. This meeting was comprised of forensic anthropology professionals and students who live and work in the southeastern regions of the United States. There were a total of fourteen participants from this meeting. Of the fourteen participants, seven were in the Ph.D. level, one in the Master's level, two in the Bachelor's degree level, one was currently in their undergraduate year studying physical anthropology and three had no degrees in physical anthropology (see Figure 4). The total sample of forty-two was therefore comprised of the participants from the Mountain, Desert, and Coastal meeting, and the participants from the Mountain, Swamp, and Beach meeting (see Figure 5).

Data Collection

Although the collection of data occurred at two separate locations at different times, the same materials were used throughout this research. Before the participants were given directions, eight skull casts were placed on different tables. While the ideal study would have utilized real skulls, it was not possible for this particular study. Because the skulls were needed for a long period of time and also had to be shipped to two different anthropology meetings, the use of casts was more efficient. Each skull was placed next to a number. Skull one was Asian, skull two was European, skull three was African, skull four was European, skull five was Asian, skull six was African, skull seven was Asian and skull eight was Asian. In total, there were four Asian skulls, two European skulls, and two African skulls. Skull number two's (European) mandible was lost after the first test occurred. Therefore, the participants at the Mountain, Swamp, and Beach meeting did not assess a complete skull for skull number two because the mandible was absent. The participants had no knowledge of the ancestry of each skull. Also, placed next to each skull were two separate sheets of paper that listed nonmetric traits. One paper listed nonmetric traits for European, African, and Asian ancestral populations. This list was compiled from Rhine's "Nonmetric Skull Racing" (1990), Hinkes' "Shovel-Shaped Incisors in Human Identification" (1990) and Birkby et al.'s "Identifying Southwest Hispanics Using Nonmetric Traits and the Cultural Profile" (2008) (See Figure 6). The second paper was a more detailed listing of nonmetric traits for East Asian, American Indian, White Polynesian, and Black ancestral groups. This list was taken from Gill's "Craniofacial Criteria in the Skeletal Attribution of Race" (1998) (see Figure 7).

Each participant received a stapled packet of papers. The first paper consisted of a survey-like questionnaire (see Figure 8) that was compiled of six questions. Accompanying the questionnaire were three papers with the numbers one through eight. At the top of the first numbered paper were directions for the participants to follow. The participants were also given verbal instructions. These instructions were to fill out the questionnaire, then assess the ancestry of all eight skulls and write their determination in the corresponding blank. All participants were asked to classify each skull into one of the three ancestral groups: European, African, or Asian. The reason the participants were asked to classify each skull into of these three ancestral groups is because the majority of published material on ancestry assessment focuses on these three groups. If they felt comfortable in being more specific, for example narrowing a skull down from Asian to Native American, they were asked to do so. The participants were told to use the two papers on nonmetric methods for references. They were asked to list the traits they used to assess the ancestry of each skull. The participants had forty-five minutes to assess all eight skulls. Because participants were asked to assess the ancestry of eight skulls within a forty-five minute window, the time crunch could have very well hindered the results. Again, because these blind tests occurred at anthropology meeting, the time had to be limited. Throughout both studies the same eight skulls were used (with the exception of skull number two, because the mandible was lost before the second blind test) as well as the same reference papers and questionnaire packets.

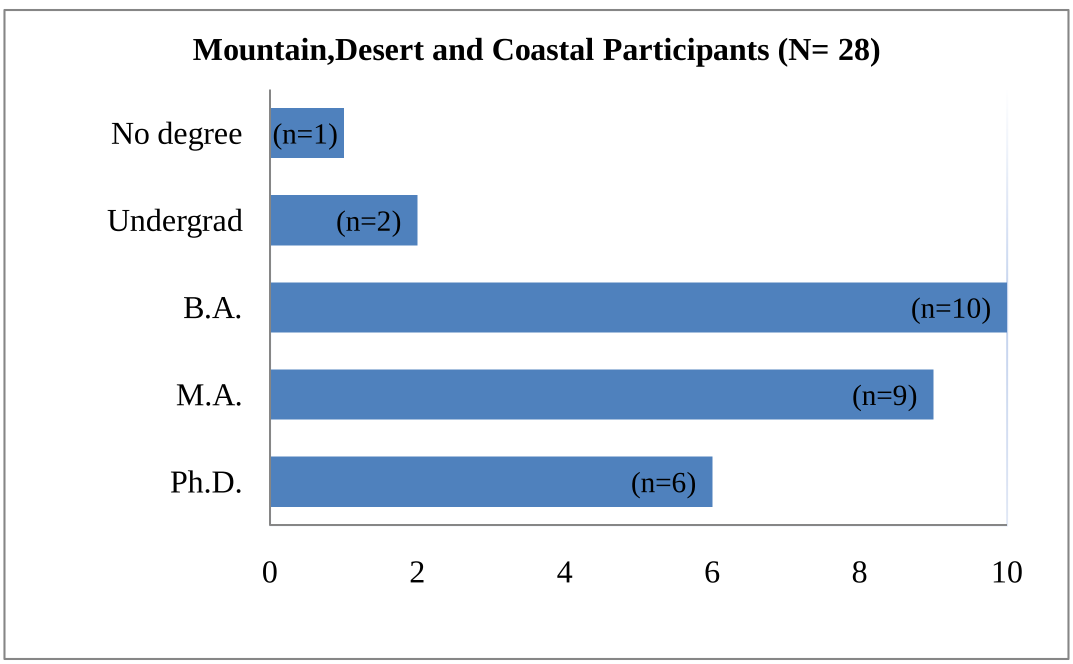

Figure 3. Mountain, Desert, and Coastal Participants. This figure provides a breakdown of the Mountain, Desert, and Coastal meeting participants according to different education levels.

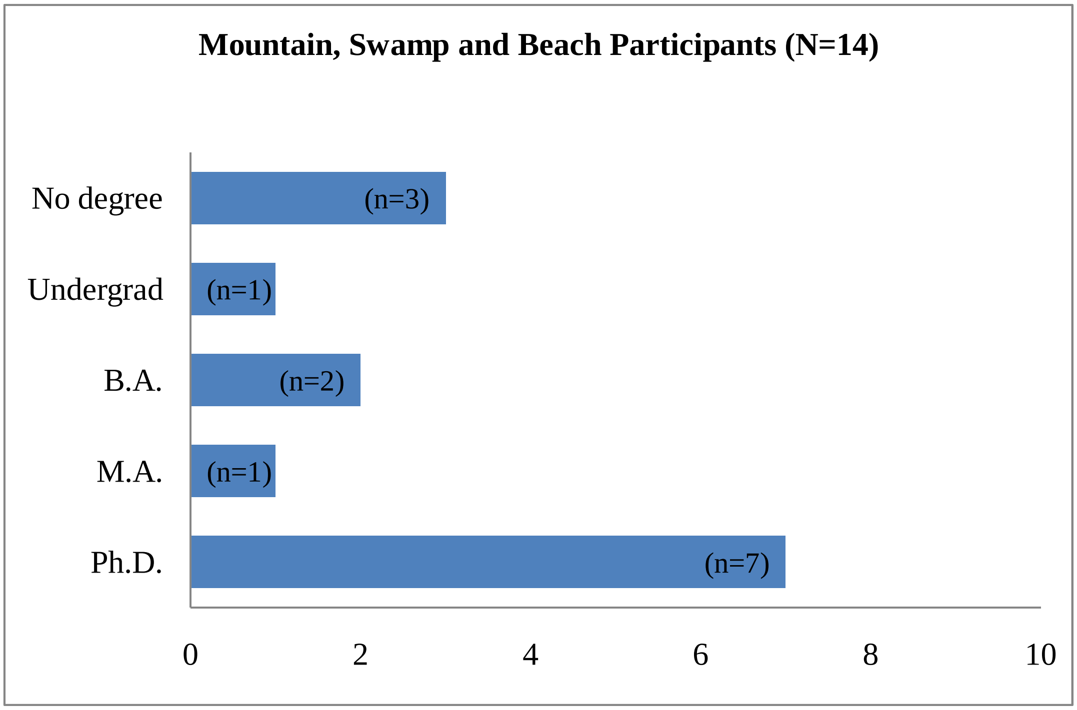

Figure 4. Mountain, Swamp, and Beach Participants. This figure provides a breakdown of the Mountain, Swamp and Beach meeting participants according to different education levels.

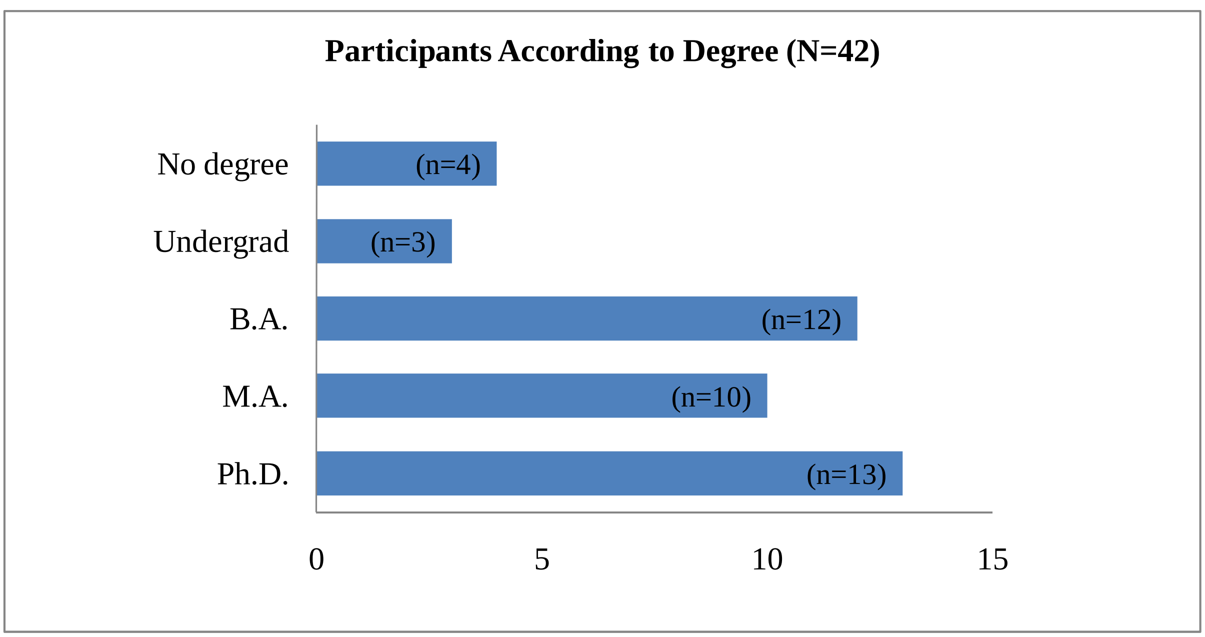

Figure 5. Total Sample Size. This figure provides a breakdown of the total sample size according to different education levels.

Nonmetric Traits for Determining the Ancestry of a Skull

European

- •Sloping orbits
- •Tower nasals
- •Large nasal spine
- •Deep nasal sill
- •Retreating zygomatics
- •S-shaped zygomaticomaxillary suture
- •Long Base Chord
- •Round external auditory meatus
- •Oval window visible
- •Parabolic dental arcade
- •Bulging palatine suture
- •Carabelli's cusps
- •Bilobate & prominent chin
- •Undulating mandible
- •Pinched ascending ramus
- •Slanted vertical ramus
- •Straight gonial angle

African

- •Rectangular orbits
- •Quonset hut nasals
- •Small nasal spine
- •Guttered nasal border
- •Vertical zygomatics
- •S-shaped zygomaticomaxillary suture
- •Long base chord
- •Round external auditory meatus
- •Oval window visible
- •Hyperbolic dental arcade
- •Bulging palatine suture
- •Molar crenulations
- •Blunt & vertical chin
- •Straight mandibular border
- •Pinched ascending ramus
- •Slanted ascending ramus
- •Straight gonial angle

Asian

- •Rounded orbits
- •Tented nasals
- •Small nasal spine
- •Blurred nasal sill
- •Nasal overgrowth
- •Projecting zygomatics
- •Angled zygomaticomaxillary suture
- •Short base chord
- •Elliptical external auditory meatus
- •Oval window not visible
- •Elliptic dental arcade
- •Straight palatine suture
- •Buccal pits/shovel-shaped insicors
- •Enamel extinsions on molars
- •Blunt & vertical chin
- •Striaght mandibular border
- •Wide ascending ramus
- •Vertical ascending ramus
- •Everted gonial angle

Works Cited:

Rhine S. Nonmetric Skull Racing. In: Gill G, Rhine S, editors. Skeletal Attribution of Race. Maxwell Museum of Anthropological papers No. 4. Albuquerque, NM: University of New Mexico, 1990.

Hinkes MJ. Shovel-Shaped Incisors in Human Identification. In: Gill G, Rhine S, editors. Skeletal Attribution of Race. Maxwell Museum of Anthropological papers No. 4. Albuquerque, NM: University of New Mexico, 1990.

Birkby et al. Identifying Southwest Hispanics Using Nonmetric Traits and the Cultural Profile. Journal of Forensic Sciences 2008; 53:29-33.

Figure 6. Reference Printout A. This figure is a copy of one of the two handouts that participants used for reference purposes.

Table 1

CRANIOFACIAL TRAIT VARIATIONS COMMON TO EACH GEOGRAPHIC RACE

Characteristics	*East Asian*	*American Indian*	*White*	*Polynesian*	*Black*
Cranial form	broad	medium-broad	medium	highly variable	long
Sagittal outline	high, globular	medium-low sloping frontal	high, rounded	medium	highly variable post-bregmatic depression
Cranial sutures	complex	complex	simple	complex	simple
Nose form	medium	medium	narrow	medium	broad
Nasal bone size	small	medium/large	large	medium	medium/small
Nasal bridge form	flat	medium/tented	high/steeple-like	medium	low/quonset hut
Nasal profile	concave	concavo-convex	straight	concave/concavo-convex	straight/concave
Interorbital projection	very low	low	high, prominent	low	low
Nasal spine	medium	medium, tilted	prominent, straight	highly variable	reduced
Nasal sill	medium	medium	sharp	dull/absent	dull/absent
Incisor form	shovelled	shovelled	blade	blade/shovelled	blade
Facial prognathism	moderate	moderate	reduced	moderate	extreme
Alveolar prognathism	moderate	moderate	reduced	moderate	extreme
Malar form	projecting	projecting	reduced	projecting	reduced
Zygomaticomaxillary suture	angled	angled	curved	curved/angled	curved/angled
Palatal form	parabolic/elliptic	elliptic/parabolic	parabolic	parabolic	hyperbolic/parabolic
Palatine suture	straight/jagged	straight	jagged	highly variable	arched/jagged
Orbital form	round	rhomboid	rhomboid	rhomboid	round
Mastoid form	wide	wide	narrow, pointed	wide	oblique, posterior tubercle
Mandible	robust	robust	medium cupped below incisors	robust rocker form	gracile oblique gonial angle
Chin projection	moderate	moderate	prominent	moderate	reduced
Chin form	median	median	bilateral	median	median

From G.W. Gill (1998) Craniofacial Criteria in the Skeletal Attribution of Race. In Reichs, K.J. Forensic Osteology.

Figure 7. Reference Printout B. This figure is a copy of one of the two handouts that participants used for reference purposes.

Survey Questions

1. Do you have some familiarity with using nonmetric traits in determining the ancestry of a skull? **Y N**

2. If yes, assess the number of skulls in which you have used nonmetric traits to determine ancestry.

   0-5 6-10 11-30 31-50 51-70 71-90 91+

3. Are you a student studying anthropology? **Y N**

4. How many years of experience do you have in forensic anthropology either as a student or a professional?

   0-1 2-5 6-10 11-20 21-40 41+

5. How many forensic anthropology cases have you worked on in your career as either a student participant or a professional practitioner? (Note: If student, count all cases including those that were assigned for class grades.)

   0-5 6-10 11-30 31-50 51-70 71-90 91+

6. What is the highest level of attainment in anthropology that you currently have?

   Undergrad B.A. M.A. Ph.D. DABFA No degree

Figure 8. Questionnaire. This figure is a copy of the questionnaire. This was used to determine each participant's level of education and experience.

Methods

In order to determine the affects of education, experience, and geographic region on the evaluation of nonmetric ancestry assessment, a number of statistical test were used. The overall responses were determined based upon each of the three different categories, level of education, level of experience, and the geographic region in which one works. The level that each participant was assigned to was determined according to their responses on the survey.

Question number six was used to determine the education level of each participant. Therefore, each participant was put into one of three groups. Group one consisted of those who had no degree or were in their undergraduate year studying anthropology. Group two consisted of those with a B.A. and or an M.A. in anthropology and group three consisted of those with a Ph.D. and or a DABFA certification.

Question number two was used to determine the level of experience of each participant. This question asks the participant to assess the number of skulls they have actually used nonmetric traits to assess ancestry. Because this research is determining the affects of experience on assessing ancestry, to measure the experience someone has should be done according to the number of skulls they have used nonmetric traits to assess ancestry. There were seven different responses the participant could choose. These were 0-5, 6-10, 11-30, 31-50, 51-70, 71-90 and 91+. These responses were combined into three different groups. Therefore, level one consisted of those that have used nonmetric traits to assess ancestry on 0-10 skulls, level two on 11-50 skulls, and level three on 51-91+ skulls. Each person, based upon their responses, received a score out of eight. Those that did not put an answer for a skull were counted as wrong. Some participants would identify a skull as an admixture, i.e. Black and Asian admixture. Of the participant responses that were used for calculations, there were ten responses of admixture. If the response included the correct answer, for example if the correct answer was European and the response was European with African admixture, it was scored as correct.

An ANOVA was conducted to determine if there are significant differences between the mean scores of each level based upon education and experience. Also, a Kruskal-wallis test was performed to determine if there are significant differences in the mean scores for each ancestral group based upon the two geographic regions. For this test, all forty-two participants were included, no matter the level of experience or education. Of the forty-two participants, they were divided according to the meeting they attended. Mountain, Desert, and Coast attendees tend to be from the western United States. Those that attended the Mountain, Swamp, and Beach are typically from the eastern United States.   To determine if there was a significant difference between geographic regions, each person received a score according to the three different possible answers (African, European, and Asian). Therefore, each person got a score out of four for the Asian category, a score out of two for the African category, and a score out of two for the European category. These scores were then used in the Kruskal-wallis test.

IV. RESULTS

Introduction

In order to test the subjective nature of the nonmetric method, a test was given to professionals and students in the field of forensic anthropology to determine if experience, education, and geographic region have any affect on the assessment of ancestry using the nonmetric method. A total of forty-two participants estimated the ancestry of eight skulls. This chapter reports the results for each skull in detail (See Figures 9-16). The statistical results of the affects of experience, education, and geographic region on the assessment of ancestry are also presented in this chapter.

Summary of Frequency Distributions

Because the proposed research is primarily interested in determining if education, experience, and geographic region play a role in ancestry assessment, the scores according to each of these categories (the education, experience, and geographic region of each participant) was compared. The mean scores for correct ancestry assessment were calculated according to each of the three different groups for education and experience. These groups for education were group one, (those with no degree in anthropology and those in their undergraduate year studying anthropology), group two (those with a B.A. and or an M.A. in anthropology), and group three (those with a Ph.D. and/ or a DABFA certification). The three groups for experience were group one (those who had used the nonmetric method to assess ancestry previously on 0-10 skulls), group two (on 11-50 skulls), and group three (on 51-91+ skulls). According to the three educational groups, group one (those with no degree and those in their undergraduate year) had a mean score of 70 % for overall correct ancestry assessment. The second educational group (those with a B.A. and/or a M.A.) had a mean score of 71.14 % for overall correct ancestry assessment, and the third educational group (those with a Ph.D. and/or a DABFA certification) had a mean score of 69.46 % for overall correct ancestry assessment (see Figure 17).

According to the three experience levels, group one (those who had used nonmetric ancestry assessment on 0-10 skulls) had a mean score of 65.59 % for overall correct ancestry assessment. The second group (those who had used nonmetric ancestry assessment on 11-50 skulls) had a mean score of 69.79 % for overall correct ancestry assessment, and those in the third group (used nonmetric ancestry assessment on 51-91+ skulls) had a mean score of 74.43 % for overall correct ancestry assessment (see Figure 18).

To determine if the forensic anthropology practitioner's geographic region had any affect on the ancestry assessment of skulls, the participants were put into one of two categories (west versus east), according to the meeting they each attended. The mean scores of correct ancestry assessment were then taken for each ancestral group, not overall assessment to determine if there were differences in assessing particular ancestry according to each geographic group. In other words, did the two geographic groups differ in the overall assessment of European versus African versus Asian? The participants that attended the western meeting, the Mountain, Desert, and Coastal meeting, correctly identified 71.29 % of the Asian skulls, 57.41 % of the African skulls, and 77.78 % of the

European skulls. The participants that attended the eastern meeting, the Mountain, Swamp, and Beach meeting, correctly identified 55.36 % of the Asian skulls, 78.57 % of the African skulls, and 92.86 % of the European skulls (see Figure 19).

Results

All statistical results were conducted using the computer package SPSS 16.0. An analysis of variance (ANOVA) is used to test if there are differences in the mean of two or more sample groups. Therefore, for the purpose of this research, an ANOVA was conducted to determine if significant differences exist between the mean scores for correct ancestry assessment of each group based upon education and experience. A Kruskal-wallis is the non-parametric equivalent to an ANOVA, which test the hypothesis that *k* number of samples is drawn from the same population. A Kruskal-wallis test was performed to determine if the mean scores of correct ancestry assessment are significantly different for each ancestral group (European, African, and Asian) based upon the two geographic regions.

ANOVA

The ANOVA showed there to be no significant difference between the mean scores of the three levels of education $F (2, 39) = .120$, $p > .001$. Also, the ANOVA showed there to be no significant difference between the mean scores of the three levels of experience $F (2, 39) = 2.448$, $p = .100$.

Kruskal-wallis

The Kruskal-wallis test showed there to be a significant difference between the two geographic groups in the mean scores of identifying Asian ancestry, $H = 7.808$, 1 d.f., $p = .005$, and African ancestry, $H = 6.580$, 1 d.f., $p = .010$. However, there is no significant difference between the two geographic groups in the mean scores of identifying European ancestry, H = 1.822, 1 d.f., p = .177.

Conclusions

Based upon the statistical results, experience with the nonmetric method of assessing ancestry and education in anthropology does not have any affect on the assessment of ancestry when utilizing the nonmetric method. However, experience in terms of the forensic anthropologist's geographic region, which is likely being affected by the population demographics in which they work, has a significant affect on the assessment of ancestry for cases with Asian and African ancestry.

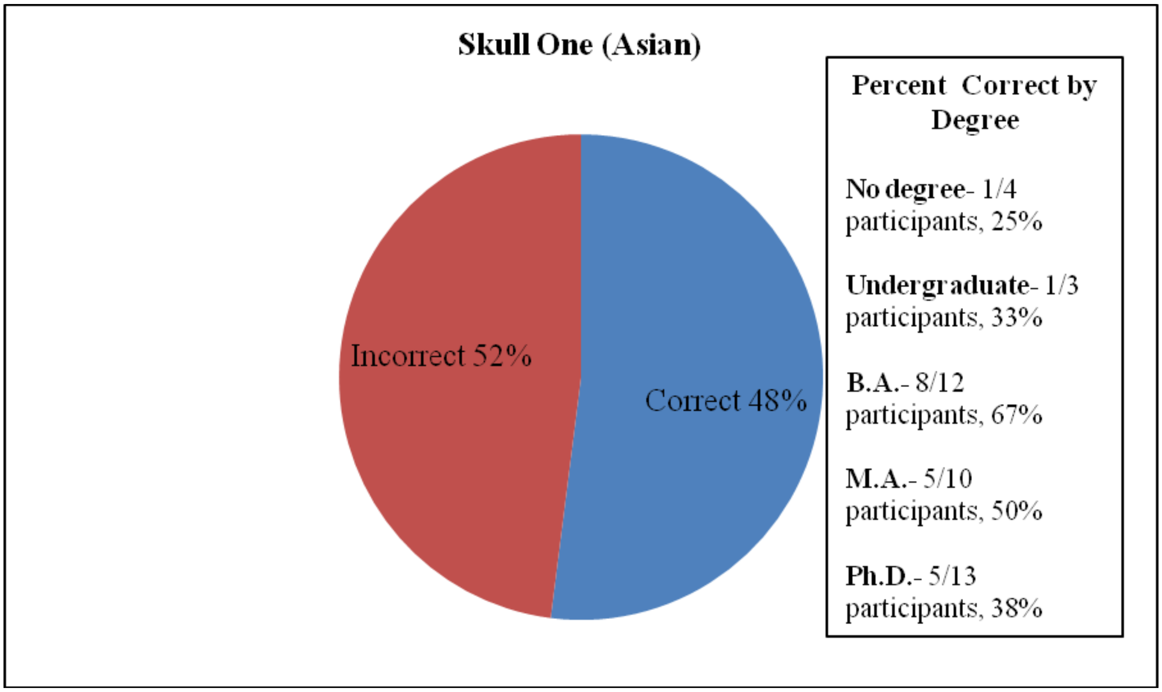

Figure 9. Scores for Skull One. This figure shows the percentages of correct versus incorrect responses for skull one.

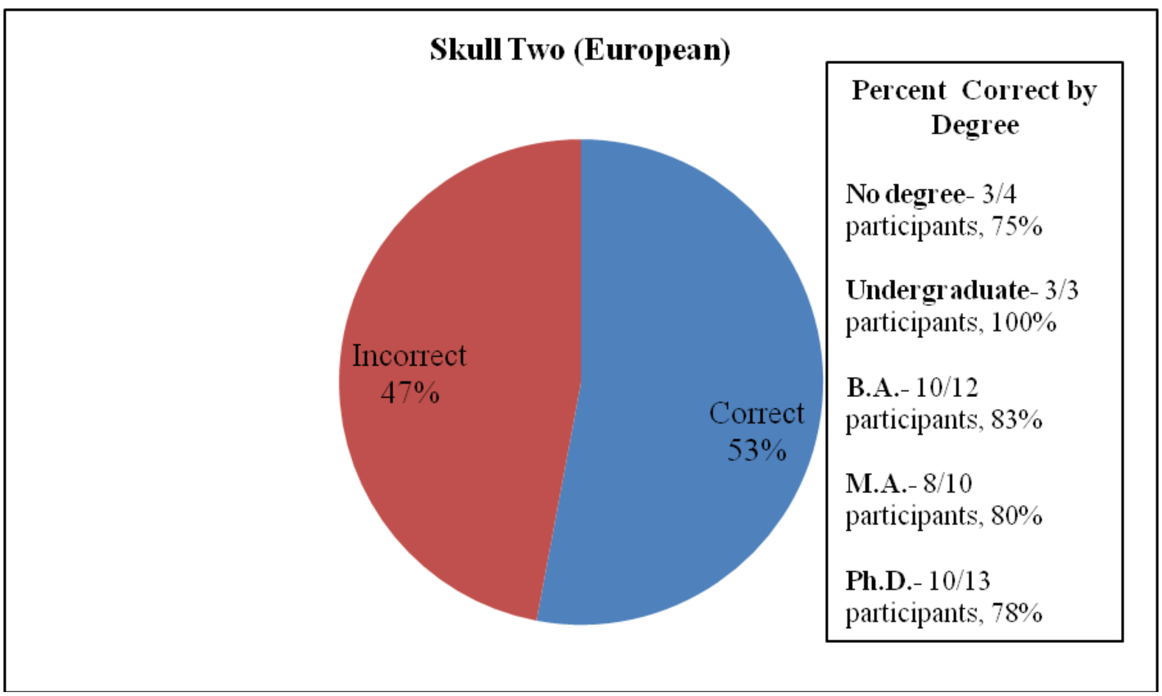

Figure 10. Scores for Skull Two. This figure shows the percentages of correct versus incorrect responses for skull one.

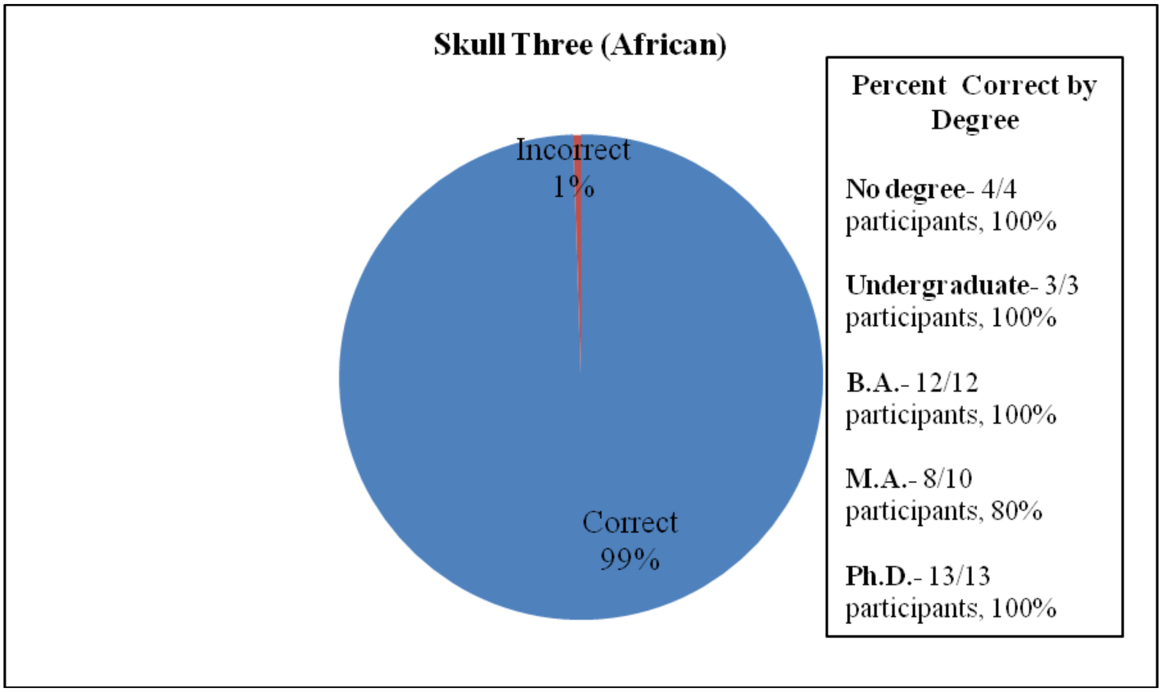

Figure 11. Scores for Skull Three. This figure shows the percentages of correct versus incorrect responses for skull three.

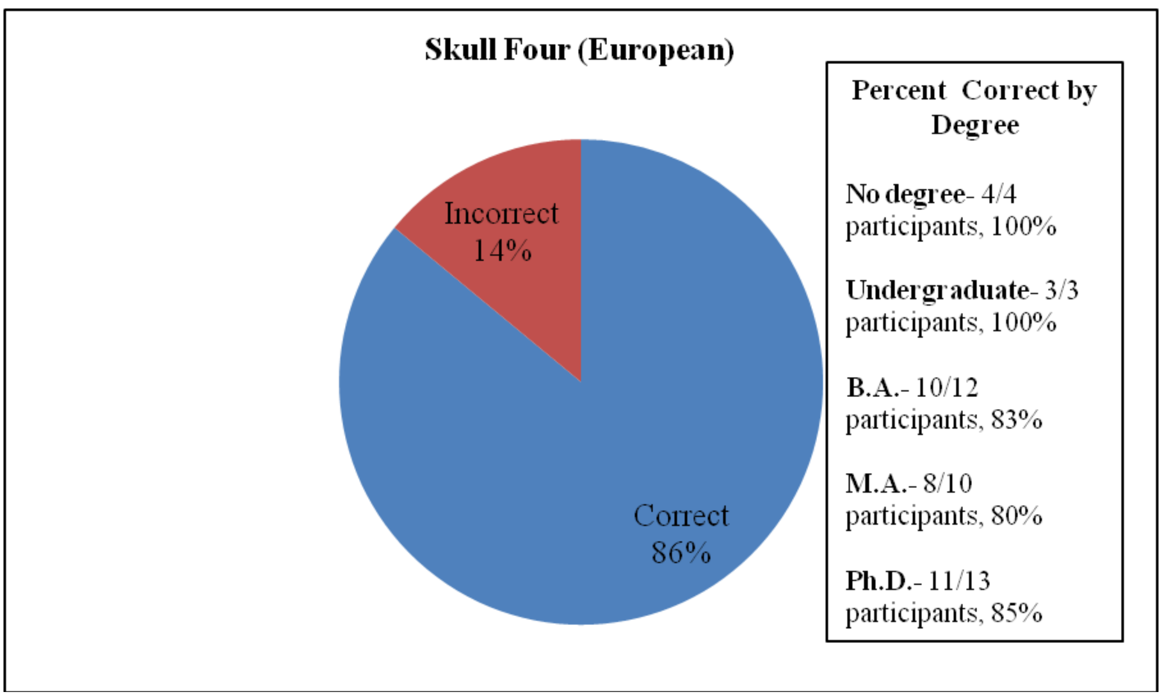

Figure 12. Scores for Skull Four. This figure shows the percentages of correct versus incorrect responses for skull four.

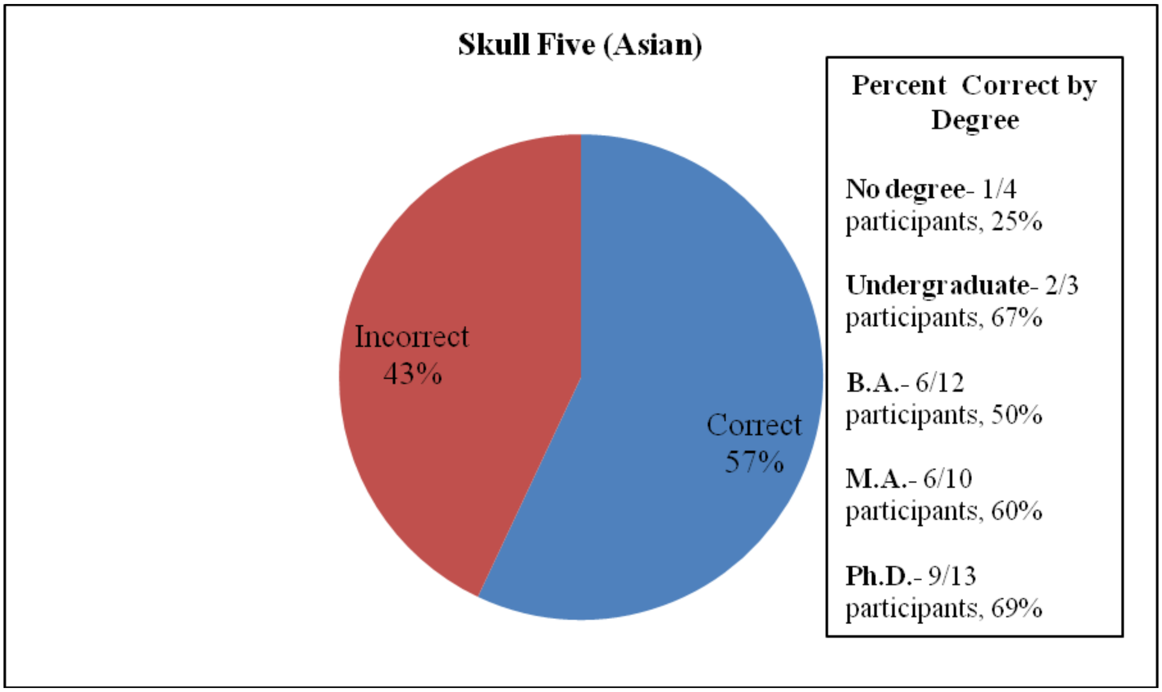

Figure 13. Scores for Skull Five. This figure shows the percentages of correct versus incorrect responses for skull five.

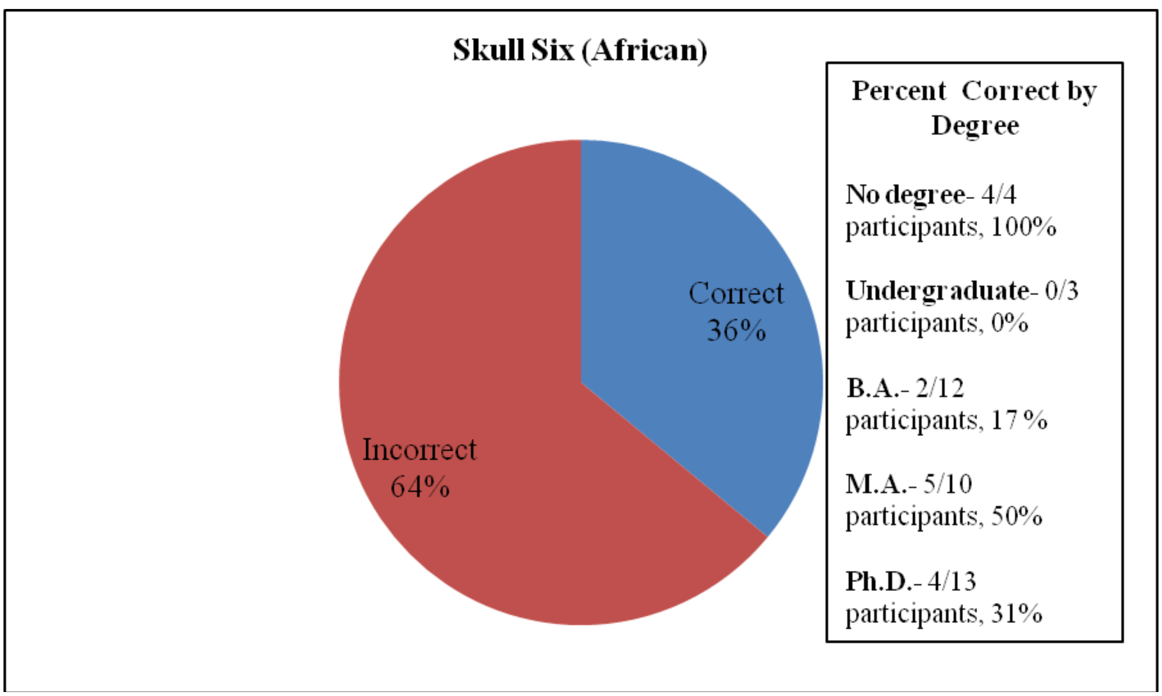

Figure 14. Scores for Skull Six. This figure shows the percentages of correct versus incorrect responses for skull six.

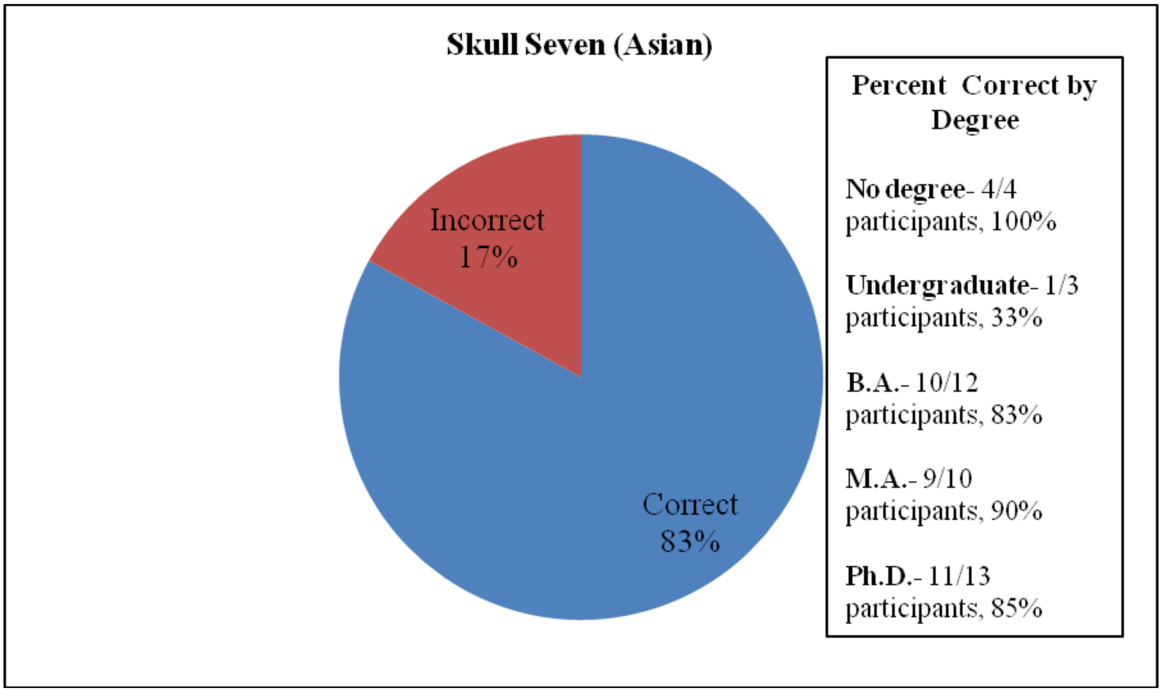

Figure 15. Scores for Skull Seven. This figure shows the percentages of correct versus incorrect responses for skull seven.

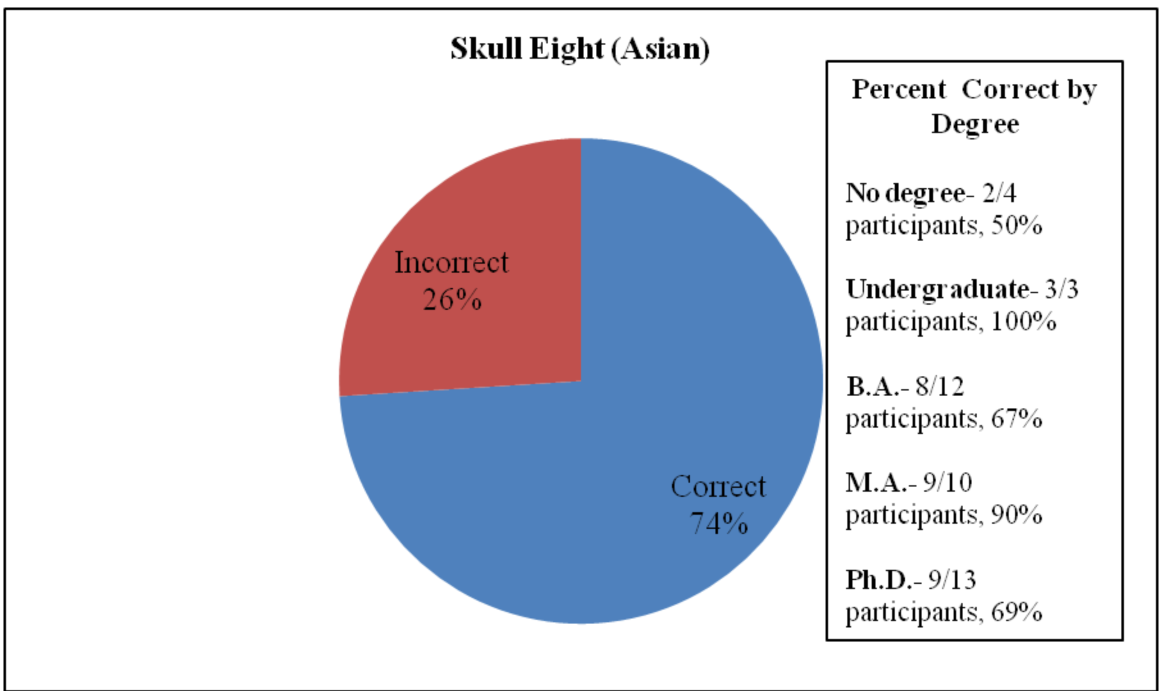

Figure 16. Scores for Skull Eight. This figure shows the percentages of correct versus incorrect responses for skull eight.

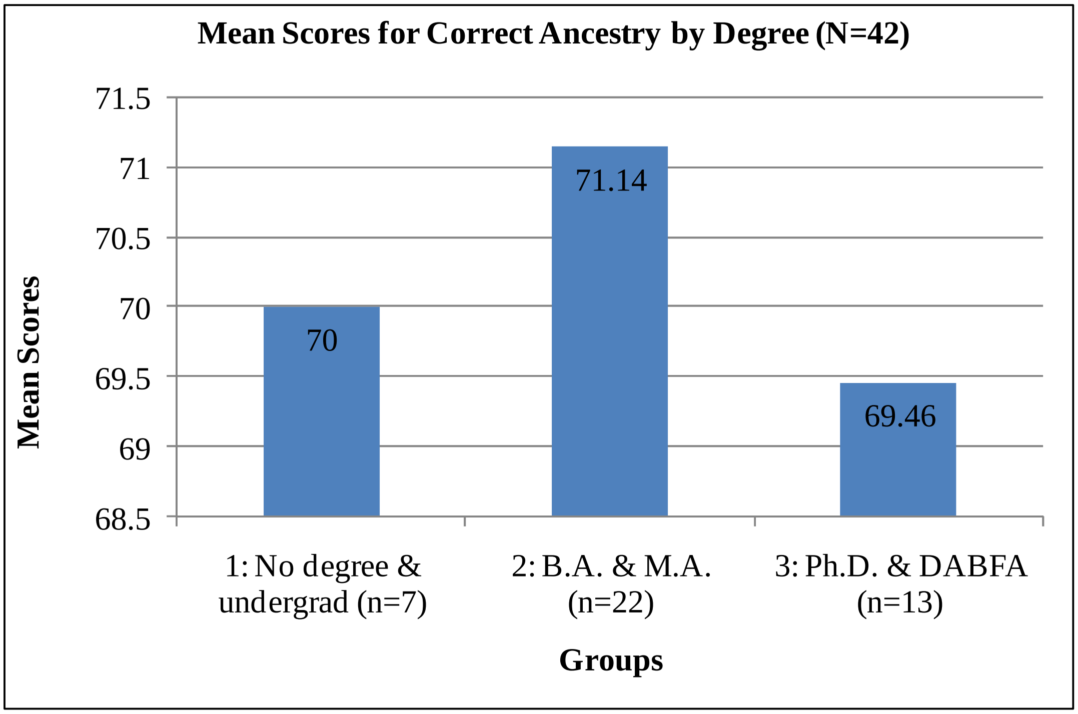

Figure 17. Mean Scores by Degree. This figure provides a detailed breakdown of the mean scores of correct ancestry assessment according to the three educational groups.

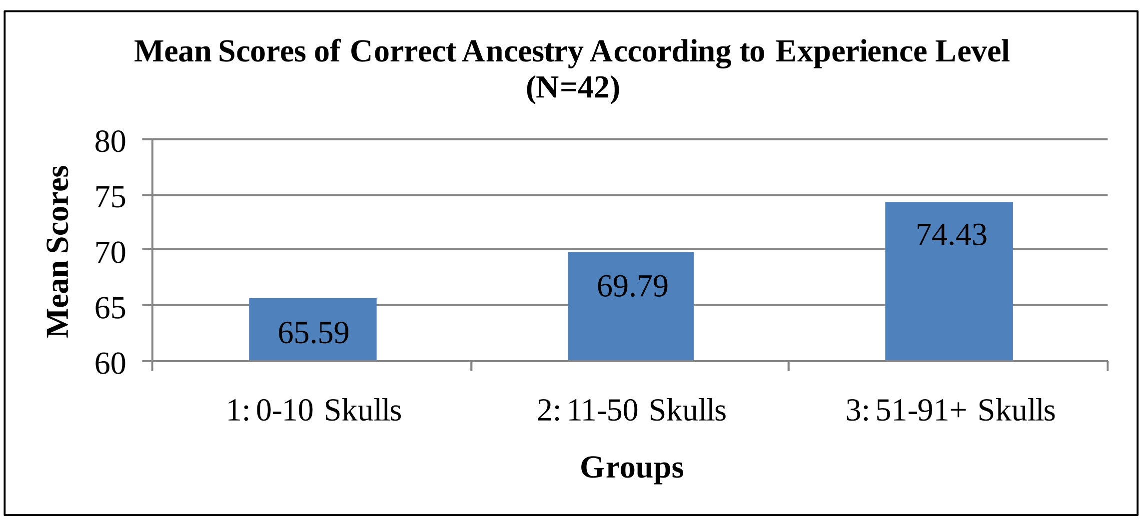

Figure 18. Mean Scores by Experience. This figure provides a detailed breakdown of the mean scores of correct ancestry assessment according to the three experience groups.

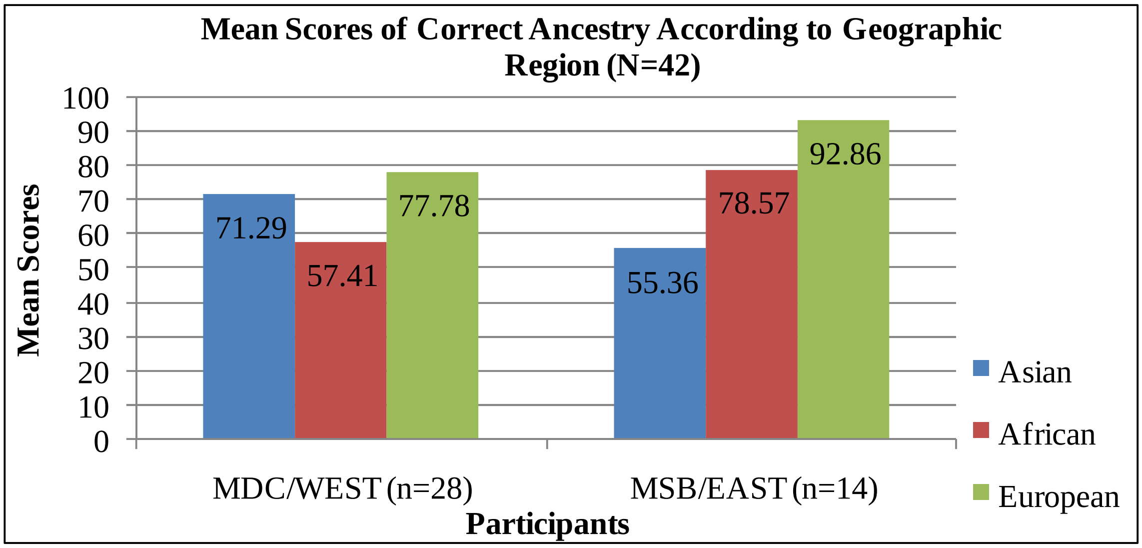

Figure 19. Mean Scores by Geographic Region. This figure provides a breakdown of the mean scores of correct ancestry assessment according to the two geographic regions.

V. DISCUSSION AND CONCLUSIONS

The primary goal of this study was to measure the affects that education, experience, and geographic region have on ancestry assessment. The results of this study indicate there is no significant difference in the mean scores of correct ancestry assessment of those individuals with a greater amount of education (those with a Ph.D. and or a DABFA certification) and those with little education (those with no degree in anthropology or those in their undergraduate year studying anthropology) in forensic anthropology. Based upon these results, education in forensic anthropology does not play a major role in the assessment of ancestry using nonmetric traits of the skull. This could be due to a number of reasons. It is important to keep in mind that the results are only portraying the affects of education. Education has nothing to do with experience. For example, just because someone may have a Ph.D. in anthropology does not necessarily mean the person has a great deal of experience with the nonmetric method of assessing ancestry. Perhaps these results also indicate that the nonmetric traits being used by individuals are not as subjective as once thought. In other words, if those participants that are just beginning their education in forensic anthropology are performing just about the same as those who have a Ph.D. and those that are DABFA certified, then this could mean that the nonmetric traits are easy to see, easy to differentiate, and are not subjective in their ratings.

Based upon the present research experience alone, defined according to the number of skulls that each participant indicated they had used the nonmetric method on to assess ancestry, does not affect the assessment of ancestry using nonmetric traits of the skull. Once again, keep in mind that experience is taken into account and education has no bearings on the results. It seems more likely that experience with the nonmetric method of assessing ancestry would have a greater affect on a person's ability to correctly assess the ancestry of a skull than education, simply because the more you use a particular method, the better you will get at using it correctly. However, this is not the case based on the present results.

Although education and experience do not play a role, geographic region does play a role in ancestry assessment when taking into account the geographic differences. The results of this study indicate that there are significant differences between the mean scores of correct ancestry assessment of the two geographic regions when it came to assessing the ancestry of Asian and African skulls, but not European skulls. This is likely due to population demographics and ultimately the forensic anthropologist's caseload. Those in the western United States are more likely to encounter Hispanic remains and scored significantly higher in the assessment of Asian ancestry than those in the eastern United States. However, those on the east side of the states scored significantly higher in assessing African ancestry than those on the west side of the United States.

Many forensic anthropologists have stated that education and experience are important factors in the assessment of ancestry (Hinkes 1993; Hooton 1926; Rhine 1993; Stewart 1979). According to the results of the present study, education and experience do not play a major role. In light of previous research, these findings are not consistent with those of Hefner et al. (2007), who found that experience and education do play a role in ancestry assessment (Hefner et al. 2007). The results of the present study likely differ from the previous research of Hefner et al. (2007) because the two blind tests were set up differently. First of all, unlike the present study, Hefner et al. (2007) used seven test cases (seven skulls), while the present study used eight, and each participant was asked to assess the ancestry and the sex of each. Also, the participants in Hefner et al.'s (2007) study were given 1.5 hours to complete, while the present study only allowed forty-five minutes. Hefner et al.'s study also used other skeletal elements, such as femurs, real skulls, casts of skulls, and skulls with pathological conditions (Hefner et al. 2007), while the present study only used skull casts. Another major difference from Hefner et al.'s (2007) study is that the present study tested the affects of the forensic anthropologist's geographic region on ancestry assessment.

The fact that there are differences in the mean scores between the two geographic regions of the United States needs to be addressed. If forensic anthropologists are encountering remains of a particular ancestry more frequently than others (due to population demographics), then perhaps there needs to be more training provided for those forensic anthropologists for other demographic groups. If forensic anthropologists mostly encounter the remains of a certain ancestry because of the particular geographic region in which they work, then they need to have the knowledge and training to be able to recognize an ancestry that they would normally not encounter.

The fact that education and experience do not play a role in the assessment of ancestry using the nonmetric method, also shows that the nonmetric traits are clear and not ambiguous. The nonmetric traits are clear enough for those participants with little education and experience to see, so much so that the mean scores for correct ancestry assessment are very similar between the participants with little education and experience and those with the most.

Recommendations for Future Research

This study produced preliminary results which indicate that education and experience in forensic anthropology have no affect on a person's accuracy of ancestry assessment through the nonmetric method. The results further suggest that a forensic anthropology practitioner's geographic location has an affect on ancestry assessment, particularly in the assessment of African and Asian ancestry. This research should be expanded upon to determine the overall impact that geographic region has on ancestry assessment. This preliminary research only focused on the western and eastern areas of the states. However, further subdividing the states and refining the geographic regions into distinct areas could show the true impact that population demographics have on ancestry assessment.

Conclusions

In conclusion, although it has been argued that the nonmetric method of ancestry assessment is one which requires experience and education (Hinkes 1993; Hooton 1926; Hooton 1946; Rhine 1990; Stewart 1979), the present research has proven otherwise. According to the results of the present study, education and experience in forensic anthropology have no affect on ancestry assessment through nonmetric traits of the skull. However, the forensic anthropologist's geographic region is affecting ancestry assessment, particularly when assessing the ancestry of African and Asian skulls. More data and more testing should be conducted to determine the overall affects of geographic region on ancestry assessment.

REFERENCES

1990. Race and Hispanic Origin Population Density of the United States: 1990: U.S. Census Bureau.

1996. Statement on Biological Aspects of Race. American Journal of Physical Anthropology 101:569-570.

Adams B, and Byrd J. 2002. Interobserver Variation of Selected Postcranial Skeletal Measurements. Journal of Forensic Sciences 47(6):1193-1202.

Armelagos GJ, and Gerven DPV. 2003. A Century of Skeletal Biology and Peleopathology: Contrasts, Contradictions, and Conflicts. American Anthropologist 105(1):53-64.

Ayers H, Jantz R, and Moore-Hansen P. 1990. Giles and Elliot Race Discriminant Functions Revisited: A Test using Recent Forensic Cases. In: Gill G, and Rhine S, editors. Skeletal Attribution of Race. Albuquerque, NM: University of New Mexico: Maxwell Museum of Anthropology Anthropological Papers No. 4.

Belcher R, Williams F, and Armelagos G. 2002. Misidentification of Meroitic Nubians using Fordisc 2.0. American Journal of Physical Anthropology Supplement 34(42).

Berry R, and Berry A. 1967. Epigenetic Variation in the Human Cranium. Journal of Anatomy 101:361-379.

Birkby W, Fenton T, and Anderson B. 2008. Identifying Southwest Hispanics Using Nonmetric Traits and the Cultural Profile. Journal of Forensic Sciences 53(1):29-33.

Blumenbach J. 1775. De Generis Humani Varietate Nativa Liber: Gottingae, Germany: Bergman Publishers.

Boas F. 1910. Changes in Bodily Form of Descendants of Immigrants, United State Immigration Commission. Washington D.C.: Government Printing Office.

Brace CL. 1995. Region does not mean Race-Reality versus Convention in Forensic Anthropology. Journal of Forensic Sciences 40:171-175.

Brace CL. 1997. Race Concept. In: Spencer F, editor. History of Physical Anthropology: An Encyclopedia. New York: Garland Publications.

Brace CL. 2005. Race is a four-letter word: Oxford University Press. 326 p.

Brooks S, Brooks R, and France D. 1990. Alveolar Prognathism Contour, An Aspect of Racial Identification. In: Gill G, and Rhine S, editors. Skeletal Attribution of Race. Albuquerque NM: University of New Mexico: Maxwell Museum of Anthropological Papers No. 4.

Brues A. 1990. The Once and Future Diagnosis of Race. In: Gill G, and Rhine S, editors. Skeletal Attribution of Race. Albuquerque NM: University of New Mexico: Maxwell Museum of Anthropological Papers No. 4.

Burns KR. 1999. The Forensic Anthropology Training Manual: Prentice Hall, Inc.

Byers SN. 2005. Introduction to Forensic Anthropology: Pearson Education Inc.

Dirkmaat DC, Cabo LL, Ousley SD, and Symes SA. 2008. New Perspectives in Forensic Anthropology. Yearbook of Physical Anthropology 51(1):33-52.

Giles E, and Elliot O. 1962. Race Identification from Cranial Measurements. Journal of Forensic Sciences 7:147-157.

Gill G. 1998. Craniofacial Criteria in the Skeletal Attribution of Race. In: Reichs K, editor. Forensic Osteology: Charles C. Thomas Publisher, Limited.

Gill GW. 2000. Does Race Exist? A Proponent's Perspective. NOVA Online.

Goodman AH, and Armelagos GJ. 1996. The Resurrection of Race: The Concept of Race in Physical Anthropology in the 1990's. In: Reynolds LT, and Lieberman L, editors. Race and Other Misadventures: Essays in Honor of Ashley Montagu in his Ninetieth Year. Dix Hills, NY: General Hall Inc. p 424.

Hefner JT. 2007. The Statistical Determination of Ancestry using Cranial Nonmetric Traits. University of Florida.

Hefner JT, Emanovsky P, Byrd J, and Ousley SD. 2007. The Value of Experience, Education, and Methods in Ancestry Prediction. University of Tennessee, Knoxville, TN.

Hinkes M. 1990. Shovel-Shaped Incisors in Huma Identification. In: Gill G, and Rhine S, editors. Skeletal Attribution of Race. Albuquerque, NM: University of New Mexico: Maxwell Museum of Anthropological Papers No. 4.

Hinkes MJ. 1993. Race, Ethnicity, and Forensic Anthropology. NAPA Bulletin 13(1):48-53.

Hooton E. 1926. Lecture notes of EA Hooton. Peabody Museum archives. Cambridge, MA.

Hooton E. 1946. Lecture notes of EA Hooton. Unpublished manuscripts of the Peabody Museum archives of E.A. Hooton. Cambridge, MA.

Howells WW. 1973. Cranial Variation in Man. Peabody Museum Papers.

Ishada H, and Dodo Y. 1997. Cranial Variation in Prehistoric Human Skeletal Remains from the Marianas. American Journal of Physical Anthropology 104:399-410.

Jamison P, and Zegura S. 1974. A Univariate and Multivariate Examination of Measurement Error in Anthropometry. American Journal of Physical Anthropology 40(2):197-203.

Jantz F. 1970. Change and Variation in Skeletal Populations of Arikara Indians. Lawrence: Department of Anthropology, University of Kansas.

Jantz R, and Ousley S. 2005. FORDISC 3.0: Personal Computer Forensic Discriminant Functions. Knoxville: Departments of Anthropology, University of Tennessee.

Klepinger L. 2006. Fundamentals of Forensic Anthropology: Wiley-Liss.

Leathers A, Edwards J, and Armelagos G. 2002. Assessment of Classification of Crania using Fordisc 2.0: Nubian X-Group Test. American Journal of Physical Anthropology 34:99-100.

Linnaeus C. 1759. Systema Naturae: Lugduni Batavorum: Theodorum Haak.

Marks J. 1994. Black, White, Other. Natural History:32-35.

Moore-Jansen PH, and Jantz RL. 1988. A Database for Forensic Anthropology: Structure, Content and Analysis. National Institute of Justice (US): University of Tennessee Department of Anthropology.

Morton SG. 1839. Crania Americana. Philadelphia: J. Dobson.

Nafte M. 2000. Flesh and Bone: An Introduction to Forensic Anthropology: Carolina Academic Press.

Ramirez RR, and Cruz GPdl. 2002. The Hispanic Population in the United States: March 2002, Current Population Reports. U.S. Census Bureau, Washington D.C.

Rhine S. 1990. Nonmetric Skull Racing. In: Gill G, and Rhine S, editors. Skeletal Attribution of Race. Albuquerque, NM: University of New Mexico: Maxwell Museum of Anthropological Papers No. 4.

Rhine S. 1993. Skeletal Criteria for Racial Attribution. National Association for the Practice of Anthropology Bulletin 13(1):54-67.

Rushton J. 1999. Race, Evolution, and Behavior: A Life-History Perspective. Port Huron, MI: Charles Darwin Research Institute.

Sauer N. 1993. Applied Anthropology and the Concept of Race: A Legacy of Linnaeus. National Association for the Practice of Anthropology Bulletin 13:79-84.

Smay D, and Armelagos G. 2000. Galileo Wept: A Critical Assessment of the Use of Race in Forensic Anthropology. Transforming Anthropology 9(2):19-29.

Snow C, Hartman S, Giles E, and Young F. 1979. Sex and Race Determination of Crania by Calipers and Computers: A Test of the Giles and Elliot Discriminant Functions in 52 Forensic Science Cases. Journal of Forensic Sciences 24:448-460.

Stewart T. 1979. Essentials of Forensic Anthropology. Springfield, IL: Charles C. Thomas.

Washburn SL. 1963. The Study of Race. American Anthropologist 65(3):521-531.

Williams FLE, Belcher RL, and Armelagos GJ. 2005. Forensic Misclassification of Ancient Nubian Crania: Implications for Assumptions about Human Variation. Current Anthropology 46(2):340-346.

VITA

Amber Wheat was born and raised in Louisiana. She holds a bachelor's degree in Anthropology from Louisiana State University. She entered the Graduate College of Texas State University-San Marcos in August 2007. Her research interests include all aspects of biological human variation, particularly craniofacial variation and development. She is married to her best friend, Austin. She and her husband currently reside in Texas with their two dogs.

Permanent e-mail: AD1293@txstate.edu

This thesis was typed by Amber Wheat.