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# Examining Variation in Intentional Cranial Modification in Ancient Tucume, Peru

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# *EXAMINING VARIATION IN INTENTIONAL CRANIAL MODIFICATION IN ANCIENT TÚCUME, PERU*

by

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Abstract

The purpose of this research is to analyze intentional cranial modification at the site of Túcume located in Peru. Intentional cranial modification is the permanent alteration of the infant cranium through the use of apparatuses that will alter the shape of the skull resulting in lifelong implications. This analysis serves to answer three research questions through testing the hypotheses in regards to the variation among individuals, the sex-based differences in the population, and how cranial modification patterns differentiate normal burials from sacrificed individuals at Túcume. The data include a total of 480 individuals with 375 crania observable. It was found that 26% of individuals with crania were modified. A sex-based pattern was identified since 47% of females were modified while only 18% of males were modified. There were 99 sacrificed individuals with only 6% of them being also modified. The data indicates that there was not a statistically significant difference in the modifications between the sacrificed and non-sacrificed individuals. There is also not enough evidence to indicate that the sacrificed individuals were from other locations. The individuals that were sacrificed were most likely from Túcume. In regards to classification type, it was found that fronto-occipital vault modification was the most prevalent at 56% regardless of sex or age. Fronto-occipital and lambdoidal modifications were more frequently performed on females while occipital was more frequent among males. From the data, this indicates that this was not a common practice at Túcume. There was enough variation in the types of modification that suggests it was not a universal practice. The practice of head shaping in past societies is an important aspect because it holds social implications. It is clear that this thesis provides important insight into Túcume's past and contains important information in regards to sex-based patterns of head shaping as a marker of group identity.

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# INTRODUCTION

## Research Purpose

Throughout human history, intentional cranial modification has been practiced all over the world in many diverse cultures. There is large variety and aspects that make each culture unique in this practice. For example, intentional cranial modification has been practiced in China (Qun et al., 2019), Australia (Brown, 2010), Bronze Age Eurasia (Mayall & Pilbrow, 2019), Pre-Columbian Ecuador (Munizaga, 1976), Neolithic Russia (McKenzie & Popov, 2016), Pre-Columbian Maya (Geller, 2006) and numerous other locations all over the globe. If the practice is so prominent in many cultures throughout time, then why is the history of this ancient practice not completely understood? The purpose of this research is to analyze the ancient practice of intentional cranial modification at the archaeological site of Túcume, Peru in order to explore the social implications. Through this process, patterning will be examined such as sex-based and burial patterning in order to interpret the practice.

There are many facets that go into intentional cranial modification. It is a practice that embodies cultural, social, and historical significance. While physical appearance is the most prominent aspect that one recognizes, it holds more than just physical variation. It suggests implications for life identity and intentionality. For instance, Velasco (2018) discusses certain head shapes could have been used to differentiate individuals in socioeconomic divisions. This would identify the modified individuals to a certain group within the society such as an elite with social privileges. This thesis addresses and explores these possible implications based off of a data set from the archaeological site of Túcume located in the northern coastal plains of Peru.

Even though many locations have practiced intentional cranial modification, this thesis aims to focus on analyzing the practice specifically at the archaeological site of Túcume, in

northern Peru. This analysis will provide insight into ancient complex societies in the Andean region. This research is important because it allows for the identification of patterns within the Túcume culture and could also provide information for the progression of future research. The purpose of this thesis is answering crucial questions about Túcume which includes: What patterns can be observed for specific individuals at Túcume to be intentionally cranially modified? What observable differences are present between sexes? Are individuals at Túcume found in different burial contexts such as sacrificed burials modified differently?

## Intentional Cranial Modification

The origin of intentional cranial modification in the Andes has been falsely accredited to the Incas; however, it is estimated that ancient Peruvians were utilizing this practice at least 1,000 years before the Inca empire was created (Schijman, 2005). As defined by Alfonso-Durruty et al. (2015: 608), intentional cranial modification is the "permanent alteration of the normal morphology of the skull that is achieved by systemically pressuring the calvaria during infancy and childhood." Pressure is strategically applied to the cranium using apparatuses such as boards, pads, bands, stones, or a combination of devices (Rhode & Arriaza, 2006). The alteration of the cranium occurs during infancy due to the malleability and plasticity of the skull during this time period of growth and development. The bones of the cranial vault have not completely ossified and allows for the bones to be shaped in a specific manner. An infant's skull contains fontanelles that are located around the crania; therefore, this makes it possible for modification to be successfully performed without neurological harm. The topic of neurological damage during this process has long been debated; however, the brain is able to adapt and grow

into the unrestricted areas of the skull since the process is done during the early growth stages of life (Pomeroy et al., 2010).

A frequent question surrounding intentional cranial modification is why the practice is performed. This question is complicated and it will likely vary depending on the culture. One thing known for certain is that it was an important part of the lives of these societies. The modification is a result of the interaction between a newborn and their caretaker (Alejandro, et al., 2019). This is done in a social context and implies social meaning. It appears that some scholars attribute the practice to societal standards such as belonging to a certain status/class, used as an ethnic marker, or to improve one's beauty (O'Brien & Stanley, 2013). Due to these reasons for the practice, it is possible that in certain societies powerful classes or elites could use local ethnic differences for discrimination or to gain advantages (Torres-Rouff & Yablonsky, 2005). As previously stated, the origins of the practice depend on the culture. For instance, it is argued that the ancient Maya of Mesoamerica utilized this practice to prevent newborns from experiencing soul loss through their heads (Duncan & Hofling, 2011). Stone (2012) adds that in some cultures it could be a way to control female subordination. Overall, it can be seen that the reason for the practice of intentional cranial modification is constrained by the culture's local customs and preferences (Torres-Rouff & Yablonsky, 2005).

While this thesis focuses on intentional cranial modification, it is important to understand that modification can also occur unintentionally. This is an imperative element to understand when analyzing modified remains because it will impact the interpretation of the results from the data. When analyzing modified remains, one must be able to differentiate an intentional modification from an unintentional one. Some cultures demonstrate no evidence of unintentional modification and will therefore say something different about that society. One of the most

common examples of unintentional cranial modification is cradle boarding. This technique is used to immobilize the child but could inadvertently result in flattening of the skull in certain areas (Lessa et al., 2008). This can happen when the child's head is secured to a single board while lying on their back (Kuzminsky et al., 2016). Some cultures even considered cradle boarding necessary for proper child-rearing (Blom, 2005).

Skeletal modification practices are important aspects when analyzing an ancient cultural population. There are countless practices that alter the skeletal structure that have been demonstrated throughout history such as foot binding, neck rings, tight-lacing/corsets, etc. (Stone, 2012). All of these practices are important aspects in bioarchaeology. Body modification and shaping will inevitably leave marks on the skeleton in a patterned way. This allows for those osteologists to identify the cultural meaning behind the practices.

## Bioarchaeology

Anthropology contains numerous subfields including bioarchaeology that allows for the scientific study of humans and their past. As defined by Martin et al. (2013: 1), bioarchaeology is "the study of ancient and historic human remains in a richly configured context that includes all possible reconstructions of the cultural and environmental variables relevant to the interpretations drawn from those remains." Bioarchaeology demonstrates the connection that biology has with culture where the context is a key component with the human remains (Larsen 2015). It is able to provide an integrative and interdisciplinary study (Larsen, 2015). Bioarchaeology is an essential part of Anthropology because it combines the scientific approach by applying traditional scientific methods and theories while embodying the human experience. Bioarchaeologists traditionally applied a processual approach to their research and are more

theoretically aware than before (Blom, 2017). As previously mentioned, bioarchaeology is an expansive field with countless topics. Some common examples of research within the field could include: sexing skeletons, aging remains, chemical compounds of the body, isotope analysis, skeletal morphology, pathology, anatomy, osteology, trauma, forensics, etc. Researchers utilize this field and its techniques to analyze and interpret the past, present, and future of humans. Bioarchaeology utilizes time depth and a cross-cultural perspective of humans to look at science in a different way in regards to biological and cultural aspects (Martin et al., 2013). This field has contributed not only to the understanding of Andean prehistory but also to Anthropology as a whole. It also allows for fluid dialogue between the disciplines of Biology and Archaeology.

## LITERATURE REVIEW

Intentional cranial modification has been practiced throughout time by many diverse societies. For decades scientists have studied and created their own classification systems for this ancient practice. The purpose for this literature review is to synthesize previous research on the topic. This section helps to trace the history of the practice and add to the knowledge that we have for intentional cranial modification. This section is organized into three main sections which includes: classification types, reasons for intentional cranial modification, and pathology and controversial neurological implications.

### Classification Types

Different modification styles reflect the location where the modification devices were placed on the skull resulting in restricted cranial growth. For instance, fronto-occipital modification utilizes a modifying apparatus that applies pressure to the frontal and occipital bones of the skull. This has the potential to cause parietal bulging since it reduces the distance between the endocranium of the frontal and occipital bones. The parietal bulging occurs from the braincase growing laterally into the unrestricted areas, which can allow for identification of this process. Parietal bulging can also be seen in Figure 1, which depicts the superior view of a mature adult female with moderate fronto-occipital modification.

*Figure 1. Superior view of individual, T-Bal IB ENT5. Mature adult female between the ages of 35 and 60. This individual is from Túcume and demonstrates bulging of the parietal bones due to moderate fronto-occipital modification. (Photo courtesy of Dr. J.M. Toyne).*

There are various modification styles that are broken down into types and sometimes subtypes. However, intentional cranial modification does not have a widely accepted classification system. When statistically analyzing different modification types of hundreds of individuals, it can become difficult and confusing without a set classification system. Over time due to this obstacle, many researchers have created their own system for classification. According to Dingwall (1931) Lunier and Magitot each created a ten-type classification system and Topinard made four primary types along with subtypes for a total of nine. There has also been confusion as there are often times multiple names for the same type of modification. Different classification systems vary depending on culture and data that are available. Also, the

degree to which a cranium is modified will be variable among populations (Del Papa & Ivan, 2007). Generally, types of modification that are usually included are frontal, fronto-occipital, annular/circular/circumferential, tabular and lambdoidal. Listed in Table 1 below are the most common types of modification with the corresponding sources that have used them. This includes scholars that have used these classifications in their analysis or discussed them in their research. Some types have the same names or have slight differences but are categorized in Table 1 based on the most common categorization that was found in the literature. It can be seen that there are new names for old styles and subtypes that have been created.

Since Túcume is located in the northern coastal plains of Peru, South American research and classification systems will be the most pertinent and comparable for this research. These will include those used by Blom (2005) in Tiwanaku, Torres-Rouff (2002) in Chile, Cocilovo et al. (2011) in the south-central Andes, and Hoshower et al. (1995) in Peru, just to name a few. To remain consistent in this research, I will follow one type of classification system that will be further explained in detail in the Data Collection and Methodology section.

Table 1. Intentional cranial modification types categorized with scholars who have used them along with the corresponding region.

| **Classification Type:** | **Description of Styles:** | **Source:** | **Corresponding Region:** |
|---|---|---|---|
| Circular/Annular/ Circumferential<br>• Circular Erect<br>• Circular Oblique | Circular elongation of the cranium through equally applied pressure all around the cranium. | Alejandro et al. (2019)<br>Pomeroy et al. (2010)<br>Alfonso-Durrruty et al. (2015)<br>Blom (2005)<br>Boston (2015)<br>Cocilovo et al. (2011)<br>Sanchez-Lara et al. (2007)<br>Hoshower et al. (1995)<br>Kuzminsky et al. (2016)<br>Rhode & Arriaza (2006)<br>Torres-Rouff (2002)<br>Torres-Rouff & Yablonsky (2005)<br>Velasco (2014)<br>O'Loughlin (2004) | -Pampa Patagonia, Argentina<br>-North-Central Peru<br>-Fuego-Patagonia, Chile<br>-Tiwanaku<br>-South Central Andes<br>-Moquegua Valley, Peru<br>-Andes<br>-Prehistoric South Central Andes<br>-Pre-Columbian Andes<br>-San Pedro de Atacama, Chile<br>-Eurasian steppes & the Andes<br>-Colca Valley, Peru |
| Frontal bone flattening | Flattening on only the frontal bone. | Hoshower et al. (1995)<br>Torres-Rouff (2002) | -Moquegua Valley, Peru<br>-San Pedro de Atacama, Chile |
| Fronto-occipital | Flattening on the frontal and occipital bones. | Pomeroy et al. (2010)<br>Alfonso-Durrruty et al. (2015)<br>Blom (2005)<br>Boston (2015)<br>Cocilovo et al. (2011)<br>Sanchez-Lara et al. (2007)<br>Hoshower et al. (1995)<br>Lessa et al. (2008)<br>Rhode & Arriaza (2006)<br>White (1996)<br>O'Loughlin (2004) | -North-Central Peru<br>-Fuego-Patagonia, Chile<br>-Tiwanaku<br>-South Central Andes<br>-Moquegua Valley, Peru<br>-Chillon River Valley, Peru<br>-Prehistoric South Central Andes<br>-Pre-Columbian Andes<br>-San Pedro de Atacama, Chile |
| Occipital bone flattening/Tabular Oblique | Flattening on only the occipital bone.<br><br>The location where the pressure if applied from the modification device creates a more oblique angle. | Pomeroy (2010)<br>Okumura (2008)<br>Alfonso-Durrruty et al. (2015)<br>Blom (2005)<br>Cocilovo et al. (2011)<br>Hoshower et al. (1995)<br>Kuzminsky et al. (2016)<br>Lessa et al. (2008)<br>Torres-Rouff (2002)<br>Torres-Rouff & Yablonsky (2005)<br>Velasco (2018)<br>O'Loughlin (2004)<br>Tiesler (2013) | -North-Central, Peru<br>-Pre-Columbian Peru<br>-Fuego-Patagonia, Chile<br>-Tiwanaku<br>-South Central Andes<br>-Moquegua Valley, Peru<br>-Andes<br>-Chillon River Valley, Peru<br>-Pre-Columbian Andes<br>-San Pedro de Atacama, Chile<br>-Eurasian steppes & the Andes<br>-Colca Valley, Peru |

| | | | |
|---|---|---|---|
| Lambdoidal/Tabular Erect | Flattening on the occipital bone with pressure at lambda. It creates a more vertical/erect angle. | Pomeroy (2010)<br>Okumura (2008)<br>Alfonso-Durrruty et al. (2015)<br>Blom (2005)<br>Cocilovo et al. (2011)<br>Hoshower et al. (1995)<br>Kuzminsky et al. (2016)<br>Torres-Rouff (2002)<br>Torres-Rouff & Yablonsky (2005)<br>Velasco (2018)<br>Tiesler (2013) | -North-Central, Peru<br>-Pre-Columbian Peru<br>-Fuego-Patagonia, Chile<br>-Tiwanaku<br>-South Central Andes<br>-Moquegua Valley, Peru<br>-Andes<br>-Pre-Columbian Andes<br>-San Pedro de Atacama, Chile<br>-Eurasian steppes & Andes<br>-Colca Valley, Peru |

## Reasons for Intentional Cranial Modification

The reasons behind the practice of intentional cranial modification may vary depending on region and time period. This practice infers intentionality and implications for life identity. Due to this factor, many reasons for the practice will embody societal implications. The most prevalent reasons that have been discussed throughout the literature includes: ethnic marking, group identity, aesthetic purposes, or social status.

Ethnic marking and group identity appear to be the most prevalent reasoning for the practice among the literature. Blom (2005) explains that the practice allows for the creation of visual characteristics that are not present at birth and gives meaning to those distinct social but collective differences. Therefore, this means that intentional cranial modification is a social construct with societal meaning. Scholars that have mentioned ethnic marking or group identity as a reason in their research includes: Lessa et al. (2008) in Chillon River Valley, Peru, Blom (2005) at Tiwanaku, Alejandro et al. (2019) in Pampa-Patagonia, Argentina, Hoshower et al. (1995) in the Moquegua Valley, Peru, Kuzminsky et al. (2016) in the Andes, Torres-Rouff (2002) in Middle Horizon San Pedro de Atacama, Chile, and Velasco (2018) in Colca Valley, Peru. This practice could be considered to be group identity over individual because of the

practice is shared. It is expected that everyone belonging to the same group will look the same throughout generations. This practice gives identity from birth based on the parents' social membership. This is identified in the archaeological record through analysis of the practice and identifying patterns at a site. Intentional cranial modification was used as a physically sign of identifying who they were and which group they belonged to.

Sex-based patterns will often be discovered during analysis of the practice as well. Sex plays an important role in intentional cranial modification including at Túcume. For example, Gerszten et al. (1998) conducted research in the Ica Valley of the coastal Peru and the Azapa Valley of northern Chile. In Gerszten et al.'s (1998) sample, they found an equal frequency of modification among sexes that illustrates a gender-based patterning in that area.

Another possible aspect of intentional cranial modification is that it could have been performed for aesthetic purposes. The use of the practice for aesthetics could have been done for numerous reasons but could have been based on what was considered beautiful or desirable in a particular society. Some researchers that have mentioned or attributed this to the practice includes: Schijman (2005) in pre-Columbian Andes, Alfonso-Durrruty et al. (2015) in Fuego-Patagonia, Chile, O'Brien and Stanley (2013) in the South Central Andes, Rhode and Arriaza (2006) in the prehistoric South Central Andes, and Torres-Rouff (2002) in Middle Horizon San Pedro de Atacama, Chile.

The last interpretation for the ancient practice is to demonstrate social status. Although, it has been identified for opposing ranks. For certain cultures it is used to mark a sign of high social class while others use it as a form of discrimination against lower classes. According to Schijman (2005), different head shapes establish an individual's social status in a society: castes, classes, slaves, etc. While other times, it reserved for elites, nobility, or ruling class (Schijman,

2005). It is interesting to see how there are vast differences throughout different cultures. Scholars that have discussed social status as the reason for the practice includes: Okumura (2014) in pre-Columbian Peru, Duncan and Hofling (2011) among the Maya, Hoshower (1995) in Moquegua Valley, Peru, Kuzminsky (2016) in the Andes, O'Brien and Stanley (2013) in the South Central Andes, and Schijman (2005) in the pre-Columbian Andes. Whether intentional cranial modification is for social status, it can be seen that there are numerous diverse reasons for it depending on the culture.

## Pathology and Controversial Neurological Implications

While not as common throughout the literature, pathology and potential neurological damage is still an imperative aspect to discuss. Throughout the literature, neurological implications have been discussed and debated in regards to intentional cranial modification. This topic has been limitedly discussed but appears to have been a small trend throughout the literature. It appears that some scholars such as Schijman (2005), White (1996) and Lessa et al. (2008), have concluded that intentional cranial modification does not result in any neurological damage.

Pathological conditions that occur because of the practice are not intentional but rather are often collateral damage. Cranial vault lesions are among the more common pathology. Okumura (2014) and Lessa et al. (2008) argue that ramifications from cranial modification could be expected, especially localized erosive lesions on the vault during modification due to wear of materials against the scalp or cysts that develop due to consistent pressure on soft tissues. Lesions could be due to numerous variants such as poor hygiene and abrasive modification methods or inexperience of the caregiver with modification apparatuses (Lessa et al., 2008).

Gerszten et al. (1998) discusses the correlation between cranial modification and the increase in occurrence of wormian bones. Gerszten et al. (1998) also explains numerous other conditions that were found in individuals with cranial modification including: cribra orbitalia, trephination, and neosplasia. While some of these conditions are not direct links, they are still important considerations for the research to recognize potential harmful outcomes of cranial modification. Regardless, across the Andean region, cranial modification has been identified and can be used to examine variation in practice and purpose.

# BACKGROUND AND ANCIENT LIFE OF THE ANDES AND TÚCUME

## Background of the Andean Region

The coast of Peru is an arid desert with the Andes Mountains located to the east (Heyerdahl et al., 1995: 56). This area consists of numerous valleys, the largest and most northern of which is the Lambayeque (Heyerdahl et al., 1995: 57). Inhabitation of the Andean region first began at least 12,000 years ago and is referred to as the Preceramic Epoch (Heyerdahl et al., 1995: 58). Overall, the region experienced periods of cultural flourishment such as large monument construction and relied heavily on marine life throughout different time periods.

## Background of Túcume and its Structures

### *Chronology and Background of Túcume*

In the northern coastal plains of Peru lies the archaeological site of Túcume. The location of Túcume can be seen in Figure 2.

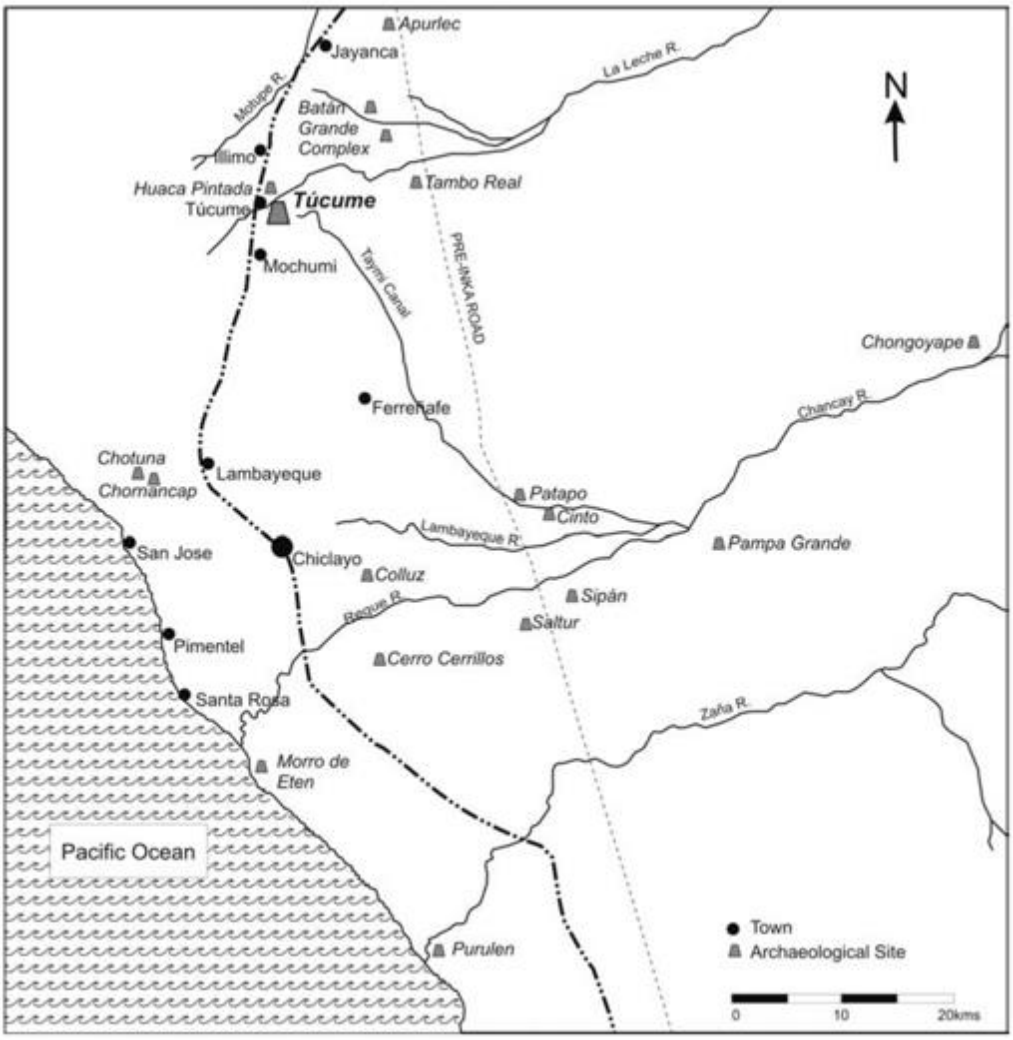


*Figure 2. Map of the Lambayeque region depicting the location of Túcume (Toyne, 2015: 177, Figure 4.1)*

Túcume resides about 28 km north of Chiclayo, the center of the Lambayeque Valley (Heyerdahl et al., 1995: 57). The site spans about 220 ha and is centered around a large natural hill known as ‘Cerro La Raya’. This translates to the Mountain of the Ray fish and reaches a height of about 140 m (Heyerdahl et al., 1995: 57). All remains and platform mounds span in a circle around the base of this natural hill. There is a total of 26 mud-brick platform mounds serving a variety of purposes including administrative, economic, and ritual functions (Toyne, 2016: 216). The Monumental Sector of Túcume is the north and northwest quadrants of the site

that contain the greatest concentration of platform mounds (Heyerdahl et al., 1995: 79). There are several principal archaeological features that are the main focus of the site. These features include: Huaca Larga, Temple of the Sacred Stone, Huaca Las Estacas, Huaca 1, Huaca Las Balsas, Huaca Facho, South Cemetery, White Cave, East Spur Sub-Sector, East Spur Sub-Sector II, East Spur Sub-Sector III, and East Spur Sub-Sector IV (Figure 3).

Túcume's occupation is divided into three major occupations: the Lambayeque (c. AD 1000/1100—1350), the Chimú (c. AD 1350—1470), and the Inca (AD 1470—1532) (Heyerdahl et al., 1995: 76). These occupations in Túcume's past are defined by excavated material and radiocarbon dates. Inhabitation and construction have spanned all throughout this chronology of Túcume's past.

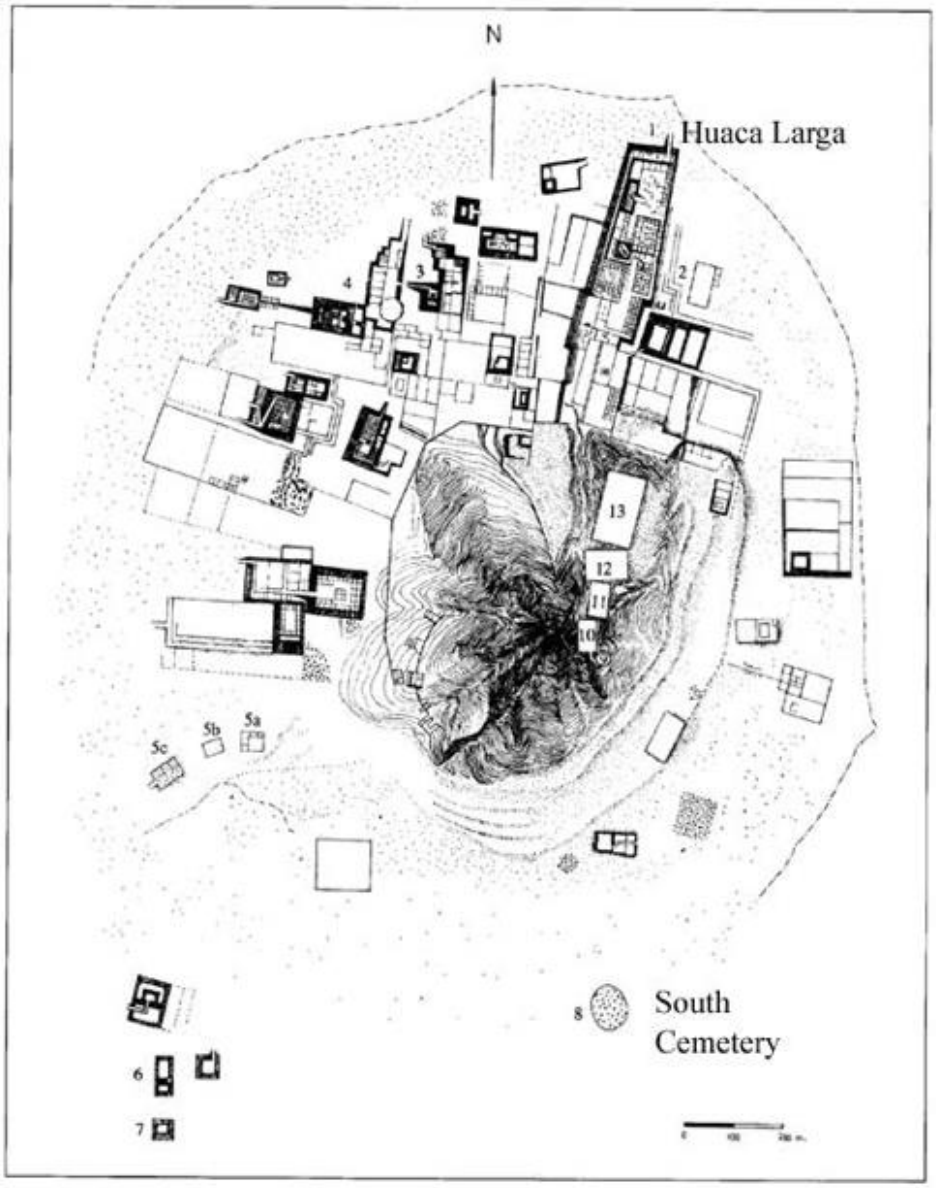


*Figure 3. Map of Túcume showing principle archaeological features. 1 Huaca Larga; 2 Temple of the Sacred Stone; 3 Huaca Las Estacas; 4 Huaca 1; 5a Sector V, rectangular compound; 5b Sector V, West Mound; 5c Sector V, Funerary Platform; 6 Huaca Las Balsas; 7 Huaca Facho; 8 South Cemetery; 9 White Cave; 10 East Spur Sub-Sector I; 11 East Spur Sub-Sector II; 12 East Spur Sub-Sector III; 13 East Spur Sub-Sector IV (Heyerdahl et al., 1995: 78, Figure 33)*

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## *Features of Túcume*

Túcume is an important site because it demonstrates a variety of contexts and gives good insight into life during this time period. There are several features at Túcume that are important

because they were utilized as parts of daily life at the site. Huaca Larga is one of the most predominant features at Túcume. During the Inca Period, it was established as the focus of their occupation (Heyerdahl et al., 1995: 90). It is a platform mound that is about 700 m long and 280 m wide. Cemeteries are an important aspect in this research. The South Cemetery contained burials and offerings which was mostly pottery (Heyerdahl et al., 1995: 171). The burials at Túcume correlate with the earliest period, the Lambayeque, and the latest period, the Inca. The burials were from the South Cemetery as well as various others around the site (Heyerdahl et al., 1995: 178).

The Temple of the Sacred Stone, or TPS, is located east of Huaca Larga's Platform 2. It is a U-shaped structure containing an upright rock positioned in the middle of the temple (Heyerdahl et al., 1995: 101). The location of this temple is important because it appears that it was strategically placed at the principal entrance of Túcume. The rock that is positioned in the middle of the temple is called a *huanca*. These have been worshipped throughout the Andes but was the first one found on the north coast of Peru (Heyerdahl et al., 1995: 102). The burials from in front of TPS included a large number of individuals that were human sacrifices (Toyne, 2015: 191).

Throughout the temple, there are various offerings made in and around the central structure (Heyerdahl et al., 1995: 103). There were human but also llama bodies buried around the Temple of the Sacred Stone (Heyerdahl et al., 1995: 112). The human remains were buried in strategic body positions. They were either in a semi-flexed position, lying on their backs with the head slightly raised and legs crossed or just extended while lying on their backs. The evidence from the site indicates that the human burials at this temple were human sacrifices that took place

over several centuries (Toyne 2015). Therefore, this means that the Temple of the Sacred Stone was dedicated to ceremonial rites and offerings.

### *Human Sacrifice at Túcume*

Human sacrifice appears to have been practiced at Túcume. As Toyne (2016) depicts, 94% of remains from the Temple of the Sacred Stone at Túcume demonstrate a consistent pattern of perimortem sharp force trauma. This pattern suggests that individuals were sacrificed for a shared aspect of social identity or ritual practice (Toyne, 2016: 220). Figure 4 shows the comparative mortality profiles between sacrificed individuals from Templo de la Piedra Sagrada and the Túcume cemetery burials. Graph A demonstrates that only adult males were sacrificed while more females have been recovered from other cemeteries at Túcume. Graph B indicates that the vast majority of individuals that were sacrificed were young adults. According to Toyne (2016), the data indicate that sacrifices of individuals may have been performed to establish positions of power by the elites; therefore, victims may have had little choice of becoming a sacrificial offering due to either social or religious coercion (Toyne, 2016: 238). From the evidence, it can be seen that the sacrificed individuals were chosen because they were group specific, which was restricted to young adult males and children. Toyne (2016: 237) explains that based on the skeletal indicators, the sacrificed individuals most likely experienced chronic biological stress at higher levels during the early years of life. This information is consistent with and suggests that they may have been individuals of lower social status. Overall, it is clear that sacrificed individuals were specifically chosen and this could later compare to those who were intentionally modified.

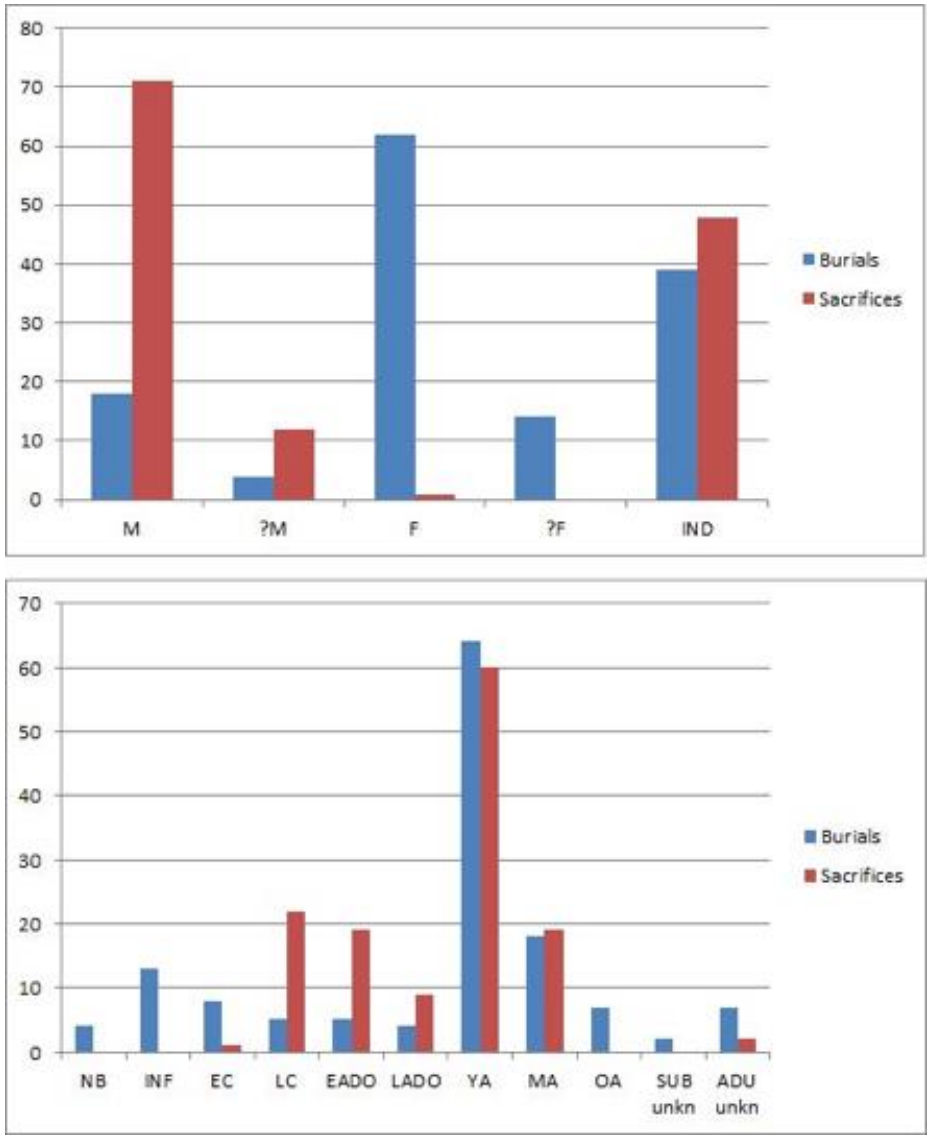


*Figure 4. Templo de la Piedra Sagrada sacrifice victim comparative mortality profiles with Túcume cemetery burials: (A) comparative sex distribution and (B) comparative age estimate distribution (Toyne, 2016: 227, Figure 8.4).*

## MATERIALS AND METHODS

The data set that is analyzed for this research is multi-faceted and the first step before analysis is laying out the data that are present from Túcume. All of the following data were collected by Dr. J. Marla Toyne directly from the skeletal remains at Túcume and can be found in Appendix 1. Due to the fact that chronology is not the focus of this thesis, the materials not separated chronologically. For this research, a juvenile is an individual that is 18 years old or younger and an adult is over the age of 18 years.

There were a total of 480 individual skeletons recovered from the site with only 375 containing crania. This included 95 adult females, 108 adult males, 9 adults of undetermined sex, and 163 juveniles. Out of the 375 individuals, there were 276 normal burials with crania and 99 sacrificed individuals. Those that were sacrificed consisted of only juveniles and adult males. The sacrificed individuals were defined based on whether they showed signs of deliberate trauma such as decapitation or cut marks.

## METHODOLOGY

Each individual was organized into categories for analysis. These categories included: case number, remains archaeological I.D., burial location, context (sacrificed/not sacrificed), sex, age, demographic code, cranial modification/no cranial modification, location of cranial modification (fronto-occipital, frontal bone flattening, occipital bone flattening, lambdoidal, annular), degree of cranial modification (minimal, moderate, pronounced), and symmetry of modification (symmetrical, not symmetrical). This was done using an Excel® spreadsheet. These data are presented in a chart (Appendix 1).

I have chosen a specific classification system to organize the cranial remains of this data set. The cranial modification categories/types that were used for this research and observed at Túcume included: fronto-occipital, frontal flattening, occipital flattening, lambdoidal, and annular shaping. There were some individuals where cranial modification was not able to be determined because of poor preservation. Due to this fact, modification style was analyzed based on the individuals where style could be assessed.

Once the data were categorized, the first step that was performed was quantification. The total summaries and frequencies out of the total categories were determined. Next, a chi-square test was performed by using an online chi-square calculator, https://www.graphpad.com/quickcalcs/contingency1/. This is a key step in this research because chi-square analysis allows to test for significant differences between groups in the data set. This includes sex or age-based patterns. This methodology allows for testing of the hypotheses and analyzing the results. These sex and age-based patterns did not include the sacrificed individuals. This was done in order to avoid biased results since the sacrificed individuals were composed of only adult males and juveniles.

## Testing the Hypotheses

The hypotheses in this research are as follows:

H1: It is expected that everyone at Túcume will exhibit intentional cranial modification. If this is not supported, then this indicates only specific people were intentionally modified. From this, it is expected that intentional cranial modification demonstrates a pattern and contains meaning.

H2: I hypothesize that female and male crania were modified in the same way. If this is not supported, then this suggests that females and males were modified differently. From this information, it is expected that there was sex-based patterning that determined intentional cranial modifications.

Finally, H3: It is hypothesized that sacrificed individuals (adult males) were not different in cranial modification frequency from those adult males who were buried in the normal cemeteries. Alternatively, it would mean that patterns in cranial modification distinguished sacrificed individuals from the non-sacrificed. It would then be expected that there was societal meaning behind intentional cranial modification.

RESULTS

Out of the total of 375 individuals from Túcume with crania (all categories), 96 show evidence of cranial modification. Table 3 depicts the results of the categories of individuals from Túcume. From Table 3, it can be seen that there are 45 modified adult females, 19 modified adult males, 1 modified adult of undetermined sex, and 31 modified juveniles. Juveniles cannot be accurately sex and therefore was not broken down into sex categories.

Table 3 shows the data for sacrificed individuals. Out of the total 375 individuals, 99 were from the sacrifice TPS context. Of the sacrificed individuals, 59/99 were adult males and 40/99 were juveniles. While this is not the main focus of the research, the fact that the sacrificed individuals were only adult males and children is an informative piece of information and the interpretations of this will be discussed later. There were six sacrificed individuals that were modified; four adult males and two juveniles.

Table 2. Categorical breakdown of individuals from Túcume.

| | **Total number of individuals not modified (Percentage)** | **Total number of modified individuals (Percentage)** | **Total number of individuals** |
|---|---|---|---|
| Individuals with crania | 279 (74%) | 96 (26%) | 375 |
| Normal burials with crania | 186 (67%) | 90 (33%) | 276 |
| Adult females | 50 (53%) | 45 (47%) | 95 |
| Adult males | 89 (82%) | 19 (18%) | 108 |
| Adults with undetermined sex | 8 (89%) | 1 (11%) | 9 |
| Juveniles | 132 (81%) | 31 (19%) | 163 |

| | | | |
|---|---|---|---|
| Sacrificed individuals | 93 (94%) | 6 (6%) | 99 |
| Sacrificed adults (males) | 55 (93%) | 4 (6%) | 59 |
| Sacrificed juveniles | 38 (95%) | 2 (5%) | 40 |

The frequency data are shown in Figure 5. The non-modified individuals in Figure 5 do not include the sacrificed individuals. It can be seen that adult females were the most modified category while juveniles were the largest group of non-modified individuals. Figure 5 also shows that adult males and juveniles were the only individuals that were sacrificed with adult males sacrificed at a higher frequency than children.

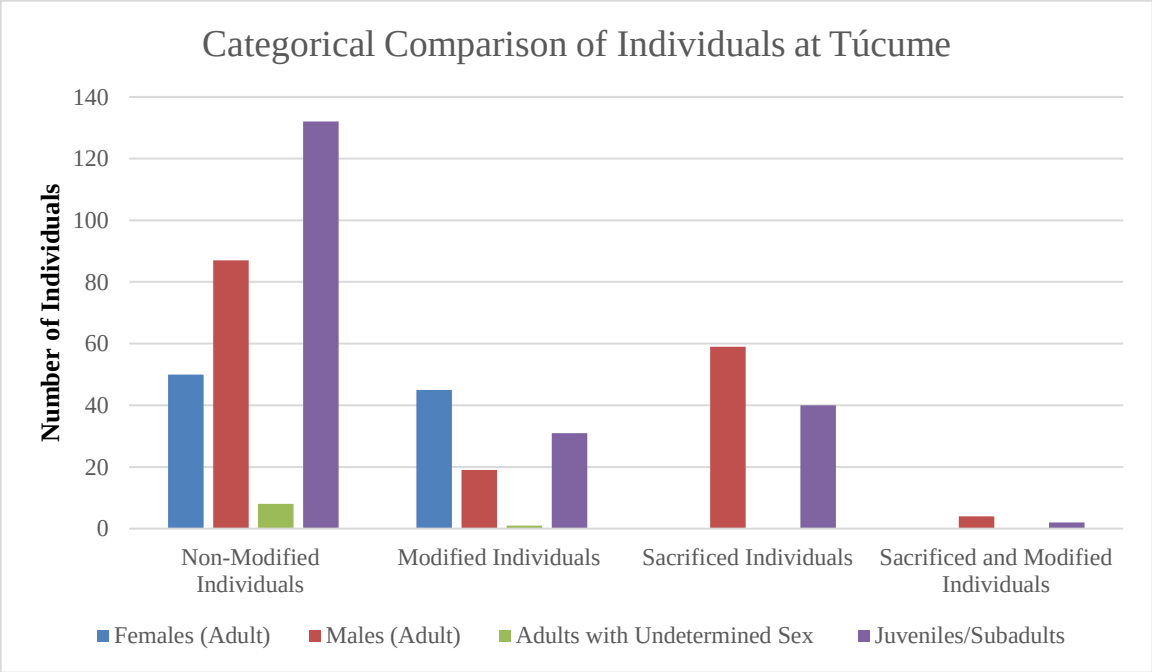


*Figure 5. Breakdown of categorical comparison of individuals with the y-axis being the number of individuals and x-axis being the categorical group.*

## Frequencies and Analysis of Intentional Cranial Modification

The chi-square analyses are presented in Table 3, including those tests where the differences were statistically significant.

*Table 3. Chi-square analysis results.*

| **Categories:** | **Chi-Square Analysis:** | **Significant Difference:** |
|---|---|---|
| Adult females/Adult Males | $X^2 = 19.401$, df = 1, $p < 0.0001$ | yes |
| Adults/Subadults | $X^2 = 5.960$, df = 1, p = 0.0146 | yes |
| Adult Males/Sacrificed Adult Males | $X^2 = 2.901$, df = 1, p = 0.0885 | no |
| Juveniles/Sacrificed juveniles | $X^2 = 3.664$, df = 1, p = 0.0556 | no |

One of the most important aspects of this research is the observed modification type. There are 5 modification types observed at Túcume which includes: fronto-occipital, frontal bone flattening, lambdoidal, occipital bone flattening, and annular. It is important to note that since there is no universal classification system, different styles could be considered the same types. For instance, occipital bone flattening and lambdoidal could be considered the same style. For this research, lambdoidal is modification with pressure at lambda which results in a more erect angle. Occipital bone flattening places the pressure below lambda resulting in a more oblique angle. However, as stated some research could classify these types as the same since there is modification on the posterior aspect of the skull. These types could also be different variations of the fronto-occipital modification. In regards to this research, they are all three separate types of modification for this classification system.

Figure 6 shows the frequencies for modification styles and is broken down into groups: the total percentage of modified individuals, the percentage of modified adults, and the percentage of modified juveniles. In Figure 6, it can be seen that the fronto-occipital modification was the most frequently observed modification style at Túcume at 60%. The other styles were lambdoidal occurring at 32%, occipital bone flattening at 4%, frontal bone flattening

at 3%, and annular at 1%. When categorized into adult and juvenile groups, fronto-occipital modification was still the most frequently occurring style. For adults, fronto-occipital modification occurred at 35%, occipital bone flattening at 4%, lambdoidal at 23%, and I did not observe annular and frontal bone flattening. In regards to juveniles, fronto-occipital modification occurred at 26%, frontal bone flattening at 3%, occipital bone flattening at 0%, lambdoidal at 9%, and annular at 1%.

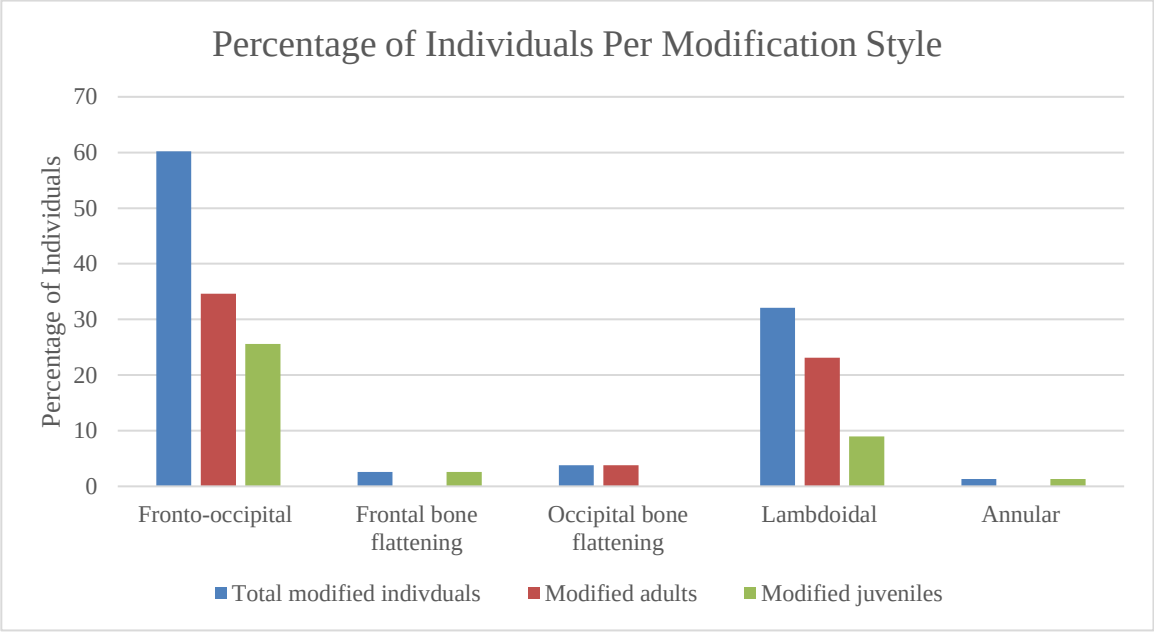


*Figure 6. Percentage of modified individuals categorized by the total percentage of individuals modified, the percentage of adults modified, and percentage of juveniles modified. The x-axis is the modification style and y-axis is percentage of individuals.*

Figures 7 and 8 depict two examples modification types exhibited at Túcume. Figure 7 shows a lateral view of a young adult male. This individual had moderate fronto-occipital cranial modification. Figure 8 shows an oblique view of a juvenile with annular modification. Note, Figure 8 shows the only individual that was annularly modified.

*Figure 7. Individual: T-Bal IB ENT 4. Lateral view of young adult male with moderate fronto-occipital modification. (Photo courtesy of Dr. J.M. Toyne).*

*Figure 8. Individual: T-HL RH017. Oblique view of a juvenile with annular modification. (Photo courtesy of Dr. J.M. Toyne).*

Sex-based differences in modification types could also give important insight into practices and social identity at Túcume. Table 4 shows the differences in modification type in regards to each sex and only include adults. I did not observe any individuals in the annular and frontal bone flattening categories. There are individuals with those two types; however, Table 4 serves to demonstrate the difference between sexes. From Table 4, it can be seen that fronto-occipital modification was most frequent among both females and males. It is also important to note that occipital bone flattening was only observed among adult males. This information gives insight into the data since it appears that fronto-occipital modification was the most common modification at Túcume regardless of sex. It also shows that a specific modification style appears to be reserved for males.

*Table 4. Sex-based differences in modification types.*

| | Frequency of modification type | Total number of adult females | Total number of males | Total number of adults with undetermined sex |
|---|---|---|---|---|
| Fronto-occipital | 56% | 17 | 9 | 1 |
| Frontal bone flattening | 0% | 0 | 0 | 0 |
| Occipital bone flattening | 6% | 1 | 2 | 0 |
| Lambdoidal | 38% | 12 | 6 | 0 |
| Annular | 0% | 0 | 0 | 0 |

Degree of modification is another important aspect of this research. Minimal and moderate degrees of cranial modification were observed. No individual was categorized as having pronounced modification. Degree was determined by visual observation of the pictures of the remains. This thesis acknowledges that there could be circumstances such as a hard-sleeping

surfaces that could cause minor flattening. Due to available methods, data was not calculated for this section. In some instances, a degree was not able to be determined due to fragmentation or incompleteness of the remains. Shown in the following figures are some examples of different degrees of modification with pressure at lambda. Figure 9 shows a young adult female with no cranial modification. Figure 10 is an example of a mature adult female with minimal modification with pressure at lambda. Figure 11 depicts a mature adult male with moderate lambdoidal flattening. The cases provide evidence that indicates that there is a wide range in the degree of modification among the individuals at Túcume.

*Figure 9. Individual: T-Bal IB ENT3. Lateral view of young adult female with no cranial modification. (Photo courtesy of Dr. J.M. Toyne).*

*Figure 10. Individual: T CS IIB T30a. Lateral view of mature adult female with minimal lambdoidal modification. (Photo courtesy of Dr. J.M. Toyne).*

*Figure 11. Individual: T CS IA T14a. Posterior view of mature adult male with moderate lambdoidal modification, note the biparietal bulging. (Photo courtesy of Dr. J.M. Toyne).*

## DISCUSSION

The results of the data have been presented and this section will serve to analyze the results in relation to the three hypotheses. From the analyzed data, it can be seen that H1 is not supported, since only 26% of individuals from Túcume were intentionally modified. This indicates that there is a pattern to be found due to the fact that certain individuals at Túcume were chosen to be modified. This also suggests there was social meaning behind the practice at Túcume.

H2 was not supported, since females and males were not modified in an equal manner. Adult females were modified at a much higher frequency of 47% while the percentage of adult males was 18%. More than two times the amount of females were modified than males, which is supported by the chi-square test. This again indicates that there was significant societal meaning behind intentional cranial modification at Túcume.

H3 was supported, since the data demonstrate that sacrificed individuals were not different in terms of frequency of intentional cranial modification at Túcume. The practice is not what caused these individuals to be sacrificed and therefore, there was no difference in modification when it came to sacrificed individuals. There were only 6% of individuals that were modified and sacrificed. The chi-square test supports this since the comparison between modified adult males and sacrificed modified adult males was not statistically significant. This is also shown in the chi-square test that compares modified juveniles to sacrificed modified juveniles, which is also not statistically significant. Overall, pattern shows a consistent practice with the other individuals (non-sacrificed) at Túcume.

## Modification at Túcume

After analyzing the hypotheses, patterns were able to be identified and interpretations can be made about the data. Only 26% of individuals with crania at Túcume were modified. There was a very small number of individuals that were chosen for the practice. A major factor is the reasoning for the practice or what the practice represents. Hoshower et al. (1995) explains that the evidence from the Omo M10 cemetery at Tiwanaku indicated that modification could possibly be representation of kin groups and regional affiliation. Blom (2005) supports this as well by explaining how cranial modification is a permanent symbol of ascribed, acquired, or aspired identity from their elders. Studies done in the area help to support my claim that individuals that experienced intentional cranial modification at Túcume were chosen for ethnic group identity. While the majority of the Túcume population was the same, 26% were modified which indicates that not everyone at the site was the same.

The types of modification can also be looked at. Túcume appears to not be consistent with other sites that demonstrate the practice in regards to modification styles. Other sources include Okumura (2014) that discusses three different types in pre-Columbian skulls from Peru and Cocilovo et al. (2011) that discusses four in the south central Andes. There are five different modification styles at Túcume with one standing out. The variation in modification styles points to social meaning behind the practice at Túcume. The small percentage for some modification types could demonstrate ethnic or group marking or even for aesthetic purposes. These individuals could have been from different ethnic group and were modified with a particular style to mark their differences. Another option is that the modified individuals were elites. Okumura (2014) contemplates the possibility of different modification styles being a result of social status. This would account for the small percentage. However, if the modified individuals

were of high or important status then there is a high probability that they would have been in a marked or specific grave. From the information that is known, this research aims to conclude that modification style at Túcume is attributed to ethnic group identity.

## Gendered Differences in Modification

The patterns give insight into gendered practices at Túcume where 47% of female individuals with crania were modified. This is a large difference in comparison with the males with only 18%. This information establishes a sex-based pattern where females were preferentially modified. If females were chosen over males to be intentionally modified, this might mean that female were seen as some sort of group that needed to be modified in order to differentiate them. Blom (2005) and Duncan and Hofling (2011) discussed the lack of sex-based patterns since the frequency of modification was the same among males and females. The opposite is true at Túcume. This could give insight into their societal practices such as their standards of beauty or marriage practices. The individuals at Túcume felt the need to differentiate groups based off of sex. Since it is possible that the practice could have been done for aesthetics or a form of beauty. Understanding marriage practices at Túcume would better help to understand which specific reason the practice was performed for and add to this interpretation. Intentional cranial modification could have been a way to distinguish which woman or man was from Túcume if they married into a different group. Regardless, the practice was performed to distinguish an individual and mark them for life identity.

Another integral aspect to note is that modified juveniles make up 19% of all juveniles at Túcume. This group is not broken down further since it contains infants, children, and teenagers. They all cannot be sexed and therefore collectively make up one group. Even though this group

of remains cannot contribute to the sex-based patterning, it does give insight into the practice of intentional cranial modification at Túcume since these juveniles would have grown up into adults if they had lived.

There was a visible difference between sexes in regards to modification types. For fronto-occipital and lambdoidal modifications, females were modified at a higher rate while occipital bone flattening was more frequent among males. These patterns reflect social meaning because it pinpoints differences for certain groups based on sex. This research supports that fronto-occipital modification could have been universal for the people residing at Túcume; however, other types could have been reserved for a certain sex or for those coming from outside of Túcume.

## Cranial Modification and Sacrifice

Sacrificed individuals made up 26% of cranial remains observed in this study. Only 6% of these sacrificed individuals had modified crania. Due to the small percentage, this indicates that people were not sacrificed because they were modified. If this were the case, then we would see a much higher frequency of individuals that were modified and showed evidence of sacrifice. This information suggests there was a different selection process, either identity or role in society.

## Túcume Compared to Other Sites

An important component of this analysis is how Túcume compares to other sites in the surrounding area. Of the sample of 375 crania, 26% of individuals with crania were modified. Due to this fact, this research supports that very few specific people were chosen for modification at Túcume. This can be supported through comparison with other groups in the

Andean region. Table 5 visually compares three other sites to Túcume in order to see if they remain consistent. Velasco (2018) conducted research in the Colca Valley located in Peru. His research utilized 5 classification types like Túcume; however, his fifth classification includes an unmodified type. The Colca Valley research did not assess age or sex; therefore, his research did not show a sex-based pattern, unlike this Túcume analysis. Velasco (2018) concluded that the prevalence and uniformity of the practice of intentional cranial modification increased over time. In the Colca Valley, there was consolidation of ethnic boundaries which is reflected in the practice showing homogeneity. During the early LIP, 39.2% of individuals were modification and increased to 73.7% in the late LIP. Regardless of time in the Colca Valley, cranial modification occurred at a higher frequency than at Túcume.

Torres-Rouff (2002) conducted research during the Middle Horizon in San Pedro de Atacama, Chile. At this site, there were three types observed with no difference in regards to sex except for with annular types. This contributes to her argument that individuals with a tabular modification may have performed female exogamy. Tabular modifications remained the most prevalent types in the area. This research concluded that at Toconao Oriente and Solcor 3, modification was thought to be used for group identity that is not related to sex. Finally, analysis showed that the practice remained constant throughout time in the San Pedro Oases at about 50%. The rate of modification at Toconao Oriente was 45.5% and the rate at Solcor 3 was 57.6%. Both locations demonstrated a higher frequrncy of cranial modification than at Túcume.

Blom (2005) conducted research in Tiwanaku and the surrounding areas located in the southern Andes. Their study consisted of 412 skulls where 83% of remains were modified. Cranial modification at this site was split into two main categories for classification type. This research showed that the practice was performed equally among the sexes indicating that there

was not any sex-based patterning found. The frequency of modification in the Altiplano region was 81% and 84% in the Moquegua region. These two regions show cranial modification at a much higher rate than at Túcume. Finally, the reasoning for the practice at Tiwanaku is complex; however, it appears that it was done for group identity. The surrounding area had strong local identities and Tiwanaku was the diverse center with fluid boundaries.

*Table 5. Túcume Compared to Other Sites.*

| **Site/Region** | **Percentage of Modification** | **Sex-based differences (% modified)** | **Classification Types** | **Potential Reasons** |
|---|---|---|---|---|
| Túcume | • 26% | • Females: 47%<br>• Males: 18% | 5 types | • Group identity/Ethnic marking<br>• Aesthetics |
| Colca Valley, Peru<br><br>(Velasco, 2018) | • 39.2% (early LIP)<br>• 73.7% (late LIP) | • Sex-based differences not analyzed | 5 types | • Ethnic marking (social aspect) |
| Middle Horizon San Pedro de Atacama, Chile<br><br>(Torres-Rouff, 2002) | • 45.5% (Toconao Oriente)<br>• 57.6% (Solcor 3) | • Toconao oriente Females: 43.6%<br>• Toconao oriente males: 46.7%<br>• Solcor 3 females: 65.1%<br>• Solcor males: 51.0%<br>• Sex-based difference for annular style | 3 types | • Ethnic marking/local identity (not related to sex)<br>• Social status |
| Tiwanaku/Southern Andes<br><br>(Blom, 2005) | • 81% (Altiplano region)<br>• 84% (Moquegua region) | • No sex-based differences | 2 types | • Group/ethnic identity |

From the comparison of the surrounding areas, it can be seen that Túcume was similar in certain aspects. However, Túcume does not remain completely consistent with them. Túcume

displayed a variety in types of modification as well as being heterogeneous. The other three sites that are compared to Túcume are more homogenous for type of cranial modification except for the annular modification type at San Pedro de Atacama, Chile. The reasoning behind the practice at the sites also are not completely parallel to each other. While group identity appears to be a common theme, there are other factors that come into play such as social status and aesthetics. Out of the four sites that were compared, Túcume had the lowest frequency of cranial modification. Túcume exhibited only 26% of individuals with modification while the other sites had a much higher percentage. Overall, it appears that Túcume is unique and provides important insight into the research of the practice.

# CONCLUSIONS

This research embodies many factors in regards to Túcume's past population and their cultural practices. I have demonstrated that there were patterns that showed a social meaning behind the practice of cranial modification. Juveniles had the highest number of non-modified remains; however, females were modified at a higher rate than males and juveniles. It is important to remember that the juveniles at Túcume died before they had the chance to become adults. They had the potential to experience the same societal experience in adulthood if they had survived longer. Another important finding to this research is the fact that sacrificed individuals were not differently modified from other individuals buried at the site. There were also patterns based off of the modification types. Fronto-occipital modification was the most frequent style regardless of sex or age. This indicates that this particular style was more common at Túcume while others may have been used for a certain sex or identity.

## Limitations of the Research

While the information presented in this thesis was informative to the site of Túcume, there were some limitations to this study. The methods available to me were a limitation in this research. This research is based off of the photographs of the remains from Túcume and prevented a more hands-on approach that could have been more detailed. Arguably, one of the most predominant limitations was preservation. Some individuals were intentionally cranially modified; however, some could not be determined due to the poor preservation of the remains. This research did not include chronology which was definitely a limitation. Chronology could have been another variable that could have been tested in order to see change in cranial modification over time. Social status of individual inferred from grave offerings could also add

to the data. By knowing the status of the burials, another variable could have been added in order to better classify the remains.

## Future Directions for Research

This research serves as background information into the practice of intentional cranial modification at this site. Future research could continue this topic by researching how intentional cranial modification affects the muscles of the skull, dental wear patterns, or even morphometrics. Previous research has been done in regards to these topics such as Boston et al. (2015), Kuzminsky et al. (2016), and Okumura (2014). This practice impacts the cranial/facial anatomy of an individual and could have effects on a living human. Since intentional cranial modification can have social implications, future research could analyze not only biological impacts but the social interactions that one could endure for their whole lives. This could be explored through research on a current living culture that practices some kind of modification. This type of research could better explore the social impact on an individual that is modified.

The remains give important insight into what life was like in the ancient Andean region of South America. Regardless of the direction, it is important information that should continue to be researched in order to best understand the past. This research is important to the history of Túcume because it gives insight into one of their most important ancient practices. However, this research is also important to bioarchaeology and the Andes as a whole. This thesis contributes to the history of the region and gives a look into the past of the people that lived in and around the Andes of South America. It gives important insight into how intentional cranial modification was practiced at Túcume.

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APPENDIX 1.

Age Key:

| Code | Meaning of Code | Age Range Estimations |
|---|---|---|
| INF/NB | Infant/New Born | 0-1 year |
| EC | Early Child | 2-4 years |
| LC | Late Child | 5-12 years |
| EADO | Early Adolescent | 13-15 years |
| LADO | Late Adolescent | 16-18 years |
| ADU | Adult | 18-50+ years |
| ADU | Young Adult | 18-35 years |
| MA/OA | Mature Adult/Old Adult | 36-50+ years |

Demographic Key:

| Code | Meaning of Code |
|---|---|
| INF | Infant |
| JUV | Juvenile |
| ADO | Adolescent |
| FADO | Female Adolescent |
| MADO | Male Adolescent |
| YAF | Young Adult Female |
| YAM | Young Adult Male |
| FADU | Female Adult |
| MAF | Mature Adult Female |
| MAM | Mature Adult Male |

| Case # | Sacrificed/Not Sacrificed | Sex Estimate | Age Estimate | Demo Code | Location of Cranial Modification | Degree of Cranial Modification |
|---|---|---|---|---|---|---|
| 1 | Not sacrificed | F | MA | MAF | F/O | moderate |
| 3 | Not sacrificed | M | MA | MAM | lambda | moderate |
| 9 | Not sacrificed | M | MA | MAM | lambda | moderate |
| 11 | Not sacrificed | M | YA | YAM | lambda | moderate |
| 17 | Not sacrificed | IND | EC | JUV | lambda | moderate |
| 30 | Not sacrificed | M | MA | MAM | lambda | moderate |
| 40 | Not sacrificed | F | MA | MAF | lambda | minimal |
| 43 | Not sacrificed | F | MA | MAF | lambda | moderate |
| 56 | Not sacrificed | F | MA | MAF | lambda | minimal |
| 59 | Not sacrificed | IND | EC | JUV | lambda | minimal |
| 67 | Not sacrificed | IND | EC | JUV | frontal | N/A |
| 71 | Not sacrificed | F | MA | MAF | lambda | minimal |
| 74 | Not sacrificed | F | MA | MAF | lambda | minimal |
| 81 | Not sacrificed | F | MA | MAF | F/O | N/A |
| 84 | Not sacrificed | F | LADO | FADO | F/O | minimal |
| 85 | Not sacrificed | M | MA | MAM | F/O | minimal |
| 86 | Not sacrificed | IND | MA | ADU | F/O | moderate |
| 88 | Not sacrificed | F | YA | YAF | F/O | moderate |
| 89 | Not sacrificed | IND | LC | JUV | F/O | moderate |

| | | | | | | |
|---|---|---|---|---|---|---|
| 90 | Not sacrificed | F | YA | YAF | F/O | minimal |
| 91 | Not sacrificed | M | YA | YAM | F/O | moderate |
| 92 | Not sacrificed | F | YA | YAF | N/A | minimal |
| 93 | Not sacrificed | F | YA | YAF | N/A | minimal |
| 99 | Not sacrificed | F | YA | YAF | F/O | moderate |
| 101 | Not sacrificed | F | MA | MAF | F/O | minimal |
| 102 | Not sacrificed | IND | EC | JUV | F/O | moderate |
| 103 | Not sacrificed | IND | INF | INF | F/O | moderate |
| 104 | Not sacrificed | F | YA | YAF | F/O | moderate |
| 105 | Not sacrificed | IND | EC | JUV | F/O | moderate |
| 108 | Not sacrificed | F | YA | YAF | F/O | minimal |
| 111 | Not sacrificed | IND | INF | INF | F/O | moderate |
| 112 | Not sacrificed | M | MA | MAM | F/O | minimal |
| 113 | Not sacrificed | IND | EC | JUV | F/O | N/A |
| 115 | Not sacrificed | IND | EC | JUV | F/O | moderate |
| 118 | Not sacrificed | F | YA | YAF | F/O | moderate |
| 119 | Not sacrificed | IND | INF | INF | F/O | moderate |
| 120 | Not sacrificed | IND | EC | JUV | F/O | moderate |
| 123 | Not sacrificed | IND | LC | JUV | F/O | N/A |
| 124 | Not sacrificed | M | MA | MAM | F/O | N/A |
| 129 | Not sacrificed | IND | LC | JUV | F/O | moderate |
| 131 | N/A | IND | EC | JUV | lambda | minimal |
| 135 | Not sacrificed | F | YA | YAF | F/O | minimal |
| 136 | Not sacrificed | F | MA | MAF | lambda | minimal |
| 139 | Not sacrificed | F | YA | YAF | F/O | minimal |
| 146 | Not sacrificed | F | YA | YAF | F/O | moderate |
| 148 | Not sacrificed | IND | LC | JUV | F/O | moderate |
| 152 | Not sacrificed | F | YA | YAF | F/O | minimal |
| 155 | Sacrifice | F | EADO | FADO | lambda | minimal |
| 156 | Sacrifice | IND | EADO | ADO | lambda | minimal |
| 158 | Not sacrifice | F | YA | YAF | F/O | minimal |
| 161 | Not sacrificed | M | YA | YAM | N/A | N/A |
| 163 | Not sacrificed | M | YA | YAM | F/O | moderate |
| 164 | N/A | F | YA | YAF | N/A | N/A |
| 165 | N/A | F | YA | YAF | N/A | N/A |
| 167 | N/A | F | YA | YAF | N/A | N/A |
| 168 | N/A | F | YA | YAF | N/A | Minimal |
| 169 | N/A | F | YA | YAF | N/A | N/A |
| 170 | N/A | F | YA | YAF | N/A | N/A |
| 172 | N/A | F | YA | YAF | N/A | N/A |
| 173 | N/A | F | YA | YAF | N/A | N/A |

| | | | | | | |
|---|---|---|---|---|---|---|
| 174 | N/A | F | YA | YAF | N/A | N/A |
| 175 | N/A | F | YA | YAF | N/A | N/A |
| 176 | N/A | F | YA | YAF | N/A | N/A |
| 177 | N/A | F | EADO | FADO | F/O | moderate |
| 178 | N/A | F | YA | YAF | N/A | N/A |
| 179 | N/A | F | YA | YAF | N/A | N/A |
| 182 | N/A | F | LADO | FADO | N/A | N/A |
| 185 | sacrifice | M | MA | MAM | F/O | N/A |
| 186 | sacrifice | M | YA | YAM | F/O | moderate |
| 187 | sacrifice | M | YA | YAM | lambda | N/A |
| 278 | Not sacrificed | F | YA | YAF | lambda | minimal |
| 279 | Not sacrificed | F | YA | YAF | lambda | minimal |
| 282 | Not sacrificed | IND | INF | INF | lambda | moderate |
| 287 | Not sacrificed | F | YA | YAF | lambda | minimal |
| 291 | Not sacrificed | M | YA | YAM | lambda | minimal |
| 293 | Not sacrificed | F | YA | YAF | lambda | minimal |
| 299 | Not sacrificed | F | YA | YAF | lambda | minimal |
| 301 | Not sacrificed | F | YA | YAF | lambda | minimal |
| 302 | Not sacrificed | IND | EADO | ADO | lambda | minimal |
| 310 | Not sacrificed | IND | LC | JUV | annular flat | N/A |
| 318 | Not sacrificed | IND | EC | JUV | F/O | N/A |
| 319 | Not sacrificed | F | MA | MAF | occipital | N/A |
| 325 | Not sacrificed | IND | LC | JUV | F/O | N/A |
| 326 | Not sacrificed | IND | EC | JUV | F/O | N/A |
| 330 | Not sacrificed | F | YA | YAF | F/O | moderate |
| 333 | Not sacrificed | M | YA | YAM | F/O | moderate |
| 334 | Not sacrificed | F | MA | MAF | F/O | moderate |
| 335 | sacrifice | M | YA | YAM | N/A | N/A |
| 339 | Not sacrificed | M | MA | MAM | F/O | moderate |
| 340 | Not sacrificed | F | YA | YAF | F/O | moderate |
| 343 | Not sacrificed | IND | INF | INF | F/O | N/A |
| 346 | Not sacrificed | IND | INF | INF | F/O | N/A |
| 350 | Not sacrificed | M | MA | MAM | occipital flat | N/A |
| 352 | Not sacrificed | M | MA | MAM | occipital | minimal |
| 353 | Not sacrificed | IND | EC | JUV | frontal | minimal |
| 367 | Not sacrificed | IND | INF | INF | F/O | N/A |