CULTURAL HISTORY OF CRANIAL MODIFICATION IN THE LAMBAYEQUE VALLEY COMPLEX PERU

by

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of
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DEDICATION

This thesis is dedicated to the indigenous peoples of Latin America, victims of past and present persecution. May the findings in this research help bring light to your untold stories, never to be forgotten.

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I wish to thank my family, supporters, and friends who made this milestone possible. My loving husband, Brian, who has and continues to stand by my side with never-ending support and love. My daughter, Elizabeth, who is the light of my life and makes me proud to be her mother. My strong and tenacious mother, who taught me resilience, determination, and the quest for knowledge. My affirming father, who taught me integrity, the value of hard work, and pride in my own Andean heritage. My sweet dog, Lucy, who kept me company during late nights while I worked on assignments. Dr. Haagen Klaus, who provided wonderful learning experiences in and outside of class, unwavering support, and genuine kindness. Drs. Rashmi Sadana, Linda Seligmann, and Debra Lattanzi-Shutika, who facilitated engaging, thought-proving, and dedicated instruction in anthropology at GMU. Drs. Cortney Hughes Rinker and Bethany Usher, who graciously offered invaluable advice and insight as committee members. Ms. Sally Evans of Fenwick Library, who was incredibly patient and helpful with the thesis review process. Ms. Anna Burcham and Ms. Farhana Islam, for their assistance with processing departmental requirements. The members of the Washington Association for Professional Anthropologists, for their incredible encouragement and inspiration. Dr. Tom Greaves, who mentored me since the beginning of my anthropology studies. Drs. Carla Freeman, Jeana Abromeit, and John Savagian of Alverno College, who were instrumental in my undergraduate education, admission to GMU, and overall lifelong learning. My supportive and accommodating colleagues at Tecolote Research Inc., for their flexibility and faith in me. The caring members of Studio PAUSE, for always cheering me on and partaking in the celebration of humanity and art. Finally, my wonderful classmates, who taught me so much and included me in incredibly memorable class, field, and life experiences. Thank you all.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

CULTURAL HISTORY OF CRANIAL MODIFICATION IN THE LAMBAYEQUE VALLEY COMPLEX OF PERU

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This thesis serves as a bioarchaeological investigation of cranial modification spanning three millennia and originating from several different archaeological sites found on the north coast of Peru. Utilizing perspectives from cultural anthropology, archaeology, and biology to interpret the nature, variation, and meanings associated with this particular form of body ritualization, this study seeks to translate the emic motivations exercised by indigenous groups long ago of Latin America and specifically the central Andes. Since a single standard interpretation of head shaping is not representative of all cultures that performed this tradition, analysis of data collected from the Lambayeque Valley will provide vital contextual information about the body and this transformative process as regarded by native groups specific to this region. For these reasons, a set of hypotheses addressing cranial modification will address broader questions of social complexity,

class, and difference while assessing their relevance to head shaping practices on the north coast of Peru.

CHAPTER 1

INTRODUCTION

Ritualized treatment and modification of the body is arguably one of the most ubiquitous and quintessential of human behavioral and cultural phenomena. The reasons and meanings for such actions vary across time and space, but often, they convey implicit and explicit dimensions of personal and social identity. The human body is a vehicle to transmit specific meanings and messages encoded in its shape, size, and other characteristics. The significance associated with body modification processes and outcomes further embody especially potent statements due to the intentionality behind them. Certain practices such as tattooing, piercing, and scarification involve changes made to human tissue. While evidence of such practices has been found on human mummies from different parts of the world and points in time, limitations exist to the extent in which modifications to human soft tissue involve their lack of survival of the natural decompositional process. For this reason, a full reconstruction of corporal alterations and the meanings of cultural identity in past civilizations are limited in archaeological settings since much of the evidence has long passed into oblivion.

However, ritualized body modifications involving the alteration of bone can still be observed. First, the composition of human bone allows for a greater likelihood of survival and recovery than soft tissue. Second, transformations made to change bone

shape are often permanent in nature, making their identification more possible even after lengthy periods of time. Finally, while some body modifications correspond to specific stages in life to mark religious or social milestones (e.g., puberty), the alteration of bone involves an intersection with processes of bone growth and development. Pliable and soft at birth, a newborn skeleton begins as a matrix of cartilage or membrane. As the skeleton develops, the more mineralized and less plastic skeletal structure becomes. This makes the deliberate alteration of human bone rather unique in terms of body ritualization and life history as it may only be done successfully during certain windows of life.

Some forms of bone alteration are gender-specific, purely aesthetic, relevant to certain geographic regions of the world, and only applicable to particular periods in history. An example includes the practice of foot binding on adolescent girls within elite social classes beginning in 10th Century China (Bukley Ebrey, 1993). The tradition resulted in foot shape representations of the lotus flower in which silk shoes were worn to adorn tiny foot sizes (Gates, 2014). Outcomes of such alterations resulted in "aesthetically beautiful" feet that also caused lifelong debilitating pain while permanently altering mobility patterns of females and restricting their overall movement (Carroll, 2009).

However, other kinds of bone modification contrast starkly from those like Chinese foot binding especially in relationship to bones that make up the head. Responsible for fine motor functioning and coordination, the human head houses vital organs contributing to a human's interaction with the extrinsic world because of the

physical locus of sensory, emotional, and spiritual domains (Arnold and Hastorf, 2008). Furthermore, the head's dominant placement at the top of the uppermost part of the body makes it the most dominant locus of social personification amongst many cultures (Tiesler and Lozada, 2018). Since it is a central focus involving so many aspects of human interaction, the human head represents the "canvas" expressing sociocultural ideas, standards, prohibitions, and taboos (Tiesler and Lozada, 2018).

For these reasons, efforts directed towards altering bones of the head can provide remarkable insights into motivations for body ritualization and modification. One such recognized human tradition of corporal transformation is cranial modification. Often synonymous with the terms "cranial deformation," "cranial modeling," "cranial vault molding," or "head shaping," cranial modification constitutes one of the most ubiquitous and ancient forms of biocultural practices known to humanity (Tiesler, 2012). Spanning different continents and timeframes, the social significance of head shaping involves multiple layers of complex relationships between societies, persons, and sociocultural norms related to gender, social age, status, and ethnicity (Tiesler and Lozada, 2018).

There are important reasons for studying the practice of cranial modification from the past. Written documentation of past cultural traditions is either limited or unavailable. Observations captured by those viewing rituals from an external or etic perspective frequently provide inaccurate, absent, or highly biased testimonies that fail to inform readers of motivations and meanings altogether. Therefore, bioarchaeology, or the scientific study of human behavior from osteological evidence found within the

archaeological record, provides valuable insight into the intersection between culture and biology as found in the practice of cranial modification.

Another important motivation for studying cranial modification relates to the crafting of a specific identity in relationship to corporeality. For many different ancient peoples, emphasis on metaphorical craft of personal identity or "self" was crucial, as it involved literal physical embodiment of symbolic meaning related to personhood (Tiesler and Lozada, 2018). Since the technique of altering head shape is both sanctioned and performed by societal members, it demonstrates how the body (and therefore the head) are regarded as material receiving the meaning while also conveying the self-assignment of group identity (Foucault, 1995; Tiesler and Lozada, 2018). However, how is self-identity crafted when practiced on infants? Posing this question makes the practice of head shaping perhaps one of the most unique forms of body modification: parents and caretakers pre-determine the self-identity an infant receives and ultimately embodies later in life. Therefore, the investigation of this tradition provides a remarkable window not only into thought processes and motivations associated with identity, but also concepts and beliefs associated with kinship and childcare from ancient contexts.

This leads to another important point in support of studying cranial modification, especially in relationship to meaning derived from its actual process. Other forms of body modification, such as tooth inlays, tattoos, piercings, or scarification involve relatively shorter periods of time to achieve desired results. Perforation of tissue and cartilage can be performed in a matter of minutes to hours, whereas cranial modification requires a much longer procedural duration to obtain a certain outcome. To that end, the

product of the process results in permanent alteration that cannot be reversed. The permanent transformation from the practice occurs before a child's cranial bones can fully form and fuse, potentially revealing the agency and intentions of caretakers to exercise specific principles and ideas and physically express them through a process of modification. Additionally, unlike the aforementioned body transformations, cranial modification does not involve a trial of physical endurance to include pain and bleeding (Tiesler and Lozada, 2018). For many past cultures, rituals to mark passages of life required participation in ceremonial processes that engraved social integration upon significant life experiences such as adulthood, penance, valor, or punishment of transgressions (Tiesler and Lozada, 2018). Entwined with concepts of physical endurance, the outcome more than not demonstrated triumph over a challenging life experience (Tiesler and Lozada, 2018). Nevertheless, cranial modification does not appropriately conform to these parameters of body ritualization and serves an entirely different purpose dependent upon the culture in question. Therefore, in an effort to gain deeper insight and understanding into cranial modification practices amongst ancient civilizations, this thesis will specifically explore the bioarchaeological record of head shaping in a region of the world renowned for this tradition.

Among ancient Andean and Mesoamerican peoples, overwhelming evidence of head-shaping traditions has been found in the archaeological record and serve as exemplars for study. First, the vast abundance of cranial modification evidence found on Latin American crania, iconographic depictions, and devices used in procedural head shaping adjustments, strongly suggests the treatment carried high symbolic value (Tiesler

and Lozado, 2017, 2018). The significance of this cannot be overstated especially because it directly involves the physical remains of indigenous peoples who created and led highly dynamic complex civilizations including the Inka and Maya societies. Upon European colonial contact and later conquest, some native groups were targeted and annihilated, while others were subjugated and manipulated. While colonial powers originating from Portugal, France, and Britain focused primarily on economic exploitation of local resources, colonizers originating from Spain sought to dominate native peoples with absolutist perceptions of cultural and religious superiority (Tiesler and Lozado, 2018). In carrying out this mission, Catholic Spaniards were acutely aware of indigenous perceptions of the body and actively campaigned to discredit "sacrilegious" practices contradicting natural forms of the head as "intended" by God (Cieza de León, 1984, pp. 227; Lozada, 2011; Tiesler, 2014; Tiesler and Zabala, 2011; Zabala, 2014). Thus, the interpretation of native ideologies regarding identity based on physical evidence is incredibly valuable, as it both shares and validates the narrative of historically marginalized and disenfranchised peoples, as well as providing information and perspectives otherwise "erased" from history.

Second, the diversity of cranial shapes and sizes derived from cranial modification techniques and among Latin American samples indicates that there was not a "one size fits all" approach to this kind of body ritualization. Instead, the fact that so many different varieties of cranial modification existed across several distinct cultures, geographic groups, and different time periods offers remarkable opportunities to compare and contrast deeply embedded sociocultural meanings for various peoples throughout

history. Tiesler and Lozada (2018) eloquently make this argument by explaining that of all human body parts, the head is cross-culturally ascribed paramount importance since it is the locus of all sensory apparatuses that engage with the external world (also, see Scherer, 2018). But how each societal group interprets the human head differs vastly in meaning and significance (Scherer, 2018). For this reason, exploration of different narratives and from various points in time are essential to interpret meanings and how they may have also evolved over time.

Finally, because of the near ubiquity of cranial modification amongst ancient civilizations within Latin American, it is no wonder that the first truly scientific investigations into the practice occurred in Latin America and by Latin Americans. This is especially important because it (1) demonstrates not only the autonomy and authority Latin Americans took to understand and protect their cultural heritage but also accurately document the accounts of their native ancestors, and; (2) provides a novel example of an anthropological topic (body ritualization) from a bioarchaeological perspective. Since the discipline focuses on human remains, it is uniquely positioned to examine the humanities and its material research by integrating multiple lines of evidence and multiple explanations of humanity's past experiences (Buikstra and Beck, 2006; Larsen, 2015). Ultimately, a bioarchaeological approach to interpreting meaning in cranial modification provides a more holistic interpretation of past human behavior as human remains serve as an the most exceptionally data-rich source of archaeological material (Gowland and Knüsel, 2006).

RESEARCH HYPOTHESES

With respects to investigating a sample of cranial modification in Latin America, this thesis will focus on the Andean peoples of the Lambayeque Valley Complex along the north coast of Peru over a nearly 3,000 year-long period. This geographic and cultural setting location was chosen for this work owing to multiple factors relevant to the archaeological, ethnohistoric, and bioarchaeological data corresponding to the cultures in the region and the extensive bioarchaeological data that have been collected over the last 20 years on cranial modification. In particular, the region is the largest coastal valley system in Peru that produced one of two principle centers of dominant complex cultural development along the north coast (Klaus, 2008). Included in this developmental sequence were sophisticated political, economic, technological societies that organized and operated highly complex cultures prior to Spanish contact (Klaus, 2008). The skeletal biological datasets used in this study consisted of more than 1,600 individuals, spanning 3,000 years of pre-Hispanic and post-contact civilizations (1500 BC – AD 1500), and originate from 28 different archaeological sites in the Lambayeque Valley. They include pre-Hispanic chiefdoms of the Cupisnique (1500 – 650 BC), the constellation of peoples that comprised the northern Moche polity (AD 100 – 750), the Sicán (AD 900 – 1350), and local populations consisting of mostly Moche descendants under two eras of foreign rule by the Chimú and Inka empires (AD 1350 – 1532). Further, peoples dating from the Early/Middle and Middle/Late Colonial periods were also incorporated into this study.

The analysis of cranial modification in this study involves three hypotheses. The first hypothesis addresses the social complexity of civilizations in the north coast region of Peru ,with an emphasis on political, economic, and social development in the region, and in relationship to cranial modification: As society became more complex, cranial modification became more common in the Lambayeque Valley Complex. However, disappearance of the practice after the time of Spanish conquest demonstrates how eradication of body modification played into the broader strategy of Spanish Colonists to force assimilation of all non-European sectors of native society (*sensu* Tiesler, 2014, pp. 249). Ultimately, justification for such measures resulted in forced cultural transformations that conveniently met the needs of the Spanish crown (Tiesler, 2014, pp. 249). Therefore, an evaluation of modification presence versus absence will 1) allow for comparisons to be made between time periods, 2) assess trends of the practice over time, and 3) show how the authoritative presence of colonial Spanish governance had an impact on cranial modification's practice in the Lambayeque region.

Hypothesis II focuses on cranial modification in relationship to social class: Head shaping practices in the Lambayeque Valley complex were not based on social class. Practiced in other regions of the Andes, (Blom, 2006; Velasco, 2018) cranial modification communicated social identity, and specifically, social status. However, not all cultures that practiced this did so to showcase membership in a social class group. To this end, an assessment of head shaping on remains of elite versus non-elite members of specific social groups from the Lambayeque Valley will reveal the tradition was not class-based in the north coast of Peru. This hypothesis, in essence, tests the inferences

made by Verano (1997) and Klaus et al. (2016) in smaller scale studies that cranial modification cross-cut all social strata.

The third hypothesis is related to the second one. This line of questioning examines prevalence of cranial modification in relationship to social variation and possible meanings behind its practice. As Alvarado-Viñas and Manzanilla (2018) argued, all societies assign symbolic content and meaning to the body, either with provisional or permanent modifications, in order to project group associations based on identity symbols intentionally related to a specific group. The path-breaking research of Deborah Blom (2006) and her investigations of head shaping practices in the southern Central Andes supports this notion of specific meaning and identity based on head shape. Distinct head shapes provided material evidence for cultural differentiation that played out in everyday settings in this region of the Andes (Mannheim et al., 2018). However for other parts of the Andes, cranial modification was ubiquitous due to a single childcare practice that yielded a variety of non-standardized head shapes (Mannheim et al., 2018). Therefore, Hypothesis III applies this scenario as a likely explanation for cranial modification meaning in the Lambayeque Valley Complex: Head shaping practices were not performed to intentionally inscribe markers of identity but rather strictly as the result of childcare practices such as cradle boarding.

In pursuit of these questions, this thesis explores critical concepts of identity as a social construct as expressed through cranial modification. Setting the stage to guide the reader through this explanation, Chapter 2 presents a broad survey of head shaping throughout history while revealing how bioarchaeology plays a key role in driving

scientific research to discern meaning from behavioral patterns exhibited in the past. In Chapter 3, a literature review of cranial modification will detail theoretical considerations on this bioarchaeological research topic, chart the disciplinary history of its study, and highlight the notable paradigms of methodological advancements to reach modern paleopathological and bioarchaeological methods today. Since cultural context plays an important role in understanding the purpose of cranial modification in the Lambayeque Valley Complex, Chapter 4 will entail an archaeological overview of the various indigenous peoples and cultures, while also detailing the impacts of Spanish colonization on social organization, political economy, and religion of Peru and specifically the north coast region. Chapter 5 will present the particular materials and methods used in this study, including details about the sites where people were buried as well as the statistical methods involved in the analysis. Chapter 6 will present the interpretation of the results, while Chapter 7 will address their relationship to the aforementioned hypotheses and relevant theory. Finally, Chapter 8 will summarize the study's significance in relationship to the discipline of bioarchaeology and future directions of cranial modification research.

CONCLUSION

This thesis serves as a bioarchaeological investigation of cranial modification spanning three millennia and originating from several different archaeological sites found on the north coast of Peru. Utilizing perspectives from cultural anthropology, archaeology, and biology to interpret the nature, variation, and meanings associated with

this particular form of body ritualization, this study seeks to translate the emic motivations exercised by indigenous groups long ago of Latin America and specifically the central Andes. Since a single standard interpretation of head shaping is not representative of all cultures who performed this tradition, analysis of data collected from the Lambayeque Valley will provide vital contextual information about the body and this transformative process, as regarded by native groups specific to this region. For these reasons, a set of hypotheses addressing cranial modification will address broader questions of social complexity, class, and variance and assess their relevance to head shaping practices on the north coast of Peru.

CHAPTER 2

OF HUMAN AND MODIFIED HEADS: CULTURAL HISTORIES OF ARTIFICIAL CRANIAL MODIFICATION

The act and process of artificial cranial modification has been practiced by numerous cultures across the globe and spanning at least the last ten millennia. Reshaped heads provide unique insight into the reconstruction of social, political, and cosmological systems from archaeological and bioanthropological perspectives. Undertaken as early as 15,000 years ago (Dingwall, 1931; Brown, 1981; Antón & Weinstein, 1999), intentional head shaping has been performed for a myriad of reasons, including to meet standards of beauty, express and enact elevated social standing, and display group membership, to name but a few of the associated meanings (Ortner, 2003; Tiesler and Zabala 2011). Unlike other kinds of body enhancement, such as piercing, tattooing, or clothing style, cranial modification is particularly fascinating to archaeologists since it has and continues to be the one of the most profound and lasting records used to reconstruct concepts of ethnic identity, population movement, and social stratification from the past (Clark et al., 2007, pp. 598; Hoshower et. al., 1995). While cranial modification has been relatively ubiquitous in practice throughout human history, its rationale relative to respective culture differs and cross-cultural "universals" are very elusive. Clearly, scholarship dedicated to developing and improving methods of documenting and analyzing cranial modification, along with its styles of patterning based on time period and geography,

cannot be undervalued. Their greater purpose serves to address a series of fundamental questions about humanity in antiquity: Why did multiple peoples throughout space and time exercise this unique form of body alteration? What was the rationale for taking such drastic measures to achieve highly stylized head shapes in infants for the rest of their lives? What underlying value systems did people believe in to ascribe highly unique meaning and expression from their body transformations?

This chapter presents a broad (though necessarily selective) survey of human societies that engaged in head shaping. This includes a chronological listing of research beginning with Neandertals from Shanidar Cave in Iraq, followed by Pleistocene Australians from Coobool Creek, the Huns in the Carpathian basin of Hungary, the peoples of central and southern Philippines, the Osage tribal members of Missouri and northern Arkansas, and contemporary Mangbetu people of northeastern Congo. These geographically and historically diverse cultural examples will be followed by an in-depth exploration of two specific case studies noted for cranial modification practices in the New World: the first entails an interdisciplinary examination of pre-Hispanic Maya communities in Mesoamerica, while the second encompasses the Tiwanaku society of southern Peru (Blom, 2005). Since Central America and the Andes possess the greatest sources of data, focus on these two unique regions will demonstrate how broader themes related to identity, ethnicity, beauty, status, and gender from antiquity represent current and future directions of bioarchaeological research on cranial modification. Furthermore, insights related to these themes may help provide clues in answering the pervasive questions related to why cranial modification was a common practice and the roles it

played in the lives of diverse and unrelated cultural groups around the world. Therefore, this collective body of evidence is intended to demonstrate how preserved archaeological evidence of lasting biological traits provides strong substantiation for human behavior of the past.

THE BIOARCHAEOLOGICAL APPROACH

In order to draw a deeper meaning from the practice of cranial modification in an archaeological context, it is necessary to introduce the discipline of bioarchaeology and its greater role in interpreting such behaviors from human remains. First developed in the 1970s, bioarchaeology began as a discipline in response to New Archaeology's demands for practical, theoretically driven, and scientifically-based methods centered on understanding the lives of past human beings while absent of historical bias. Although the term was initially applied to the study of animal remains from archaeological settings (Clark, 1972) it transitioned in its application to human remains during the dynamic study of the lower Illinois River Valley by Jane Buikstra in 1977. Since then, the focus of this anthropological subdiscipline has emphasized an integrative and interdisciplinary approach to studying a wide variety of topics (Larsen, 2015), which will be mentioned in greater detail later on.

The significance of this momentous paradigm shift in archaeology stems from two principle reasons:

> First, in contrast to earlier work that emphasized description, often poorly connected to any manner of context, there is a growing interest in the central role that human remains play in understanding patterns and trends in past societies. Second, the centrality of human remains for understanding past biological, social, and behavioral dynamics has motivated an emphasis on integrative research

> strategies, resulting in excavations of human remains having clear agendas and questions that guide both their recovery and their study (Larsen, 2015, pp. 3).

Therefore, the era of studying past communities by solely collecting osteological details such as sex, stature, and age is neither adequate nor suitable to investigate the entangled biological and cultural factors that are fundamental to the human body's condition, primarily because the human body is not static (Lorenz, 2008, pp. 273-303). Rather, it is made and remade by the very biological and cultural factors we seek to know more about (Lorentz, 2008, pp. 273-303). Blakey (2001, 2004) echoed these same sentiments by advocating for an analytical construction of the past from a biocultural approach, in which the socioeconomic conditions experienced by human communities in the past can either be verified or critiqued.

Research foci in bioarchaeology generally comprise a series of about a dozen predominant investigatory themes. Larsen (2015) covers such central themes, beginning with *biological stress*, or "the physiological disruption resulting from impoverished environmental circumstances" (Larsen, 2015, pp. 7). As a product of three key factors, biological stress serves as a model of (1) environmental constraints that affect overall health and reveal accessibility to essential resources necessary for survival and general well-being; (2) cultural systems that provide protective barriers from environmental elements; and (3) host resistance to variables that impair processes of adaptation, reduce work capacity, and decrease fertility (Larsen, 2015, pp. 7). Biological observations of stress from dental and skeletal sources are empirically measurable from composites of nutrition, disease, and other multi-indicator approaches (Larsen, 2015, pp. 7). Both individually and collectively, their implications ultimately provide valuable insight into

developmental stability in early life, prenatal, and postnatal stages, as well as general health outcomes later (Larsen, 2015, pp. 7).

Another area of bioarchaeological inquiry involves biocultural perspectives of disease and its degree of prevalence. Understanding how pathological conditions manifested under certain conditions yields valuable evidence to recreate perspectives on health in earlier societies, specifically life conditions based on sex, age, status, socioeconomic position, and residence amongst other key contexts (Larsen, 2015, pp. 66). Its impacts, while not always observable in the skeletal record, at the very least provide insight into methods of transmission, robusticity of the host, and pathogenicity especially in shaping understanding of human evolutionary processes (Larsen, 2015, pp. 66).

Evidence of injury and violence contribute to bioarchaeological records particularly aimed at assessing risk from accidental or violent causes in the past (Larsen, 2015, pp. 115). Traumatic injury patterns documented in osteological remains provide especially useful data related to biocultural contexts relevant to the individual, setting, and social factors contributing to the injury or death (Larsen, 2015, pp. 115). Just as in the case of disease, prevalence of trauma serves as a window into the types of lifestyle of individuals, as well as the ability to function and survive despite impairment (Larsen, 2015, pp. 116).

Analysis of degenerative conditions such as osteoarthritis is another bioarchaeological method that sheds light on the experiences of past populations, especially in relation to physical activity, along with the nature and implications of

physical workloads (Larsen, 2015, pp. 178). The deterioration of articular joints expresses itself via various causes and circumstances, with the most common condition being osteoarthritis (Larsen, 2015, pp. 179; Felson, 2000; Pritzker, 2003, Klaus et al., 2009). Often recognized as a response to a predisposition of behavioral causes, osteophytes form from joint instability (van den Berg, 1999; Larsen, pp. 179, 2015). In other words, mechanically demanding lifestyles often reveal greater marks of osteoarthritis, whereas more sedentary work repertoires indicate lower prevalence of such conditions (Larsen, 2015, pp. 212).

Without question, Larsen provides a comprehensive approach to studying bioarchaeology foci including quality of life, lifestyle, behavior, biological relatedness, and population history. He also relies on other tools besides skeletal biology, such as ancient DNA research, biodistance analyses of phenotypic variation, and isotopic analysis to bring forth scientific research to bioarchaeological investigations that have never before been considered (Goldstein, 2006, pp. 376). While this is indeed a major contribution to the discipline, it is not all-inclusive. For scholars such as Buikstra and Blakey, their version of bioarchaeology requires greater attention on the archaeological context of human remains versus "skeletal biology of the past" (Buikstra, 2006, pp. 347-358). Goldstein (2006) argues that the physical anthropologist cannot work in isolation from the archaeologist who excavated the remains; otherwise this would involve ignoring context, history, and the peoples themselves. For this very reason, a balanced relationship between principles of physical anthropology and archaeology is essential to

both interpreting the practice of cranial modification and the context from which such outcomes of behavioral practices occurred long ago.

DEFINING CRANIAL MODIFICATION

In an effort to frame the methods used to explore and analyze cranial modification, a clear definition of the practice is necessary. Explicitly, it involves the alteration of the cranium during infancy while bones are still malleable and which produces an altered phenotype involving a modified head shape. Although the human skull consists of an average of 22 bones, the cranium itself is comprised of eight bones. Cranial modification typically impacts most directly the frontal, occipital, and parietal bones (Fig. 1). According to Torres-Rouff (2003, pp. 4) its practice is a continuum, and it spans unintentional swaddling practices to the intentional binding of the head for social reasons. In instances of unintentional cranial modification, often from cradle boarding or that of an infant sleeping on a hard surface, flattening of the occipital bone is most commonplace. However, the permanent nature of intentional cranial modification serves as an especially intriguing form of body modification to anthropologists for a variety of reasons: its practice transcends geography, different time periods, and serves as a dramatic manner to transmit visible social cues: "By creating distinct differences that are not present at birth and by giving meaning to these differences, 'cultural bodies' are constructed, and symbolic boundaries created" (Blom, 2005, pp. 2). Serving to mark territory or social boundaries, the cultural features of cranial modification emphasize ethnic differences and reinforce exchange networks (Gerszten, 1993, pp. 87). Thus, when intentionally conducted, the significance of head shaping as a societal practice

makes evidence of cranial modification a remarkable source of data to research concepts of identity in a collective archaeological, biological, and cultural framework.

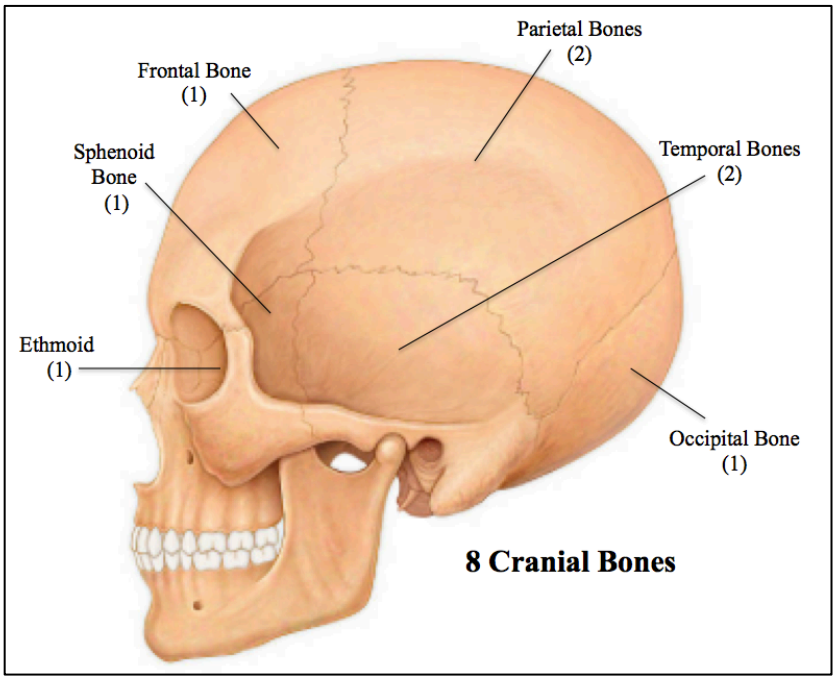

Fig. 1. Bones of the cranium. Image adapted from Getty Images

A SURVEY OF CRANIAL MODIFCATION IN THE ARCHAEOLOGICAL RECORD

Neandertals from Shanidar Cave in Iraq

Although Neandertals are a distinct subspecies whose origins preceded modern humans (but later overlapped extensively with AMHs), this close sister human taxa produced cranial modification as far back as 45,000 years ago (Trinkaus, 1982; Solecki 1960, 1961). Two recovered crania obtained from the upper Mousterian levels of Shanidar Cave in Iraq (designated Shanidar 1 and 5) revealed similar morphological traits

to Neandertals from Central Asia, the Levant, and Europe. However, the contours of their cranial vaults suggest cranial deformation (Trinkaus, 1982). Specifically, a few notable features provided particular evidence of this distinct form of body modification. The first area included the combination of high frontal flattening and high sagittal arcs on both samples, indicating that their ratio measurements fall well outside the range of normal variation for other Neandertals (Trinkaus, 1982). Another area concerns the pre-bregmatic flattening of the frontal bone on the cranium of Shanidar 1, while the lambda radius of Shanidar 5 indicates considerable abnormal occipital flattening (Trinkaus, 1982). Collectively, these observations, when compared to features of cranial modification in AMHs, strongly suggest that the cranial vaults of both Shanidar 1 and 5 were artificially altered (Trinkaus, 1982). Upon evaluating alternative causes for these unusual conditions, pathological reasons and postmortem taphonomic distortion were ruled out. The type of apparatus used to gently yet firmly mold the head resulted in permanent cranial shape and would be consistent with either the use of flexible bands or manual pressing, as differences in flattening were imprecise and non-standardized to potentially reflect distinct positionings and durations of low-grade chronic pressure (Trinkaus, 1982).

While the motive for creating the noticeable aesthetic in these early humans is not at all certain, it does confirm intentionality of behavior by adult practitioners. The purposeful reasoning behind physically manipulating the crania of the infant kin perhaps fulfilled a broader objective relevant to appearance. Its timing also corresponds with first evidence of intentional and symbolically effused burials of the dead (Harrold, 1980) and

prolonged survival of the aged and infirm (Trinkaus and Zimmerman, 1982). Regardless of the motive, it would become a practice independently practiced by many different human successors of the Neandertals.

The Pleistocene Australians of Coobool Creek

One of the earliest known samples of modern human cranial modification dates to the Late Pleistocene era among native Australian skeletal remains documented at the Coobool Creek archaeological site located in the southeastern part of the continent in New South Wales. The sample, comprised of 126 individuals, dates to 14,300 $\pm$ 1000 years BP based on uranium-thorium dating (Brown, 1989). Multiple factors confer particular significance to this work. First, the large sample size provides a comprehensive set of cranial measurements (Brown 1982, 1989) with a relative absence of postdepositional distortion. Secondly, the combination of altered and non-altered crania represents a truly unique scenario for investigating cranial modification among early Australians (Brown, 1982; Antón and Weinstein, 1999; Durband, 2008). Furthermore, the cranial vault morphology of these remains exhibits patterns of extensive frontal flattening characteristic of artificial cranial modification (Brothwell, 1975; Brown 1981, 1982, 1989; Antón and Weinstein, 1999; Durband, 2008). Originally, the line of inquiry about the biological origins of these aboriginal Australians led scholars to alternatively question the presence of cranial modification by early Australians (Brown, 1981). During Brown's initial investigation of these Pleistocene crania and their possible correlation to *Homo erectus*, he concluded that the pronounced flat nature of the frontal and occipital bones, along with distinct cranial height, was due to repetitive hand pressure

applied consistently over a period of time along the front and back of the infant's cranium (Brown, 1981: 166). Using a different series of methods to measure cranial vault morphology, Antón and Weinstein (1999) also confirmed that the unique features of the frontal, occipital, and parietal bones were the result of artificial head shaping. A subsequent study by Durband (2008) employed yet another method to evaluate the Coobool Creek sample by using random expectation statistics to calculate statistical significance for cranial modification on the basis of 14 different variables. In quantifying shape variation of the cranial vaults, he arrived at the same conclusion as that of his predecessors - that the Pleistocene Australian sample had indeed been altered by cranial modification (Durband, 2008). From this scenario, it becomes evident that the permanent and irreversible (yet not self-initiated) practice served as a type of physical signifier conferring social identity and human agency (Joyce, 2005; Weik, 2014). It is not precisely clear what was intended by these Pleistocene-era acts; however, prevalence of specific shape patterning in a large sample strongly supports the notion that cranial modification was a purposeful communal custom in antiquity.

The Huns of the Carpathian Basin in Hungary

After the collapse of the Western Roman Empire, Europe experienced a large-scale migratory movement of Germanic and Eurasian nomads during the 4th to 7th century AD, better known as the Migration Period (Halsall, 2007). Responsible for this movement were the Huns of Hungary, who, while destabilizing the Roman Empire, first incorporated and then escalated a tradition of cranial modification in Europe (Werner, 1956; Maenchen-Helfen, 1958; Halsall, 2007; Hakenbeck, 2009). The practice of head

shaping was known to be sporadically practiced in Europe since the sixth millennium BC by Indo-Iranian nomadic-pastoralist cultural groups such as the Scythians, Samartians, and Alans in the Eurasian Pontic steppes and the Caucasus (Ginsburg, 1968; Czeglédy, 1983; Sinor, 1990; Brzezinski, 2002;). However, it is believed that the Huns brought along the idea and practice of cranial modification as they traveled from China and Mongolia, through Europe, ultimately to settle in the Carpathian basin of Hungary (Sinor, 1990). After their arrival, evidence from burials in the region showed a 50-80% increase in the presence of modified crania (Kiszely, 1978; Hakenbeck, 2009; Torres-Rouff, 2005; Fóthi, 2000). The nomadic nature of Huns culture has led some scholars to postulate whether the presence of modified heads in Georgia is the direct result of Hunnic social influence during the Migration Period in Georgia (Mayall et. al., 2017, pp. 3). To address this question, Mayall et al. (2017) performed a comparison of modified crania from Hungary and Georgia to determine if: (1) if the crania found in Georgia are of Hunnic origin; (2) if the application of a quantitative study can distinguish modified from nonmodified crania; and; (3) if modified crania from Georgia and Hungary can be distinguished from one another. Conducting an eigenshape analysis on 56 crania from the two respective locations revealed distinctively "Hunnic" crania possessing reduced cranial height, while Georgian modified crania featuring mild to extreme forms of variation (Mayall et. al., 2017, pp. 3). While the outcome of the study is unfortunately typological in its logic, but it did suggest only little evidence of Hunnic influence on Georgian peoples. However, it demonstrated that various cultural groups simultaneously valued and practiced traditions of cranial modification (Mayall et al., 2017, pp. 19).

Once again, a definitive answer substantiating the motive for cranial modification in this example remains unclear. Nevertheless, its reoccurring presence in yet another historical context indicates its importance and popularity as a common aesthetic practice amongst diverse human populations.

Peoples of Central and Southern Philippines

During the United States colonial rule of the Philippines in the late 1800s, American universities led ethnographic and archaeological expeditions to the islands to gather data and "educate" U.S. Government agencies on native culture, while also supplementing their inventories of archaeological artifacts. Perhaps the most renowned collection in the U.S. pertaining to Philippine history and culture is the University of Michigan Philippine Expedition Collection. From 1922 to 1925, 13,000 discrete objects from 542 archaeological sites were collected, catalogued, and incorporated into the University of Michigan's "Oriental" Division, including ceramics, jewelry, tools, ironware, and skeletal remains (Guthe, 1927; Sinopoli, 2013). Dating primarily from approximately 20 sites spanning the 14th to 16th centuries (including the Visayan group, Mindanao, Palawan, and the Sulu Archipelago) they yielded several dozen crania demonstrating signs of modification. A study performed on 53 crania from the collection sought to apply new discriminant functions in identifying and classifying artificially modified crania from diverse contexts: "Visual classification of the Philippine sample resulted in the division of the crania into four groups, including crania of ambiguous deformation status and those with round frontals and flat occipitals" (Clark et al., 2007, pp. 605). Although the improved method of classification from this successful

investigation did not directly contribute to underlying reasons for the practice of intentional head shaping, it did help develop the long-needed processes to understand individual and collective contexts of body transformations: "In most anthropological considerations of cranial deformation, classification of deformed and undeformed crania is only a first step, but it is a critical one because it defines the groups that will form the basis of subsequent analysis" (Clark et al., 2007, pp. 605).

Osage Tribal Members of Missouri and Northern Arkansas

Many scholarly examples investigating cranial modification samples often focus on methods used to identify and classify the practice in a typological fashion, as in the aforementioned cases. A lack of historical documentation, archaeological contextual sources, and ethnographic literature often leaves investigators to draw highly generic and etic conclusions about the value systems dictating the behaviors of people responsible for this tradition. However, when ethnohistoric sources are available and analyzed in concert with craniometric or anthroscopic data, highly detailed explanations can emerge to provide fascinating insight into the norms and beliefs of cultures either no longer existent or who have undergone radical alteration due to social changes over time. This particular illustration of Osage tribal membership and cranial modification is a prime example. It began with an inquiry into the distinctively flattened occipital region featured on the statue of a 19th century Osage tribesman named Black Spirit (Fig. 2.2).

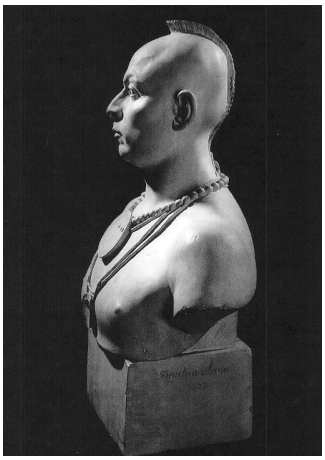

Fig. 2. Sculpture of Osage Tribal Member, Black Spirit. Photo source: Photothèque des Musées de la Ville de Paris.

French sculptor Jean-Pierre Dantan dit le Jeune (Sorel, 1989) created the bust in 1827 when Black Spirit visited France with other tribal members as invited foreign guests on behalf of the French government. Lithographs capturing the image of the bust resurfaced and caught the attention of researchers at the Smithsonian Institution, questioning whether (1) the occipital flattening on Black Spirit was due to wooden cradle boarding in infancy; (2) this custom was coincidental or purposeful, and; (3) if it was a biological trait shared by other Osages of the period (Logan et al., 2003). To answer these questions, anthropologists at the University of Tennessee consulted the Boas data bank and performed statistical assessments of its ethnohistoric, craniometric, and biographical data of Osage tribal members. The results provided a remarkably comprehensive explanation into the Osage traditional culture responsible for Black Spirit's distinctive appearance. Various ethnohistoric records describing details of Osage daily life (e.g., infant care, hair

and body decoration, and occipital flattening) established these practices as signature markings of ethnic and tribal affiliation (Logan et al., 2003):

> "There is a peculiarity in the heads of these people which is very striking to the eye of the traveler, and which I find is produced by artificial means in infancy. Their children, like those of all the other tribes, are carried on a board, and slung upon the mother's back. The infants are lashed to the boards, with their backs upon them, apparently in a very uncomfortable condition; and with the Osages, the head of the child bound down so tight to the board as to force in the occipital bone, and create an unnatural deficiency of the back part, and consequently more than a natural elevation of the top of the head" (Donaldson, 1886, pp. 45).

With regards to craniometric analysis of Boas' Osage data, researchers performed a comparative analysis of Osage crania (n=124) with neighboring Pawnee crania (n=88) (Logan et al., 2003). The inclusion of Pawnees in the sample was vital to the study because they, like the Osage, were a similar tribal group (based on timeframe and geographic location) that practiced cradle boarding but not intentional cranial modification (Logan et al., 2003). Analytical results concluded varying degrees of cranial modification (e.g., unmodified, slightly modified, extremely modified) within the Osage sample, with consistent alteration affecting the occipital region due to prolonged use of wooden cradleboards (Logan et al., 2003). Alternatively, the Pawnee sample showed a converse outcome: "[They] used cradleboards virtually identical to those employed by the Osages, [but lacked] any trace of cranial modification….The likelihood of this pattern occurring by chance [was] extremely low given the results of the likelihood ratio tests" (Logan et al., 2003, pp. 218). Evaluation of Osage biographical data collected by Boas' field assistants revealed another key dimension about their cultural traditions and its relevance to intentional cranial modification: bi-ethnic marriage (Logan et al., 2003). The forced removal of Osage peoples from their original

homes in Missouri and northern Arkansas to Oklahoma, and then later to Kansas, resulted in drastically fewer number of full-blooded tribal members (Logan et al., 2003): "An increasingly large number of Osage women, of varying degrees of admixture, took non-Indian husbands…due, in no small measure, to the relative shortage of full-blood Osage men….For many Indian women during the closing decades of the 19th century, marriage to whites was an avenue for upward social mobility, especially for their children" (Hudson, 1976, pp. 472). The decision of a mother to practice cradle boarding not only conflicted with the culture of her white husband but also drew negative attention towards native peoples during a time of rampant racism during the 19th and early 20th centuries in America (Logan et al., 2003). Ultimately, tribal members abandoned distinctive expressions of Osage ethnicity, including intentional cranial modification from cradle boarding, in order to shield themselves from racial animosity (Logan et al., 2003). Therefore, this example provides both an explanation for head shaping, along with processes of forced cultural change resulting in its cessation.

Contemporary Mangbetu peoples of northeastern Congo

A more recent perspective demonstrating ongoing customs of artificial cranial modification involves the endangered culture of the Mangbetu people of northeast Congo. Renowned for their highly developed artistic and musical contributions, the Mangbetu are popularly known for their head elongation. By binding the heads of their babies, they create striking, permanent appearances considered aesthetically beautiful. Very limited scholarly research is available on the tribe, their belief system, or their traditional custom of Lipombo (a.k.a. head elongation). Prohibition of Lipombo by

Belgian colonial government in the 1950s significantly restricted its practice. However, 20th century photographs have provided a record of this unique culture's appreciation for the altered biological form and offer depictions of what preexisting living cultures may have looked like in antiquity (Fig. 3).

Fig. 3. (**a**) Mangbetu woman and baby wearing head elongation apparatus. (**b**) Mangbetu tribal member exhibiting permanent head elongation. Photo Source: History Daily

Pre-Hispanic Maya Communities of Mesoamerica

The pre-Hispanic Maya of Mesoamerica have been widely recognized as communicating social information and their cultural beliefs via cranial modification. The combination of ethnohistoric documents, osteological data, and the Maya epigraphic record reveals other important anthropological concepts – especially those involving beliefs associated with infants and the gender roles of their caretakers (Tiesler, 2011). For the Maya, physical adjustments of the baby's head were an integral, popular process in childhood involved in the formation and emergence of an individual's socialized personhood. According to Tiesler (1998, 1999, 2010), over 80 percent of pre-Hispanic

skulls derived from different epochs and regions exhibited signs of head shaping. Tiesler's (2011) long-term study of approximately 2,000 crania from Maya territories, investigation of iconographic depictions, and interpretation of colonial ethnohistoric testimonies, provides an incredibly detailed reconstruction ideological framework of childhood, spiritual protection, and personhood. Procedures of head shaping were well represented in Maya iconography, where infants were depicted with compression devices, head tablets, and other multipurpose cradle kits during the early months of their lives (Tiesler, 2011). Sixteenth century eyewitness accounts by Landa (1566) tell of these traditions: "Both the front and the back of the baby's head were flattened by its mother four or five days after birth" (Tozzer, 1941, pp. 125). Midwives were instrumental in aiding mothers both with birthing and postpartum head manipulations for two main reasons. First, their involvement centered on spiritual protection of the child: "[They] took protective measure against loss of spiritual energy or heat (*'calor'*), the damage done by 'malignant winds' that could take possession and harm the vulnerable body and volatile spirit of the little one and ultimately put its life in danger" (Tiesler, 2011). Second, the proactive measures of head manipulation fostered physical and spiritual support for the growing family with the new addition of the baby (Tiesler, 2011). The ritualistic practices associated with head shaping involved natural and spiritual reinforcement for both baby and mother:

> "The physiological and spiritual well-being of the baby was closely observed by the mother and supervised by her mostly older female kin. Among the helpers, the midwife stands out as an authority especially during the first days or weeks of life, a time that required seclusion, a liminal stage that was though to be especially risky for both the mother and the baby" (Tiesler, 2011, pp. 119).

From the osteological data, Tiesler's study of crania from Copán (n=154) and Xcambó (n=371) provided further insights regarding gender, in which specific head shape style designated for boys or girls was not exclusive (2011). This revelation was especially relevant because Maya naming and transition ceremonies often distinguished 'womanhood' from 'manhood' very early on in life (Tiesler, 2011, pp. 127) and these are key elements of an embodied personhood. This collective information ultimately provides a multifaceted understanding of Maya life, in which the generational practice of cranial modification ascribed to women defined one of their important roles in society. Their support of community members at infancy not only helped to create an inclusive and protective environment from physical and spiritual dangers, but also shaped how ideological and cosmological beliefs were incorporated into physical or corporeal statements of identity.

The Tiwanaku Society of Bolivia and Southern Peru

The remarkable prevalence and permanence of cranial modification spanning every corner of the globe and at different points throughout the last several millennia constitutes one of the most socially controlled forms of body alteration (Torres-Rouff, 2003, pp.3). Physical representation of cultural and social values beginning at birth, carried into adulthood, and surviving well into the archaeological record stresses a fundamental notion about this particular custom's unique purpose in human history and diversity: "The body represents the particular site of interface between several different irreducible domains: the biological and the social, the collective and the individual,

structure and agent, cause and meaning, constraint and free will" (Meskell, 1998, pp.158). For the ancient cultures of the Andes, abundant evidence of cranial modification signifies greater meaning of behavioral intentions by altering the body.

An especially notable study investigating symbolic representations of identity and agency from cranial modification involves the ancient society of Tiwanaku (Blom, 2005). Dating from AD 500-1150, the southern Central Andean Tiwanaku populace encompassed an urban settlement of 20,000-40,000 inhabitants centered in modern Bolivia in which the polity actively interacted with other neighboring regions and incorporated elements of these "foreign" cultures into its own social, demographic, and ideological structures (Kolata, 1993; Mujica, 1985). However, archaeological evidence to accurately and descriptively recount how these interactions was lacking, require "additional lines of archaeological evidence…to address the issue in detail and identify the nature of diversity in Tiwanaku society" (Blom, 2005, pp. 2). No doubt, other researchers noted the problematic nature of using material culture to distinguish "style" of social groups (Blom, 2005). Using both ethnohistorical sources and human osteological data, Blom (2005) chose these two data sources to explore how this society's social groups employed cranial modification to showcase group affiliation. From an ethnohistoric angle, overwhelming evidence confirmed the use of different clothing, headdresses, and hairstyles to ascribe "provincial," "national," or "ethnic" origins (Blom, 2005, pp. 3). The practice of cranial modification, first observed by Spanish missionaries, also clearly recounted how cranial shape displayed and communicated group identity (Blom, 2005):

> "The Collaguas wore on their heads something called *chucos*, a type of tall brimless hat, and so that they could wear this hat they molded the heads of their newborns to lengthen and narrow them as high and as elongated as they could so that in remembrance the head would have the form of the volcano from which they came…."(Ulloa Mogollón et al., 1965 [1557-1586], pp.327).

The significance of cranial modification stressed the symbolic, spiritual connection designated to head shape and its relationship with the Andes (Blom, 2005). Testimonies like these, and many others, reveal forethought and careful, intentional planning was critical to achieving specific shapes of cranial alteration (Blom, 2005). From an osteological perspective, analysis of the data reinforced these initial conclusions. Samples were taken from multiple excavation sites concentrated on two areas: the Moquegua valley in far southern Peru and the Tiwanaku "heartland" in the Lake Titicaca Basin (Blom, 2005). Associated with the Moquegua sample were the inhabitants of Chen Chen, while the communities of the Tiwanaku and Katari valleys made up the altiplano sample respectively (Blom, 2005). Collectively, the total sample comprised 412 individuals. Blom applied visual methods comparable to standards created by Buikstra and Ubelaker (1994) to identify the presence and patterns of cranial modification, in which 83 percent of crania registered as modified, and within one of two shape categories: annular or fronto-occipital (Blom, 2005, pp. 10). Although Blom found no significant difference between presence and absence of cranial modification between the altiplano and Moquegua populations, significant patterns associated with the respective social groups did emerge: fronto-occipital shaping associated strictly with the local Moquegua valley sample, and a combination of fronto-occipital/annular shaping with the altiplano (Blom, 2005). This bioarchaeological analysis brings forth a major revelation

about this ancient Peruvian community: "Diverse groups of people from neighboring areas were drawn to the Tiwanaku capital in the highlands, and cranial shape modification was involved in symbolic boundary maintenance at the junction of two distinct environmental niches, the precise location of the capital site of Tiwanaku" (Blom, 2005, pp. 1). This conclusion proves especially important and potent, since historical documents produced by ancient Peruvians do not exist. Therefore, the analysis of data based on the central theme of cranial modification, provides direct insight into complex concepts of negotiated value systems and societal norms that would otherwise be overlooked or misinterpreted.

CONCLUSION

Numerous examples of known cranial modification found on every continent and since the earliest traces of human activity clearly indicate the significance of cranial modification in human history. Even though the intentionality behind head shaping in the case of older known cases in Shanidar Iraq, Coobool Creek Australia, Hunnic Hungary, and the Philippines did not provide exact meaning to the practice, its prevalence reveals its importance. Alternatively, those cases of head shaping investigated in conjunction with ethnohistoric documentation and bioarchaeological data, such as with the Osage, Tiwanaku, and Maya, yielded a more vivid, descriptive narrative of value systems and otherwise intangible ideas within these respective cultures. This brief and selective survey demonstrates the remarkable and diverse range of ideas, aesthetics, and values different societies associated with head shaping. The research on cranial manipulation from ancient contexts has allowed researchers to answer questions that could not even

have been entertained without its focus. Thus, this reveals how study of this unique theme in paleopathology and bioarchaeology is a vital theme to interpreting meaning from anthropological concepts of the body and can serve as one of the dominant avenues for innovative reconstructions of ancient cultural diversity in the future. The next chapter will reveal how the study of cranial modification has evolved from an amateur study to a scholarly theme in bioarchaeology exemplifying contextual interpretation of past cultures.

CHAPTER 3

ASSESSING CRANIAL MODIFICATION

As noted in the previous chapter, humans have engaged in countless rituals and practices to adorn, alter, and enhance the body throughout time and history. One of the most intriguing and curious forms of such physical manifestation involves cranial modification. Furthermore, the manners in which physical anthropology, paleopathology, and now, bioarchaeology, have approached the phenomenon is equally intriguing and storied. Often synonymous with the terms "cranial deformation," "cranial modeling," "cranial vault molding," or "head shaping," cranial modification constitutes as one of the most ubiquitous and ancient forms of biocultural practices known to humanity (Tiesler, 2012). Evidence of its existence across all continents reveals it was a relatively common custom, in which compression and constriction of cranial bones during the first years of life resulted in permanent alteration (Buikstra and Ubelaker, 1994; Dembo and Imbelloni, 1938; Ubelaker, 1984). However, contemporary bioarchaeological understandings of cranial modification today would not be possible without the evolutionary journey of multiple methods used to study its practice. Put more directly, this chapter asks, "How does bioarchaeology approach and understand cranial modification?"

To these ends, this chapter contextualizes bioarchaeological research on the topic and charts this disciplinary history spanning four particular time periods shaped the most

notable paradigms of methodological advancements. The first timeframe begins in the 19th century, with the popularity of taxonomic and typological systems associated with the skulls collections of naturalists, anatomists, and hobbyists. Following this era, more serious and objective (yet still, typological on the whole) anthropological investigations of head shaping occurred during the 1930s, with a concentration on the practice of head shaping throughout Latin America. By the mid-20th century, the advent of processualism in archaeology and then postprocessualism in the late 1970s offered new and alternative approaches to interpreting motivations for cranial modification. The studies and findings from the formative years indeed brought forth valuable information encompassing interdisciplinary principles from osteology, archaeology, pathophysiology, physical and cultural anthropology. In conjunction with these areas, application of the scientific method to test hypotheses made it possible to draw cultural connections with biological observations and ultimately create new standards of investigation. This led to the final period of the late 20th century and modern day, where the development of modern paleopathological and bioarchaeological methods enhanced research questions surrounding head shaping by explicitly examining cranial modification in terms of the intersections of culture and biology. Contributions from bioarchaeologists aided in the establishment of methodological parameters yielding both qualitative and quantitative data, ultimately to understand broader patterns and behaviors sustained by the ancient head-molding practitioners (Tiesler, 2014, pp.73). From this expansion of scholarship, it becomes evident how the nuanced study of cranial modification today is reconstructing meaning from the past in ways that could not be achieved earlier due to limitations of

previous paradigms. Therefore, this chapter will provide a descriptive narrative of detailing the study of cranial modification from various methods used during these specific time periods including today.

DEFINING CRANIAL MODIFICATION

In an effort to better comprehend the methods used to explore and analyze cranial modification, a clear definition of the practice is necessary. Explicitly, it involves the alteration of the cranium during infancy while bones are still malleable and with the outcome of a modified shape. Torres-Rouff (2003, pp. 4) states its practice is "a continuum between…an unintentional result of swaddling practices and the intentional binding of the head for social reasons." In instances of unintentional cranial modification, often from cradle boarding, flattening of the occipital bone is noticeable. However, the permanent nature of intentional cranial modification serves as an especially intriguing form of body modification to anthropologists for a variety of reasons: Its practice transcends geography, different time periods, and serves as a dramatic manner to transmit visible social cues, "By creating distinct differences that are not present at birth and by giving meaning to these differences, 'cultural bodies' are constructed, and symbolic boundaries created" (Blom, 2005, pp. 2). Serving to mark territory or social boundaries, the cultural features of cranial modification, emphasize ethnic differences, and reinforce exchange networks (Gerszten 1993, pp.87). Thus, its significance as a societal practice and its ubiquitous nature makes evidence of cranial modification a

remarkable source of data to research concepts of identity in a holistic archaeological, biological, and cultural framework.

19TH CENTURY CURIOSITIES AND CLASSIFICATION SYSTEMS

Although scientific investigation started to receive greater attention by the 19th century, the use of taxonomy and typology still played an important role in understanding diversity, including that of humankind. Efforts to make sense of different perceived races and cultures included methods such as those developed in Samuel Morton's *Crania Americana* (1839), in which he observed and compared skulls of different races to claim that Caucasians possessed intellectual superiority. Using craniometric evidence, he advocated for racial hierarchy and polygenism. Despite developing highly flawed and racially-charged theories, Morton's studies of indigenous skeletons resulted in four formal skull types in the Americas: cylindrical and conical shapes as well as frontal and occipital flattening. Such classifications indeed generated interest in head shaping at a time when it was no longer a common native practice (Arma 1885; Boas 1890; Morton 1839; Morton 1841). As a physician and purveyor of skeletal collections, Morton inspired others, including Aleš Hrdlička, to collect, document, and substantiate racial typologies of human difference (Platt, 2015). As chief curator of the National Museum of Natural History, Hrdlička's multiple expeditions to the American Southwest, South America, the Middle East, and Europe "created one of the world's largest collections of research material for physical anthropology, containing at his death well over 15,000 human skulls or skeletons" (Schulz, 1944, pp. 310). His efforts helped to improve methods of investigation in the discipline of physical anthropology, notwithstanding their racial

stereotyping, illicit grave robbing, and desecration of countless human remains. Both Morton and Hrdlička promoted an initial method involving visual observation to identify and classify cranial modification in the New World. Other researchers followed suit, contributing additional numbers of classifications to cover specific regions and in response to diverse anthropological interests (Tiesler, 2014, pp. 65). However, the efforts to measure and explain the different patterns of heading shaping during this time failed to objectively explain or exhibit an interest in the reasons for artificial cranial alterations based solely on a systematic categorization.

METHODS OF THE EARLY 20TH CENTURY

By the 1930s, studies of cranial modification in the Americas took a more serious, scientific approach with an emphasis on morphology and its relationship to both anatomy and pathophysiological cranial development (Moss, 1958; Pardal, 1938; Prestigiacomo & Krieger, 2010). They also created a foundational basis for current investigations on cranial modification, as the research generated during this time was more "systematical and breached different cultural spheres" (Tiesler, 2012, pp. 37). Over 1,200 publications by E.J. Dingwell encompassed ethnological work on heading shaping around the globe, with a special focus on the Americas. German anthropologist Frédéric Falkenburger (1938) conducted detailed metric analysis of South American skulls, by correlating cranial indices and angles with modification styles, ultimately yielding metric ranges of head shape variation. However, the most significant contributions came from Latin American anthropologists. In 1938, Argentinian anthropologists Adolfo Dembo and José Imbelloni published groundbreaking work on intentional cranial deformation based

on morphometric procedures. Prior to this, identification and classification involved pooling crania and ascertaining simply whether similarities in cranial vault morphology existed (Imbelloni, 1924-1925, 1933a,b). The subjective nature of visual assessment would compel Imbelloni to establish a systematic taxonomy for the classification of cranial modification in the Americas based on metric, osteological, as well as ethnic criteria resulting in distribution patterns identified through time (Tiesler, 2012). The use of quantitative methods (based on planes, lineal measurement, and angles) would help to control observational error, especially in cases of subtle cranial alteration (Perez, 2007). But the application of Imbelloni's method would prove especially useful due to the high volume of individuals displaying different styles of cranial modification (Imbelloni, 1933a). Unlike in Europe, Melanesia, or Africa, modifications in the Americas were predominately tabular in nature (Tiesler, 2014). He noted that compressions often involved the use of constricting bands or bandages, strings, or tightly fitted hats to create a tabular oblique pattern. Alternatively, Imbelloni accounted for rigid compression devices such as the usage of head splints (Dembo and Imbelloni 1938, pp. 289-303), along with unintentional cranial alteration caused by cradle boarding. The result of these constrictions established the taxonomic criteria to distinguish between two basic types of cranial modification: *tabular oblique* (fronto-occipital compressions with the help of head splints), and *tabular erect* (superior compression in supine position) (Table 1) (Dembo and Imbelloni, 1938, pp. 275). A third type, *annular modification*, is mentioned, but references an artificial orbicular or "pseudocircular" style of modification.

Imbelloni's contributions influenced other scholars, who then refined their studies with specific regional foci of head shaping in the New World.

TABLE 1. Taxonomic criteria adapted from Dembo & Imbelloni (1938; Tiesler, 2014).

Type	Distinctive Compression Technique	Degree (0-4)	Distribution of compression (in degrees ≤ 3)	Circular wraps (0-3)	Sagittal constriction (0-3)
Tabular oblique modification	Fronto-occipital compression with help of head splints	Extreme (>3)	Intermediate	Absence	Absence
			Occipitally curved	Presence of horizontal constriction (pseudocircular)	Presence of band (>0-2)
		Intermediate (≤ 3)	Frontally curved Parallelepided (or obelionic)		Bipolar separation (>2)
Tabular erect modification	Posterior compression in supine position	Extreme (>3)	Mimetic Intermediate	Absence	Absence
		Intermediate (≤ 3)	Occipitally flattened	Presence of horizontal constricion (pseudocircular)	Precence of band (> 0-2)
Annular modification	Symmetric annular constriction through elastic bands or wraps	No Information	No Information	No Information	No Information

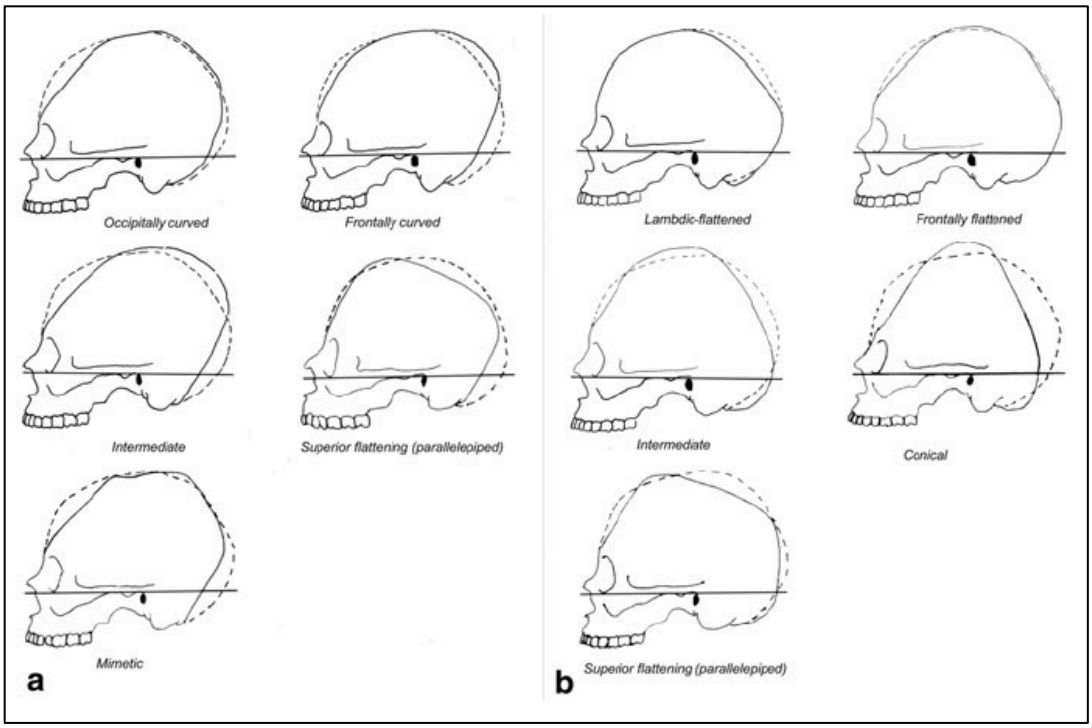

Fig. 4. Cranial modification classifications. Adapted from Tiesler's Varieties of (a) tabular oblique modifications (b) and tabular erect modifications (2014)

The Mid 20th Century

With the emergence of New Archaeology in the 1960s, the discipline of archaeology became upended after a cohort of scholars grew increasingly frustrated with the lack of critical engagement in research efforts. The impact of Imbelloni's scientific approach to study cranial modification became magnified by the paradigm shift of processualism, as anthropologists were forced to reckon with previously flawed methods lacking objectivity. No longer could the absence of critical engagement in methods to study modified crania substantiate biased conclusions about past populations and their cultural practices of head shaping. This challenge to scientifically interpret evidence based on the testing of a hypothesis from material records became a priority for other

Latin American anthropologists, as they followed Imbelloni's unprecedented methodological contributions. They included physical anthropologist Arturo Romano Pacheco of Mexico and the renowned Peruvian physician Pedro Weiss, who developed the approach of "cultural osteology."

Up until the mid-20th century, anthropological research of Mexican head shaping was Eurocentric (León, 1991; Serrano & Villanueva, 1997). By adopting Imbelloni's methods of classification, Mexican scholars such as Romano, used this foundational criteria and refined it with craniometric approaches, especially craniotrigonometry, to measure skulls (Romano 1965, 1972, 1974, 1977a, 1977b, 1980, 1996; Dembo & Imbelloni, 1938; Falkenburer, 1938). Increased attention towards the role of population studies in head shaping, versus the emphasis of individual cases, made the impact of Romano's contributions paramount to applying improved methods in the study of cranial modification (Dávalos, 1951; Romano, 1965, 1973, 1979). His development of an organizational system for different types of Mesoamerican head forms resulted in his establishment of important correlations between cultural changes in head shapes and native cosmological belief systems delineated by different regions of Mexico. This system left a lasting imprint on many generations of Mexican colleagues and students who trained in his method of cultural craniology half a century later (Tiesler, 2014).

Imbelloni's method also influenced the study of cranial modification in Peru by Pedro Weiss, but with a different outcome. As a physician, Weiss developed a deep interest for pre-Hispanic archaeology and osteology. While learning more about ancient Peruvian cultures from these perspectives, he scrutinized Imbelloni's criteria and

concluded that this taxonomic approach could not be appropriately applied to study Peruvian cranial modification practices. Instead, he advocated for a more emic classification system that would involve naming each pattern of head shaping after the indigenous culture associated with its practice, due to each group's distinctive combination of head apparatuses to achieve culturally unique and identifiable head shapes (Weiss, 1961, pp. 10-12). He did this by first distinguishing head shaping of those affected by cradleboards. Individuals determined to not have undergone intentional modification were then analyzed by the kind of head apparatuses used to generate a link in cultural areas representing the nuanced patterns of manipulation (Tiesler, 2014). The emic slant of Weiss's method proved invaluable to investigations of Peruvian head shaping, as pre-Hispanic Andean cultures did not leave behind written information. Unlike records from Mesoamerica, the absence of epigraphic evidence in the Andes made this method necessary to draw inferences about meaning of Andean culture directly from the physical evidence of the practice. Bioarchaeological data would become complementary, if not essential, to interpret head shaping.

The Late 20th Century: The Bioarchaeological Approach

The late 1970s saw the introduction of yet another paradigm shift in methods relevant to cranial modification: bioarchaeology. While the impetus of processualism drove the need to test hypotheses of mortuary data in archaeology, postprocessualism advocated for the contextual interpretation of such data to avoid representationalist pitfalls and also illuminated the importance of agency within individual contexts. A negotiated, pragmatic outcome considering the viewpoints from both theoretical camps is

often seen in bioarchaeology where the study of human skeletal remains addresses questions about past human behavior from biological data and archaeological evidence (Buikstra, 1977; Larsen, 2015).

To illustrate a more holistic interpretation of human behavior from antiquity, the bioarchaeological approach draws upon a collection of biological and cultural characteristics. Perhaps the most authoritative source for collecting skeletal remains in a consistent fashion is Buikstra and Ubelaker's (1994) *Standards for Data Collection from Human Skeletal Remains*. In addition to providing a comprehensive framework to collect quantitative and qualitative biological data, its system of data comparability aids researchers to collect "data sets relevant to studies of population variation, heritability, genetic affiliation, environmental effects, diet, health and disease, growth and development, and demography" (Glassman, 1996, pp. 1). Another advantage in its procedures focuses not solely on identifying certain skeletal qualities, but rather the overall presence and absence of characteristics: "Too often, our impressions of skeletal populations are biased by uneven reporting, usually involving the presence of an attribute condition. This is frequently evidenced in the archaeological literature" (Brooks, 1996, pp. 198). The general procedural sequence begins with paleodemographic variables. An examination of skeletal remains to estimate age is based upon from assessments of epiphyseal fusion rates, along with dental wear and eruption. Estimation of sex follows, as distinction between male and female subadults is not possible without sufficient evidence of morphological changes due to puberty. Collective evaluation of sexually dimorphic features of the cranium (e.g., mastoid process, nuchal crest, and supraorbital

ridge) and the *os coxae* (e.g., greater sciatic notch, ventral arc, subpubic concavity, and medial aspect of the ischiopubic ramus) (Buikstra and Ubelaker, 1994). Evidence of physical and metabolic stress, pathological conditions, nutritional deficiencies, trauma, and dental attributes are also gathered to create broader description about general health and the quality of life (Buikstra and Ubelaker, 1994).

Notation of cultural modifications, such as cranial modification, can also be added to the narrative in either visual or morphometric assessment. Both possess advantages and limitations to their application. The visual method, most predominantly used in investigations, involves a non-metric scoring system where instrumentation is not required. Buikstra and Ubelaker's (1994) data collection protocol guides the investigator through a series of questions, beginning with general visual observation of deformation, followed by the category of modification (e.g., tabular, circumferential, both, other); degree of severity (e.g., mild, moderate, extreme); center of pressure (e.g., lambda, squamous occipital, obelion, other); angle of pressure to Frankfurt plane (e.g., perpendicular, acute, or obtuse); presence, quantity, location, and shape of padding; and any observable symmetry of flattening. This approach is relatively efficient and information-rich, especially when examining a large number of crania within a sample. However, it is prone to interobserver error as a single standardized classification system makes it rather subjective (Clark et al., 2007).

The metric approach involves Imbelloni's (Dembo & Imbelloni, 1938) morphometric technique in which crania are subjected to a series of standardized measurements to classify and describe their respective styles of modification. This is

especially useful since ranges of variation exist from slight to severe degrees of modification. Furthermore, quantifiable evidence noting even the most subtle degree of variation supports a more accurate description of shape changes to the cranial vault, base, and face of the skull, while classifying the style of modification (Antón 1989; Cheverud et al., 1992; Clark et al., 2007; Kohn et al., 1995). The advancement of technology has further aided in the application and accuracy of measurements through landmark studies, thin plate splines, and Elliptic Fourier Analysis to generate geometric morphometric results (Boston, 2012; Cheverud et al., 1992; Frieß and Baylac, 2003). Since morphometric studies provide more descriptive and accurate data, researchers have been able to ask a broader spectrum of research questions. They include areas such as the effects of cranial modification on cognitive development (Beals et al., 1984; Lekovic et al., 2007), the concept of one's identity being embodied and communicated by distinct modifications and relationship to larger social groups (Knudson and Stojanowski, 2009), and the use of cranial modification to observe geographical mobility through an individual's life and boundaries in specific societies such as that between the Tiwanaku capital and its colonies in Peru (Blom, 2005).

CONTEMPORARY BIOARCHAEOLOGICAL STUDIES OF CRANIAL MODIFICATION

Since bioarchaeology's inception, the discipline has fundamentally transformed the means and methods for how scholars study human remains. Investigations of cranial modification occupy a liminal space in studies of bioarchaeology and bioanthropology due to its relationship with pathology and the impact of biology on culture (Torres-Rouff,

2019, pp.1). It has also gained increased attention in bioarchaeology because of the intentionality behind its practice throughout the Andes (Verano, 1997, pp. 251). Howshower et al. (1995) introduced groundbreaking studies of cranial modification providing nuanced understanding of head shape and social identity. But Verano (1997) expanded and diversified the subject as an active inquiry in Andean bioarchaeology especially by specifically establishing associations with skeletal pathological conditions, morphology, and social identity. Therefore, a closer examination of these respective designations, along with the integration of new technologies to aid in studies, will highlight how these areas are yielding future prospects and advances for study of cranial modification in the Andes (Torres-Rouff, 2019).

The Paleopathology of Cranial Modification

The designation of cranial modification as a theme in paleopathological investigations began long ago when Ortner and Putschar (1981, pp. 90) published on the practice as a pathological condition and characterizing it as a form "chronic, low-grade trauma." They argued that a difference existed between the pathological process of altering bone shape from potential minor pathological abnormalities resulting in complications from the practice (Ortner and Putschar 1981, pp. 92; Torres-Rouff, 2019, pp. 2). Aufderheide and Rodríguez-Martín (1998, pp. 34-36) also classified the practice as one of many kinds of "traumatic conditions" in human paleopathology, detailing the various types of devices and techniques used to manipulate bone growth, along with impact on brain development (Torres-Rouff, 2019, pp. 2). While the practice of cranial modification does not constitute a disease process, it still plays an important role in

paleopathology since it can produce pathological conditions reflected throughout a lifetime (Torres-Rouff, 2019, pp. 2). Furthermore, a contextual awareness should be emphasized to correctly identify head shaping results because of cultural practices to intentionally alter head shape (Torres-Rouff, 2019, pp. 2). Occipital flattening or asymmetry due to sleeping on hard surfaces gained traction in the 1990s in part to preventing SIDS, but this kind of unintentional alteration only affected the posterior regions of the cranium (Ortner, 2003, pp. 163; American Association of Pediatrics, 2019; Torres-Rouff, 2019, pp. 2). Additionally, cranial modification is generally not misconstrued as an actual pathological disease or malformation-related condition such as micro-, macro- and hydrocephaly, osteomalacia, or craniostenosis (Torres-Rouff, 2019, pp. 2). In the instances of micro- and macrocephaly, these rare pathological conditions indeed affect the cranial vault, but only in size, since the original shape is retained and is not an outcome of intentional change (Torres-Rouff, 2019, pp. 2). While microcephaly results in small head size due to abnormal brain development, macrocephaly involves an overly large head size also involving complications with the brain. Alternatively, hydrocephalus occurs from build-up of cerebrospinal fluid within cranial sinuses, placing inordinate pressure and causing brain damage. Osteomalacia affects growth of the skull due to vitamin D deficiency or malabsorption (Ortner, 2003, pp. 398-401), whereas craniostenosis is the result of cranial sutures prematurely fusing together and significantly altering the shape of the skull, which can be misconstrued for intentional modification (Aufderheide and Rodríguez-Martín, 1998, pp. 52-54; Ortner, 2003, pp. 460-463).

The study of health consequences (or the lack thereof) associated with cranial modification should also be considered with respect to pathological conditions. Within the last 20 years, several publications have addressed pathological concerns of head shaping especially because of the prevalence of the practice in prehistory (Torres-Rouff, 2019, pp. 2). These projects often have generated intense interest involving crania from the Andes, but generally conclude there to be little to no pathological impact (Torres-Rouff, 2019, pp. 2). For instance, Okumura (2014) studied a series of cranial featuring patterns of modification while simultaneously surveying patterns of crania and oral health indications. No significant relationship was drawn between osteological markers (i.e., cribra orbitalia, cranial trauma, antemortem tooth loss, dental caries, and periodontal cavities) and head shaping (Okumura, 2014). In another study, Pechenkina and Delgado (2012) compared cranial shape with health and status at Villa El Salvador in Peru, revealing that certain patterns associated with different populations rather than to cranial modification. Jiménez et al. (2012) explored the effects of heading shaping and dental occlusion on a Peruvian collection. They ultimately concluded that there was no significant effect on dental occlusion between head shape type or symmetry. Collectively, these studies along with many others prior, affirm that cranial modification causes little to no damage to an individual (Torres- Rouff, 2019, pp. 2). As a result, researchers have taken this generally accepted conclusion to investigate cranial modification as it intersects with other topics such as general health, social difference, and identity. Overviews touching on each of these topics, along with a specific example

of advanced technological integration, will demonstrate the breath and depth of bioarchaeology's scope as it relates to cranial modification later on in this chapter.

Morphology

While cranial modification among Andean skeletal collections is frequently documented by bioarchaeologists, reporting of the condition is often inconsistent since variations based on geographic demarcations necessitate different quantifiers and qualifiers (Torres-Rouff, 2019). As a result, a broad range of typologies have been generated and applied to address specific research questions regardless of region (Torres-Rouff, 2019). The most standardized method involves Buikstra and Ubelaker's (1994) approach that first determines presence/absence, followed by generic categories. However, the advancement of new technologies capturing aspects of morphology in greater and digital detail in recent years has aided in addressing deeper morphological investigations of Andean populations: "Not surprisingly, the Andes frequently serve as a laboratory for these morphological investigations due to its large, well preserved collections and variation practices" (Torres-Rouff, 2019, pp. 3). Therefore, several previous inquiries related to morphology omitted consideration of cultural developments to specific populations (Torres-Rouff, 2019).

Two broad camps of morphological studies have emerged with regards to the effects of cranial modification. The first group involves assessments of cranial modification in relationship to morphological changes by employing metric techniques to define and differentiate between categories and degrees of modification (Cocílovo and Costa-Junquiera, 2001; Cocílovo et al., 2001; Pomeroy et al., 2010). O'Brien and

Stanley (2013) examined crania from various regions of the Andes and assessed normal variation in conjunction with a quantitative approach to determine if a skull underwent modification. Soto-Heim and Quevedo (2005) explored asymmetry in Chilean skulls while others (e.g., Manríques et al., 2006, 2011; Pérez 2007; Salazar et al., 2014; Serna et al., 2012) adopted geometric morphometric techniques to answer questions of classification and documentation when comparing and contrasting different Andean groups. Collectively, these works have served to record the utility of detailed analyses modified head shapes (Torres-Rouff, 2019).

The second broad category of morphological studies looks at the impacts cranial modification has on the metric and non-metric characteristics of the skull but in relationship to evolutionary relationships and affinity (Torres-Rouff, 2019). Verano (1987) initially used this thematic approach and reported its significant effects in his work at Pacatnamú. His efforts paved the way for others by affecting methods and research questions especially as related to population groups and migration patterns in the pre-Columbian Andes (Torres-Rouff, 2012). Overall, these two schools of thought have refined and enriched the methodological approaches that now serve as the basis for scholarly research on cranial modification.

Social Identity

In addition to pathological conditions and morphology, Verano (1997) stressed the importance of cranial modification as a social marker in need of better cultural and temporal definitions. A number of other scholars achieved this by concentrating on head shaping investigations at certain sites or regions while also considering bioarchaeological

indicators of sex, violence, diet, and geographic origins (Torres-Rouff, 2002). The outcome of such efforts has resulted in profound contextual understanding of cranial modification as a social practice amongst pre-Columbian peoples in the Andes (Torres-Rouff, 2002). Several other scholars have since addressed cranial modification as an emblem of social identity by specifically focusing on ethnicity including Blom (2005) and Torres-Rouff (2002).

Barth's theoretical works (1969) outlined ethnicity as a social construct defined by regular interaction with other groups. From this notion, the body becomes considered a component of material culture, by which social expression is conveyed through the individual body (Sofaer, 2006). Such considerations of head shaping have thus enabled researchers to delve deeper into experiences of lived bodies through practices, including those involving culture, identity, and child-rearing (Torres-Rouff, 2019). The complexity of such perspectives becomes apparent from a series of specific studies. For instance, Blom and colleagues explored how cranial modification reflected practices of social organization and conveyed meaningful comparisons through the Tiwanaku region of Bolivia and Peru (Blom, 1999, 2005; Blom and Knudson, 2014; Blom and et al., 1998). Torres-Rouff (2002, 2003, 2007) expanded her work to survey cranial modification as an aspect of social identity to Chile's Atacama Oases. Additionally, Velasco's more recent work (2018a) addresses the topic of biological heterogeneity in the Colaca Valley while simultaneously exploring head shaping in ethnogenesis and social differentiation. Alternatively, independent investigations of cranial modification by Verano (1997) and Klaus (2008) respectively reveal flattening and asymmetric shaping in skeletal samples as

a result of child care practices rather than evidence of group identity amongst pre-Hispanic cultures of northern Peru. Overall, the unique and nuanced bioarchaeological approach used in these works demonstrates the highly contextualized understandings of culture from archaeological settings (Torres-Rouff, 2019).

Contextualized Bioarchaeological Research

In an attempt to further elucidate the shift towards contextualized bioarchaeological research, three separate case studies focused on the associations originally initiated by Verano (i.e., pathological conditions, morphology, and social identity) are worthy of consideration. All three scenarios involve more recent bioarchaeological studies of head shaping practiced in the Andes between 2300 BCE – 1450 CE. Nevertheless, the methodological distinctions between each case will show how substantive inferences and meaning may be drawn from cranial modification in ancient civilizations. Ultimately, their scientific approach, coupled with multidisciplinary perspectives from archaeology, osteology, paleopathology and biology will provide a holistic explanation of intentional head shaping and how the progress of such studies is yielding impressive and exciting scholarly insight about past peoples and their cultures.

Pathological Associations from Pasamayo

The case study of cranial modification from Pasamayo, the site of a large pre-Columbian cemetery located along the central Peruvian coast, dates to the Chancay culture, a regional power from AD 1200-1450. Consisting of skeletal remains discovered

at surface and ground levels originally in 1871, Okumura (2014) tested the hypothesis that individuals possessing different types of cranial modification also displayed differences in the frequency of cranial and oral health markers. The skeletal markers include five specific conditions. The first includes cribra orbitalia, or the spread of macroscopic apertures found along the roof of the eye orbits caused by iron deficiency, disease, undernutrition, and/or intestinal parasites. The second condition, cranial trauma, considers any fractures serving as evidence of daily accidents and/or social trauma. Depending on the type of fracture (e.g., resulting from blunt or acute force), speculation regarding the environmental conditions and frequency of trauma experienced by a given population could be made (Okumura, 2014). The third, antemortem tooth loss (AMTL), looks at dental wear or caries, its progression leading to exposure of tooth pulp chambers, inflamed alveolar sockets, tooth loss, and ultimately alveolar bone resorption (Hillson, 1996). Identification of dental caries caused by bacteria and the demineralization of tooth enamel, frequency of dental caries, severity of occlusal wear (e.g., a tooth presenting an open chamber associated with bone cavities described as an 'abscess'), and exposure of the alveolus to external pathogens causing periodontal cavities (Lukacs, 1996), all provide evidence and insight into dietary intake.

Okumura estimated sex and age of all 78 individuals (47 male, 31 female) from cranial morphology (Buikstra and Ubelaker, 1994), scored visually for presence and type of cranial modification status (i.e., occipital, lambdoid, fronto-lambdoid) (O'Loughlin (2004), and inspected of osteological markers related to general patterns of biological stress. Results from the study suggested a series of certain cautionary conclusions about

the individuals in Pasamayo on the basis of cranial modification. Individuals showed three different patterns of cranial modification: occipital, lambdoid, and fronto-lambdoid. Both sexes experienced the practice equally, with no difference of frequency or style used. This absence based on sex suggests that gender differences were not related to head shaping (Torres-Rouff, 2002). Females showed an unexpected higher frequency of cranial trauma as opposed to males, consisting mainly of healed compressed fractures, which are the most common type found in archaeological contexts (Roberts and Manchester, 1995). Simultaneously, males of Pasamayo exhibited exposure to especially severe forms of violence from the punctured facial fractures. In terms of oral health, males overall showed a higher frequency of antemortem tooth loss and periodontal cavities than women. No differences could be made on the basis of age. When factoring types of cranial modification into the investigation, cautionary conclusions were offered: males bearing fronto-lambdoid patterning experienced the greatest frequency of antemortem tooth loss. Alternatively, individuals with occipital modification fared better than the other two groups. Although a definitive relationship could not be made between health and social status in this case study due to small sample size, Okumura suggests the group bearing occipital deformation may have been associated with a higher social status in relation to the other groups (2014, pp. 23).

From this case study, investigation of the cultural practice of cranial modification in tandem with an assessment of health status reveals a more comprehensive picture of social factors such as status between the 13th and 15th centuries of Pasamayo. The biocultural framework highlights a complementary nature of multiple disciplines to

evaluate the material record by presenting data relevant to sociocultural reconstruction and interpretation (Tiesler, 2014). Because the study of such archaeological data could not yield the same breadth and depth of knowledge strictly from a single disciplinary perspective, it reinforces the concept that the bio-psycho-social properties of the individual are directly tied to specific ideological expressions transmitted through cultural practices (Tiesler, 2014). Its outcome, therefore, becomes a valuable reconstructed representation of social and physical environments of both individuals and populations from the mortuary material, which contain no written records.

Morphological Associations from Chile and Peru

The Pasamayo case study reveals how more traditional approaches utilizing visual methods to collect cranial modification data can indeed provide details of social meaning in relation to specific populations – and that it goes beyond traditional boundaries of "shape-only." However, growing interest and examination of Andean head shaping, in part due to bioarchaeology's growing popularity and the application of its standards, has produced greater evidence of a wider array of modification forms within the region (Pomeroy et al., 2010; Torres-Rouff, 2002; Velasco, 2016). The advancement of new scientific technology and its application to improve morphometric methodology is helping to document differences within and between types of head shaping (Kuzminsky et al., 2016). In this specific case study, researchers conducted a pilot study using a NextEngine 3D Laser Surface Scanner to generate precise models of modified crania from four different archaeological sites. They include three locations in northern Chile

(Morro 1, Playa Miller 7, and Azapa-140) and one in highland Peru (Huari in the Ayacucho Basin) spanning the course of several millennia of prehistory (Kuzminsky et al., 2016). Although eyewitness accounts from colonial chroniclers shared largely etic insights into cranial modification and their meaning in the Andes by drawing affiliations between social, linguistic, and cultural groups with different head forms (Cobo, 1979[1653]; Garcilaso de la Vega, 1966[1609] as cited in Torres-Rouff, 2003), Kuzminsky et al. (2016) wanted to ascertain if standardization existed and to what extent by applying advanced technologies to evaluate variability of the tabular oblique style at these four sites.

The Morro 1 site (2300-1600 BCE), located on the Peruvian border in the modern-day city of Arica, corresponded to the well-known Archaic hunter-gather-fisher society of the Chinchorro. The second site in Chile, Playa Miller 7 (1000 BCE – 750 CE), consisted of a marine subsistent community from the Formative period recognized for its cultivation practices and production of sand-tempered pottery (Focacci, 1974; Sutter and Mertz, 2004; Watson et al., 2010, 2013). The third location included the Chilean site of Azapa-140 (750 – 1100 CE) dating from the Middle Horizon and early Late Intermediate period. Finally, the fourth site of Huari in the Ayacucho Basin consisted of the capital of the Wari Empire in Peru during the Middle Horizon (600 – 1000/1100 CE) and Late Intermediate Period (1100-1400 CE) (Tung, 2008; Tung el al., 2013).

A total of 56 crania was selected for examination, including male and female crania to increase sample size. Standard methods to estimate sex and age were used

(Buikstra and Ubelaker, 1994), followed by evaluation of cranial completeness to collect data from specific landmarks. Additionally, crania were classified based on their originating site, time period, and any particular diachronic distinctions. Prior to 3D scanning, a general visual assessment revealed different classifications: annular, tabular oblique, tabular erect, and unmodified categories. High resolution 3D imaging produced landmark coordinates yielding geometric morphometric procedures to ultimately distinguish affinities among individuals including (1) how cranial deformation was segregated in the morphospace, and; (2) modifications differed within categorical groups (Kuzminsky et al., 2016)

The results concluded with a series of promising findings using this morphometric method. First, with the use of only 10 cranial landmarks, a distinction between annular and tabular erect modification types could be made along with a range of variations within the tabular oblique category. The range of variation for the latter suggests the tabular oblique category would benefit from a classification noting even its slight appearance, especially amongst populations in northern Chile (Torres-Rouff, 2002). Another critical point drawn from the study emerged: "Variation documented within the traditionally labeled tabular oblique type occur[ed] not just between archaeological sites, but within them, indicating that the standardization of cranial modification types within a particular population warrants further study" (Kuzminsky et al., 2016, pp. 511). Researchers concluded lower variance among the Morro 1, Playa Miller 7, and Vegachayoc Moqo sites potentially due to "a more homogenous biological population whose cultural and social developments were likely to be local, rather than from

Tiwanaku and other outside polities" (Kuzminsky et al., 2016, pp. 512). In contrast, the variance between Vegachayoq Moqo and Monqachayo samples showed an inverse relationship, with greater standardization at Vegachayoq and suggesting distinct representations of ethnic groups (Kuzminsky et al., 2016).

In reviewing the collective evidence, the study suggested three tentative conclusions regarding social ideals based on cranial modification at Vegachayoq Moqo, Morro 1, and Playa Miller 7. Evidence from these collective sites indicate strong cultural norms responsible for ideal head forms that were likely carried out by family members or a specialist class (Kuzminsky et al., 2016, pp. 512). Second, the higher than expected variance at Azapa-140 and Monqachayoc suggests less stringent norms dictating cranial modification types, likely due to various devices for modification and thus resulting in greater variation in head shapes (Kuzminsky et al., 2016, pp. 512). But perhaps the most conclusive takeaway from the experiment showed the incredible potential of 3D laser scanning in enhancing morphometric analysis by providing quantitative assessments of diachronic and geographical variation among pre-Hispanic Andean populations (Kuzminsky et al., 2016). This advancement indicates another possible paradigm shift is underway, where the incorporation of advanced technology will produce the next wave of methodological improvements in studying cranial modification. If so, this can only widen the scope of asking and better answering questions that address cultural notions from the past.

Association of Social Identity in the Colca Valley, Peru

In the case study of the Colca Valley, Velasco (2018) explored practices of cranial modification in relationship to ethnic group formation and its impacts on two major ethnic groups: the Collaguas and the Cavanas. Dating from the Late Intermediate Period (AD 1100 – 1450), skeletal samples from the two separate mortuary sites were used to explore how changes in cranial modification (a correlate of embodied identity in the Andes) established new forms of political solidarity and social inequality in the late pre-Hispanic Colca Valley (Velasco, 2018, pp. 98). In particular, Velasco sought to know how the Inka incorporated diverse peoples into the empire despite political upheaval during the preceding Late Intermediate Period.

In conjunction with establishing demographic profiles and assigning a modification category (i.e., tabular, erect, oblique, or "slight" orientation) to each of the 213 crania in the sample, he used radiometric data to correlate the prevalence, uniformity, and transformation of cranial modification practices to cultural period to evaluate evidence of ethnogenesis, or the process by which a group becomes ethnically distinct (Velasco, 2018).

Unlike other theories addressing group identity, ethnogenesis looks at the roles of class, gender, and kinship while identifying how new forms of identity emerge and evolve as a process stemming from the rupture of earlier and/or new ideologies (Hu, 2013; Voss, 2008, 2015; Weik, 2014). Cultures of the ancient Americas experienced ethnogenesis due to a wide range of social phenomena, including the disparagement of tribal groups (Hill, 1996; Klaus and Tam, 2009; Stojanowski, 2010; Weisman, 2007),

establishment of so-called racial identities, the construction of highly stratified colonial class structures (Bell, 2005; Schwartz and Salomon 1999; Voss, 2008). Since ethnogenesis goes beyond the documentation of such identity markers, the sentiments responsible for group solidarity in light of such challenges emerge and provide insight into ideologies responsible for the construction of group identity (Velasco, 2018). For cranial modification, the intent and act of close kin to inscribe social identity onto a child's body during infancy (Blom, 2005; Torres-Rouff; 2202) make it an ideal correlate to trace group identity (Velasco, 2018).

For this study, bioarchaeological and radiometric data revealed a high prevalence and uniformity of cranial modification practices over time (Velasco, 2018). Burial groups from the early Late Intermediate Period displayed greater heterogeneity in head shape versus those dating from the terminal Late Intermediate Period with greater homogeneity (Velasco, 2018). This suggests modification superseded biosocial divisions exhibited from marked tombs while also designating cranial modification for certain individuals, perhaps with social privileges and of an elite status (Velasco, 2018). In essence, the examination of archaeological and bioarchaeological data from this study demonstrate how cranial modification's study contributes to an expanded understanding of collective identity as it intersects with concepts of inequality and disparity in ancient times (Velasco, 2018).

CONCLUSION

Although the global practice of cranial modification since the beginning of human existence makes it one of the most common types of body modification documented by biological anthropologists, its permanent skeletal record in archaeological contexts makes it one of the most unique areas of research within the interdisciplinary lens of bioarchaeology (Buikstra, 2006). Specifically, the integration of paleopathological, osteological, archaeological, and biological principles in studying this ancient practice demonstrates the significant change in direction head shaping research has undergone since the 19th century. Originally promoted within concepts of phrenology, the lack of critical engagement and flawed reasoning revealed little substantive knowledge other than highly racist, biased preconceived perceptions. These limitations would be challenged by early 20th century anthropologists, who, with backgrounds in physiology and osteology, increasingly understood the practice in terms of Latin American history and culture. They led the effort to develop scientifically focused methods to examine and explain cranial modification both from an emic approach. Recognizing the need for geographic-specific methods, the methods used to study head shaping evolved as patterning proved different among and within different cultural groups. This proved especially relevant during the processual and postprocessual movements, as the need for hypothesis testing could only be appropriately applied if context and meaning were factored in. It is for this very reason that Mesoamerican and Andean classification systems diverged as separate and distinct methods of study. Methodological progress also improved by including not only visual assessments but also morphometric

evaluations. However, the emergence of bioarchaeology and its systematic standards to conduct overall skeletal analysis made it an especially appropriate approach to studying archaeological evidence of head shaping. It has become one of the disciplines to lead research efforts on the subject because it "combines techniques, methodologies, and concepts derived from physical anthropology and archaeology….to assign value to the mortal depositories of the dead and their contents, their location and chronology" (Tiesler, 2014, pp. 91). This is evident from the two cases studies presented: standard methods of interpreting biological data of skeletons and use of 3D scanners not only make data collection more efficient but also support better classification systems to identify, document, explain, and share the types of modification and the intentional meaning behinds its practice.

This brings us to the point we have reached today in learning about cranial modification practices and its significance. The question has significantly grown from the epistemological miles over the past 200 years. It has also enabled us to draw relationships between cranial modification and concepts of social change, identity, gender roles, and child rearing in antiquity. Therefore, anthropological understanding of cultural and behavioral motivations can only improve as development of methods continues to take shape, making it all the more important to continue its study in the future and in settings such as the Lambayeque Valley Complex of northern Peru.

CHAPTER 4

PRE-HISPANIC AND COLONIAL CULTURES OF THE NORTH COAST OF PERU

In order to fully understand and appreciate the various cultural dimensions associated with the practice of cranial modification in the Lambayeque Valley Complex, background information of archaeological evidence from pre-Hispanic and Colonial periods is necessary to address significant cultural patterns related to bioarchaeology. To begin, a brief summary of the unique climate and geography of the Central Andes, north coast of Peru, and Lambayeque Valley will provide the context to later explain how specific cultural groups adapted to the environment, ultimately shaping their belief systems and social patterns. This includes an overview of initial pre-Hispanic cultures, followed by a narrowed focus on the Moche and Sicán civilizations. Emergence and development of subsequent ethnic groups such as the Muchik, Chimú, and Inka will also provide additional contextual information. Finally, an ethnohistoric overview of Spanish Colonialism in Peru and the Lambayeque Valley Complex respectively, will share the systematic changes that occurred upon contact and conquest. Collectively, the details in this chapter will offer important understanding of social, political, economic, and religious aspects relevant to cultural themes in bioarchaeology, including cranial modification.

LAND AND CLIMATE: THE ANDES, NORTHERN COAST OF PERU AND LAMBAYEQUE VALLEY

The Andes, a region consisting of two *cordilleras* or mountain ranges, stretches as far north as Ecuador and Colombia and runs deep into Argentina and Chile. The Cordillera Blanca borders the Amazon Rainforest, while the Cordillera Negra aligns with the Atacama Desert. Contributing to some of the most diverse and complex landscapes, these mountains contribute to an unsurpassed variety of vegetation as well (Brush, 1982). The coastal western deserts, marking their arid presence at sea level, reach heights that can measure over 5,500 meters high along eastern tropical forests, also known as the *selva* (Brush, 1982). Around two million years ago, the westward-moving continental plate of South America met with the eastward-moving Nazca ocean plate, to join along the Pacific coast and produce the largest volume of geological material compressed within a narrow horizontal than any other place on the planet (Brush, 1982). Nevertheless, this created the evolving nature of the Andes, which to this day, present exceptionally diverse geological and topographic conditions due to erosion, tectonic, glacial, and volcanic activity (Winterhalder and Thomas, 1978). Combined with temperature and precipitation, the three influential physical factors contributing to the climatic spheres of the Andes include altitude, longitudinal and latitudinal geography, and wind streams. The Andes' steep barrier of land mass produces dramatically different climates on each side of the cordilleras: cool and dry along the Pacific while hot and humid air masses reside above the Amazon basin (Brush, 1982). Its high altitudes influence temperature, precipitation, and humidity, while heat loss and drier conditions are most prominent at higher elevations, resulting in orographic rainfall along eastern

slopes and dryness on the interior valleys (Brush, 1982). The higher temperatures found within interior valleys make for a decline in precipitation and is responsible for desert conditions along the Pacific coast.

Northern Coast

This stretch of land encompassing 2,400 kilometers of arid desert is marked by a series of rivers that descend from the Andean piedmont to the Pacific coast enabling irrigation and vegetation along mountain slopes. Yielding 14 river valleys, some with high adjacent water tables, the growth of scrub trees, marsh grass, and sunken gardens thrive, due to groundwater and moisture within these *lomas* (Benson, 2012). The significance of the rivers cannot be understated, as they span over 400 kilometers of coast and contribute to vital sources of water necessary to sustain diverse crop cultivation and pre-historic animal grazing such as camelids (Benson, 2012). Although little rainfall occurs along the western coast, the combination of cool temperatures and ocean air generate cloud formations that move inland and promote precipitation at higher altitudes (Johnson, 1976). Alternatively, warmer areas better known as *yunga* regions, provide seasonal rainfall that, along with an abundance of sunshine and mild temperatures (20-27 degrees Celsius), provide plentiful sources of fruits, vegetables, coca, and mineral resources such as copper and silver (Shimada, 1994, pp. 37). *Yunga* territories, once highly coveted by various cultures throughout time (Rostoworoski, 1985) were the sites of "Maximum Elevation Canals" (MECs). Responsible for determining the extent of irrigation in a coastal valley, these landmarks defined where one began on the eastern

border in contrast to its demarcation established by the Pacific coast's western boundary (Klaus, 2008, pp. 78).

The Pacific Ocean

In addition to these collective water sources, the backdrop beyond the desert landscape is the sea. Providing an abundant source of maritime resources, the waters of the Pacific Ocean along the Peruvian coast served as one of the richest fishing areas in the ancient world and remains so today (Klaus, 2008). As a fundamental element contributing to the development of social complexity in the Andes (Moseley, 1975), maritime resources encompass a dizzying variety of fish, mammal, bird, mollusk, and plant species. Abundant anchovies dwelling along the ocean surface not only provide nutrient rich food sources for humans, but also feed sea birds producing nitrogen rich guano from their consumption (Klaus, 2008). As a rich terrestrial fertilizer in pre-Hispanic and modern times (Julien, 1985; Klaus, 2008), these resources made it possible for agricultural subsistence to both survive and thrive in this unique environment. In addition to being a rich source of food and nutrients, the Pacific Ocean may have also played a critical role in the belief systems of pre-Hispanic cultures along the north coast, especially with regards to the concept of equilibrium (Klaus, 2008). Just as mountains were spiritually revered for their association with rain, the Pacific Ocean ceaselessly supplied year-round resources, thus providing a balance between the forces of land and water (Bourget, 2001; Shimada, 1994, pp. 38; Klaus, 2008).

Environmental Conditions

A slew of extreme environmental conditions can make life along the north coast of Peru highly susceptible to catastrophic natural phenomena (Klaus, 2008). Since Peru sits along one of the most active stretches of tectonic activity in the world, it is prone to earthquakes and volcanic eruptions. Interaction between the Nazca Oceanic Plate and the westward moving South American Plate have resulted in occasionally devastating consequences, such as the 7.9 magnitude earthquake of 1970 which killed 70,000 people (Eriksen et al., 1970; Klaus, 2008). Tsunamis have been known to occur; however, slower acting effects resulting from tectonic activity include the elevation of seafloor and reduction of arable land in pre-Historic times (Moseley and Deeds, 1982; Klaus, 2008). However, the most intense and frequent form of environmental disturbance involves the periodic massive warming of oceanic waters along the north coast, better known as El Niño (Klaus, 2008). Occurring most often around Christmas, El Niño involves a complex interaction of Pacific sea currents and air masses. With sea temperatures potentially reaching up to 31 degrees Celsius, this contributes to intense rain and thunderstorms producing catastrophic flooding (Klaus, 2008). The high sea temperatures also cause fish kills and alter sediment deposits along riverbanks which disrupt irrigation systems, thus requiring the repair of canals and other important infrastructure (Klaus, 2008). Despite its irregular occurrence, the variance in El Niño's intensity has produced climatic concerns since ca. 3000 BC (Sandweiss et al., 1996a, 1996b) and continues to produce drier or wetter seasons (Klaus, 2008).

The Lambayeque Valley Complex

Unlike every other single-river valley system of the Peruvian coast, the Lambayeque Valley Complex consists of five river valley systems from north to south, and involves a unique transitional environment located between deserts and valleys (Klaus, 2008). Through a series of complex connections that bypass through mountainous and desert terrain, the Motupe, La Leche, Lambayeque, Reque, and Zaña Rivers contribute to an environment dominated by a triangular pediplain, and defined by two divisions of the Cordillera Occidental: one running northeast-southwest just north of Chongoyape and Pátapo towards the La Leche drainage, and another traveling from the south highlands to Cerro de Reque (Shimada, 1976, pp. 24; Klaus, 2008). The result of this dynamic natural setting is an environment ideal for irrigation agriculture, offering approximately 136,000 hectares of arable land (Klaus, 2008). It is also responsible for generating multiple microenvironments. They range from coastal desert, *monte* or forest, semi-tropical forests, riverine microenvironments, and valley flanks.

Fig. 5. Topographic Map of Peru. Image by Elise Dufour.

The littoral or coastal zone encompasses a narrow strip of land along the eastern desert border, in which maritime fishing and salt production dominate the economy (Shimada, 1976, pp. 28; Klaus, 2008). Terrains vary from rocky at Morro de Eten, to sandy beaches in places such as Caleta de San José, Santa Rosa, and Pimentel (Klaus, 2008). Although poor drainage and highly saline conditions make vegetation scarce between the coastal desert region of Ferreñafe and Mórrope, sediments of clay, salt, and

gypsum are plentiful (Klaus, 2008). Sand dunes are also common, with some as far inland as 10 to 20 kilometers (Klaus, 2008). Of the vegetation that does exist, it includes shrubs, grasses, and *Tillandsia,* which is known to survive off of moisture derived from the air (Shimada, 1976, pp. 29; Klaus, 2008).

The *monte* zone, a forested region dominated by scrub vegetation, includes *algarrobo (Prosopis chilensis, juliflora,* and *limensis*) *faique* (*Acacia macracantha*), *vichayo* (*Capparis ovalifolia*), *zapote* (*Capparais angulate*) and *palo verde* (*Parkinsonia acuelata*) trees (Klaus, 2008). Although cultivation and deforestation have since altered it, the *monte* zone would likely have resembled the appearance of coverage during pre-Hispanic times (Klaus, 2008). Currently, intensive cultivation of sugar cane has contributed to clearing of the *monte* zone along with the use of Algarrobo trees for firewood (Klaus, 2008).

A semi-tropical forest microenvironment at the Poma Forest National Historic Sanctuary is home to various species of birds and exotic animals. In addition to these forests, riverine zones play a major function in the Lambayeque Valley Complex by producing highly fertile floodplains (Klaus, 2008). Through a series of merging rivers, irrigation canals form and collect high volumes of rainfall, enriching the area. Although distinct from rivers themselves, riverine microenvironments help sustain the habitats of diverse flora and fauna including tropical fruit trees and diverse bird species respectively. They also contribute to a natural network of irrigation systems comprised of five major canals in the Lambayeque Valley Complex: Racarumi I and II, Collique, Taymi, as well

as the Lambayeque River itself which provides water in and around Chiclayo and Lambayeque (Klaus, 2008).

The fifth and final microenvironment consists of valley flanks, or transitional zones found between the Andean foothills and fertile bottomlands (Klaus, 2008). Although covered with gravel, boulders, and occupied by a variety of subtropical trees and scrub, vegetation never reaches its full growth potential due to active livestock herding (Shimada, 1976, pp. 54, 62; Klaus, 2008). Amongst the flanks can also be found *quebradas* or canyons, especially in the southern and eastern regions. With some covering significant sums of territory, they serve as natural causeways between specific regions (Klaus, 2008). In the instance of Quebrada Montería, it connects the Lambayeque region and the upper Zaña Valley.

Solutions to Environmental Constraints

Despite multiple constraints produced by environmental hostilities along the north coast, peoples of the region devised innovative solutions to curtail ecological consequences. Working with nature to mitigate its negative effects, economic prospects also grew as a result of such human creativity (Klaus, 2008). Such examples include the creation of sunken gardens or *pukios*. Even though inundation from rivers made large-scale agriculture possible, the scarcity of water generated engineering efforts to collect limited sources of water (Klaus, 2008). The creation of sunken gardens first introduced during Moche III (ca. AD 300-450) involved the creation of irrigation spaces situated in large excavated depressions to maximize the benefits of high water tables (Klaus, 2008). Some *pukios* featured sliding slopes whereby water would travel to concha reservoirs

during rainy periods and then irrigate crops, thus providing longer seasons of farming regardless of rainfall (Moseley, 2001). During times of severe El Niño rains, the Sechura Desert would undergo transformation from dry land to green pastures, making it an ideal opportunity to grow various vegetables by way of short-term cultivation plot techniques (Shimada, 1994, pp. 52).

Another adaptive measure taken by pre-Hispanic peoples to alleviate harsh environmental conditions involved instituting a *parcialidad* system of political organization. Unlike devising solutions aimed at resource limitations, this approach focused on organizing the populace into specialized communities and maximizing participant economic specializations to broaden coastal resources (Klaus, 2008). Community members, divided by industries such as pottery production, fishing, metallurgy, and salt collection, would contribute in ways to generate more interregional economic interaction and interdependence (Ramírez, 1982, Shimada, 1994, pp. 54; Klaus, 2008). Socioeconomically, this suggests north coast civilizations adopted a horizontal strategy to generate resource self-sufficiency regardless of environmental conditions (Shimada, 1982).

REGIONAL CULTURAL HISTORY

The Earliest Human Settlers

Identifying and dating the earliest traces of human history in the Andes remains an ongoing challenge. Although archaeological records are important to supply evidence about the beginnings of human history and cultural developments, they cannot provide a precise timing of the first human settlement in the region, since exploration and

radiocarbon testing of many sites are still required (Dillehay, 2011). Claims of the earliest known human occupation in Peru include sites at Pikimachay Cave located in the Ayacucho region, Pachamachay in Junín, and Guitarrero Cave in the Callejón de Huaylas. Evidence from these sites includes archaeological assemblages consisting of accumulated pollen, plant, and animal remains (Keatinge, 1988). Much controversy has surrounded the dating of these sites, particularly Pikimachay Cave (ca. 20,000 years old), as the scholarly community has not universally accepted its age. Despite this complexity, human occupation dating from ~14,840 BC at Monte Verde in southern Chile, provides solid evidence of human occupation during the Lithic/Archaic Period (15,000-3500 BC) in South America. Following herds of migratory land animals, paleoindians likely crossed the Bering Strait before this glacial land bridge underwent drastic environmental and climatic changes. The transformation of retreating glaciers and rising ocean levels resulted in an abundance of fauna and flora on the continents of North and South America. It also led to the blossoming of the Lithic culture, around 9000 BC, in which human occupation grew as indicated by the increased presence of relatively uniform chipped stone-tools (Keatinge, 1988). More recent archaeological investigations suggest major social and economic foundations of existence occurred around this time:

> Archaeologists have always considered the earlier period from ~13,000 to 6000 years ago to be important in terms of the appearance of domesticated plants and animals, social differentiation, and a sedentary lifeway, but there is more to this period….The spread of crop production and other technologies, kinship-based labor projects, and population aggregation…formed a palimpsest of ever-changing conditions across many different environments of the Andes that created a patchwork of new transformations through time (Dillehay, 2011, pp. 1).

The earliest dates for human occupation on the north coast of Peru come from the site of Huaca Prieta (Chicama valley) at 14,500 BC (Dillehay, 2017). Specifically, between 12,300 and 10,500 BC, South America experienced cultural developments characteristic of the late Pleistocene period in other parts of the world (Dillehay, 2000, pp. 9). Characterized by intact deposits of unifacial tools such as Fishtail and Paiján projectile points (Dillehay et al., 2011), subsequent phases involved the presence of small housing structures and general foraging practices (Dillehay et al., 2004; Maggard, 2010). In particular, the Paiján tradition involved hunter-foragers known for their mobile tendencies between 8700 and 5900 BC (Chauchat, 2006; Briceño 2004; Gálvez 2004). As time evolved, various dwellings and structures of economy (e.g. circular houses, small mounds, and limited cultivation of wild resources) defined later timeframes based on the presence of rectangular houses, irrigation canals, agricultural fields, a wide array of cultigens, along with limited plants and animals (Dillehay et al., 2011). Additionally, people congregated closer to lands with more fertile soils, inhabited larger multi-room rectangular structures, and cultivated crops such as cotton, beans, and coca via means of manmade irrigation canals (Dillehay et al., 2011). The first evidence of maritime foraging also appeared from shell midden sites during this time (Dillehay et at., 2011). But perhaps the most significant signs of change through the sierra of Peru occurred ~8000 BC (Keatinge, 1988; Dillehay, 2011) with shifts in lithic technology and treatment of the dead. A divergence from individualized household accumulation transformed to promote integration and social fusion for ritualistic and communal reasons (Dillehay, 2011), based on a rich complex in the Nanchoc Valley on the Western slopes of northern

Peru, discovered in 1978. Identified and considered to be a nonresidential site associated with the production of lime (Dillehay et al., 1997), the processing of this mineral served as a supplement or extractive agent taken with coca. Its production was likely processed by a small community of specialized hunter-gatherers, where public dispensation involved rituals consolidating aspects of social and cultural identity (Dillehay et al., 1997). The tiered nature of the mounds' architecture, and careful placement of human, male long bones in primary and secondary burials, all suggest ritual importance of communal activities associated with the site (Dillehay et al., 1997). The discovery of scattered items, including ornaments made of malachite, copper, and quartz, suggest possible evidence of copper smelting and production (Dillehay et al., 1997). Although these observations attributed to specific sites are insufficient characterizations pertaining to human origins of pre-historic Peru in general, they do yield a few important themes about ancient civilizations during this timeframe and as they relate to the Lambayeque region: individualistic groups overcame challenges, primarily environmental, to forge integrative unities, and were further increasingly connected to webs of economic and social interactions with other coastal and highland peoples. Complex, non-linear experimentation with new forms of society, ritual, and adaptive strategies that would ultimately result in more structured organization, dependence of agricultural practices, initiation of sedentary communities, and even the unfolding of wholly new ontologies to follow in the Preceramic Period (Dillehay2017).

The Preceramic Period (3500-1800 BC)

As hunter-gatherers continued to adapt to a changing climate in the post-Ice Age environment, a trend in sedentary lifestyle developed as permanent settlements grew. Recognition of certain plants and animals, along with their utility and proliferation, resulted in their broad incorporation into daily life for use as tools, clothing, bedding, and medicinal purposes. The various natural environments also created diverse opportunities to engage in subsistence, resulting in the exchange of goods and ideas. Along the coast, hooks and woven nets became forms of new fiber technology used by communities to maximize marine resources. Yet, ceramic pottery had yet to be developed within the region. For some archaeologists, the emergence of civilization did not occur until pottery came into use because Preceramic people still derived much of their food from the wild (Moseley, 2001, pp. 107). Even though pottery-making communities in Colombia and Ecuador were already practicing agriculture by 3000 BC (Moseley, 2001), this did not mean that there was a delay in social complexity within the region. It is true that communities living in coastlands remained dependent on extracting maritime resources while well-watered tropical settings in the north were intensifying their farming and pottery practices (Moseley, 2001). However, the shift in use of certain terrestrial resources, from ascelpias to cotton, resulted in intense marine resource exploitation yielding increased specialization in fishing (Beresford-Jones et al., 2018). Evidence supporting this theory includes tests of findings from La Yerba II (7571 – 6674 Cal BC) and III (6485-5893 Cal BC) on the southern coast of Peru. Despite little archaeological evidence of social complexity during the Preceramic Period in this area, the production of

cordage for nets and lines required significant labor and highly technical skills. The remarkable preservation of organic artifacts in the region's arid climate provided direct insight into fiber fishing technology, along with details about the abundant number of different fish species caught from various water depths and made possible by the different types of nets produced. Different combinations of plant fibers used for thicker cordage and remnants from shell middens reveal the vast diversity and quantity of marine resources people retrieved in these permanent and semi-permanent settlements:

> Larger nets require[d] more people to produce and operate, motivating social co-ordination and wider economic links. Thus was emerging social complexity among the coastal hunter-gathers off the coast of Peru driven by the technological aspects of plant fiber production: firstly by the delayed-return social systems necessary to manufacture and maintain fishing nets and, in due course, through increased social stratification, division of labor, and property entailed by larger nets (Beresford-Jones et al., 2018, pp. 420).

The technological production of fibers therefore resulted not only in revolutionary sophistication of subsistence, but also highly diverse styles of social complexity in the Andes.

Such complexity was also captured through a veritable and unprecedented explosion of monumental architecture and religious formation along the northern coast. In particular, sites at Aspero, El Paraíso, and Cardal encompassed massive platform mounds, U-shaped plazas, and circular courts erected during this time period (Burger 1995; Shibata 2004). Most likely executed under the auspices of political and religious elite, the construction of these structures occurred without state-level organization or distinction in socioeconomic status (Burger 1995, pp. 37). But what was the need for such elaborate structures? Why were such complexes constructed? The answer stems

from agricultural development and environment. Dependence on agricultural subsistence led to careful observations of celestial tendencies to best prepare and schedule for agropastoral activities (Moseley, 2001). In response to appeasing entities "responsible" for harsh environmental conditions, the coastal pole saw the greater number of adobe *huacas,* or sacred ceremonial and political sites, erected during the Initial Period more than any other time in Andean Prehistory (Moseley, 2001). Irrigations systems influenced civic-ceremonial architecture by providing a means to produce mud bricks in a variety of shapes (Moseley, 2001). Religious themes generated vivid visual displays such as those exemplified by Cerro Sechín and consisting of 27 megalithic slabs erected around the front temple mound. Similar trends of architectural development found at the U-shaped ceremonial center of Cardal in the Lurín Valley (1170 to 920 BC), reveal this pyramid site held causeway plazas, semisubterranean circular courts, steep stairways, and exterior atriums elaborately decorated with dramatic murals of a gigantic, fanged mouth (Burger and Salzar-Burger, 1991). Megalithic construction projects at Sechín Alto made it the largest of its kind during the late Initial Period (~1200 BC) (Pozorski and Pozorski, 1987). However, the Preceramic era came to an end in Peru around 2000 BC. Although pottery production in South America began by 3000 BC along the Ecuadorian coast, its adoption along the Peruvian northern desert coast did not occur until 1800 BC. Upon its incorporation into society, it would provide significant economic, ideological, and artistic meaning about different principal cultural groups within the region and throughout time (Klaus, 2008).

The Cupisnique (ca. 1600-650 BC)

Once the introduction of pottery arrived along the northern coast of Peru, a chain of cultural movements developed by forming unique artistic styles and religious traditions in the La Leche-Lambayeque-Jequetepeque-Chicama-Moche region (Elera, 1998). The significance of these developments would have a direct impact on later societies, including pre-Hispanic and Colonial communities. But the emergent culture to generate a paradigm shift in north coastal living began with the Cupisnique. Originally coined by Larco Hoyle (1941) as a particular pottery style, the term was used to classify ceramics from the Cupisnique Quebrada of the Chicama Valley into five different time phases, and applied later on to subsequent Moche culture in general. Found between the Chicama and Jequetepeque Valleys, these ceramics dated between 2000 and 1500 BC, or during the Initial period (Benson, 2012). With distinctive styles and iconographic elements, the adobe pottery depicted themes of animals, plants, and anthropomorphic entities possessing supernatural powers, in a compact manner, and at times inlaid with shell or stone (Benson, 2012). These representations, along with the use of geometric designs, stamping, and patterned burnishing on gray or black clay, became the Cupisnique signature art style (Shimada et al., 1998). Mythological themes often highlighted the role of an arachnid entity, shown holding a decapitated head while fertile plants thrived from dismembered body parts it discarded (Burger 1995, 1996). Ceramic wares included stirrup-spout and effigy bottles, steatite cylindrical cups, and shallow bowls of exceptional quality (Benson, 2012). The duration of Cupisnique style endured after the height of its culture, as evidenced by stylistic influence on Moche wares much

later on (Benson, 2012). Central themes such as the spider deity, jaguar, cayman, snake, and human figures, would also be predominantly featured in Moche ceramics, ultimately continuing the merging tenants of realism and fantasy introduced by the Cupisnique (Ayasta, 2006; Campana, 1995; Tellenbach, 1998).

In addition to ceramics, the Cupisnique culture also emphasized its paramount religious authority through design and construction of large-scale civic-ceremonial complexes resulting in distinctive architectural style (Klaus, 2008). Reflected amongst a series of *huaca* sites throughout the Moche, Jequetepeque, Zaña, and La Leche Valleys, stylistic features included low-tiered platforms, expansive stairways, forecourts, and ornate colonnades (Burger, 1995; Shimada, 1996). Alternatively, smaller structures incorporated U-shaped plazas, passageways for water drainage, and elaborate murals. An example capturing these architectural traits includes the site of Caballo Muerto in the Moche Valley. Excavated during the Chan Chan-Moche Valley Project, it consists of eight structures featuring comparable architectural characteristics of Huaca de los Reyes and depicting supernatural beings much like those at Chavín de Huantar (Benson, 2012).

Perhaps one of the most interesting ceremonial sites with fine architectural elements involves Kuntur Huasi in the Jequetepeque Valley. Highlighted by its fine architectural elements, sumptuary metallurgical and ceramic goods, this burial site exemplified high status Cupisnique social rank (Kato, 1993; Onuki, 1997). Additional evidence suggesting differences in Cupisnique social class specifically comes from its metallurgy production. Based on available samples of precious metal objects, Cupisnique goldsmiths possessed incredible talent as reflected in hammered gold and

silver objects portraying supernatural beings (Benson, 2012). Technological advancement associated with copper likely began around 1000 BC based on evidence found at Mina Perdida in the Lurín Valley (Benson, 2012). This tradition would be carried on later by Chavín and Moche cultures who produced remarkable works originating from highly skilled Cupisnique artists (Benson, 2012). Although it is not well understood why the Cupisnique culture fell into decline around 700 BC, some scholars hypothesize the environmental events of El Niño phenomena contributed to societal destabilization (Elera, 1998; Elera et al., 1992). Nevertheless, their significant contributions would leave a lasting impression for others to eventually inherent along the north coast of Peru.

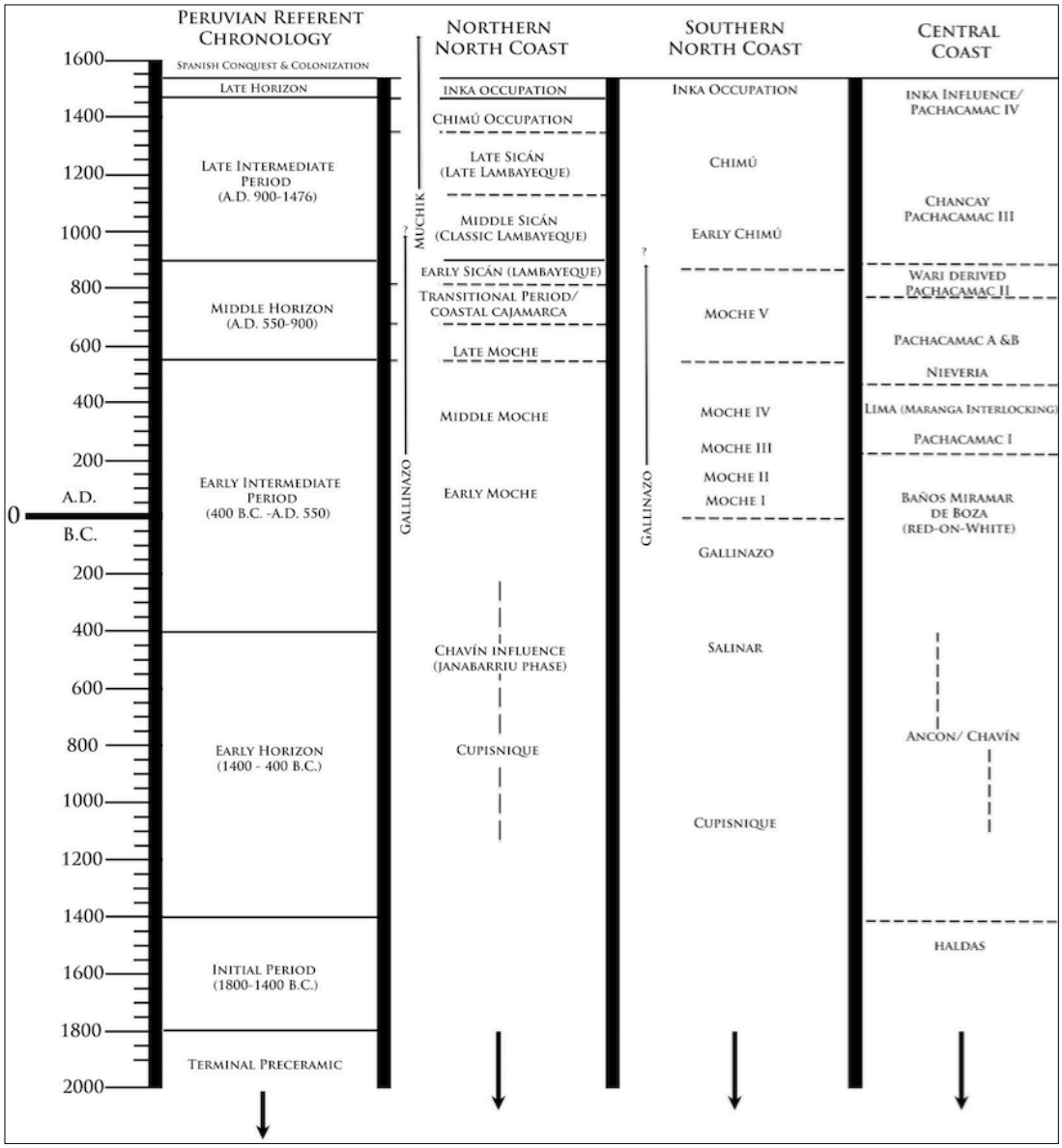

Fig. 6. Pre-Hispanic cultures of Peru. Image courtesy of Haagen Klaus.

The Salinar Culture (450-150 BC)

As Cupisnique culture waned, the Salinar culture rose to prominence within the Chicama-Moche-Virú-Valleys around 450 – 150 BC (Benson, 2012) by mimicking Cupisnique tendencies, while also expressing its own unique differences. Coined also by

Larco Hoyle (1944), Salinar was recognized as an adobe-mound producing society including sites such as Cerro Arena. Located on the southern ridge of the Moche Valley this complex consisted of 2,000 quarried stone structures with some consisting of at least 20 rooms (Brennan 1980; Mujica, 1984). Also as with the Cupisnique, the Salinar produced pottery incorporating similar themes, but as reddish, oxidized wares and using simpler forms of ceramic design (Klaus, 2008; Benson, 2012).

Despite rather limited studies of the Salinar-period in the Lambayeque Valley, evidence of population centers exist including fortified locations on the north coast (Willey 1953; Wilson 1988). One possible reason for this involves conflict with Cupisnique descendants in competition for valuable valley and coastal resources (Klaus, 2008). However, Salinar style would be overshadowed by another culture upon the middle of the first century BC: the Gallinazo.

The Gallinazo (ca. 150 BC – AD 100/500+)

First recognized by Bennett (1939) while excavating in the Virú Valley Project, the Gallinazo style was also associated with its own respective culture along the coast, but most notably in the central part of the Moche Valley (Benson, 2012; Millaire and Morlione, 2009). Preceded by Cupisnique occupation, Gallinazo sites featured monumental architectural structures and highly sophisticated irrigation systems suggesting the existence of an extensive urbanized populace (Benson, 2012). The stone-terraced complex of Cerro Sajino on the northern margin of the Pampa de Chaparrí backs this notion in which Raca Rumi canals supported La Leche drainage points (Klaus, 2008). Similarly, the U-shaped complex of Cerro La Calera, located two kilometers west

of Cerro Huaringa, served as a political and religious center for Gallinazo communities (Klaus, 2008). Measuring 49,000 m^2 and 20m high, this structure was likely the adobe platform mound of Huaca Letrada-Paradones (Shimada and Maguiña, 1994: 43-47).

In terms of ceramics, Gallinazo pottery production involved a combined process of applying a wax design to surfaces that burned off during firing, followed by painting of negative spaces (Benson, 2012). Subjects incorporated themes of warriors, felines, birds, sea life, and houses yet depicted them in a distinctive style (Benson, 2012). Although well established prior to Moche style, Gallinazo ceramic artistry left a profound influence on Moche craftsmanship, as found at a probable ceramic workshop at Batán Grande in the La Leche Valley (Shimada and Maguiña, 1994). Additionally, both Gallinazo and Moche styles appeared together at Pampa Grande later on with the Moche taking precedence (Shimada, 2001: 181-183, 198, 200). Such investigations, coupled with other observations of Gallinazo artistic style persisting during and after Moche times, suggests (1) a closer relationship between the two cultures existed, and; (2) Gallinazo did not abruptly end by the beginning of the Moche era (Evans, 1952; Wilson, 1988; Klaus, 2008). For instance, polychrome murals found at the Moche Huaca de la Luna reflect striking similarities to Gallinazo techniques (Uceda et al., 1994), while late Moche burials dating from AD 550 – 750 contained Moche and Gallinazo vessels (Ubbelohde-Doering, 1957; Donnan and Cock, 1997; Klaus, 2008). But perhaps the strongest evidence showing commonality between the two cultures involves samples of mitochondrial DNA analysis of Gallinazo individuals from Huancaco burials: no genetic distinction could be made between the two groups, revealing the two peoples were one in

the same (Shimada, 2004; Klaus, 2008). Nevertheless, despite their incorporation into Moche culture, facets of Gallinazo political, biological, and artistic contributions deserve exclusive distinction for two reasons (Klaus, 2008). First, they may provide additional clues into the origins of later Moche and Sicán civilizations. Second, they yield evidence of a correlation with earlier Cupisnique populations (Klaus, 2008). Therefore, a closer examination of Gallinazo life and culture warrants further study to improve the understanding of pre-Hispanic cultural patterns of north coastal populaces.

The Moche (AD 100-800/850)

Despite having notable predecessors and interacting with equally interesting contemporary cultures, no firm evidence confirms a single Moche place of "origin" (Benson, 2012). However, based on the five stylistic-chronological phases established by Larco Hoyle (1948), evidence of Moche culture at multiple coastal sites has been documented (Klaus, 2008). It is believed two separate polities formed in response to socioeconomic developments evolving from earlier Gallinazo social structures (Shimada, 1999; Klaus, 2008). They include the northern polity of the La Leche-Lambayeque Valley and the southern polity located in the Chicama-Moche region. Although some scholars would designate the unification of this dual polity in the late Moche IV (AD 450-550) as the creation of the first true Andean state, it would be more accurate to define it as a 'super-chiefdom' established along the northern Peruvian coast by the southern polity (Shimada, 1999; Klaus, 2008; Klaus et al., 2018). The reoccurrence of disruptive weather patterns, including disastrous droughts, floods, and landslides, would significantly impact political, religious, and social practices. As periods of chronic

drought waned and agricultural practices became more dependable, political transformations led to a more centralized form of Moche governance involving the dual polities (Moseley, 2001).

Early Moche History: The Northern Polity

The site providing some of the greatest insights into the norms, beliefs, and practices of dominant early Moche polity were centered at Huaca Rajada (Moche II-III, ca AD 200 – 400) near the town of Sipán in the Lambayeque Valley (Alva, 1994, 2001; Alva and Donnan, 1993). Consisting of two monumental adobe pyramids with a low platform, Huaca Rajada's earliest built structure dates to around AD 300, in which the Moche interred El *Señor de Sipán*, or their Lord of Sipán. Found intact and untouched by looters, this discovery yielded perhaps one of the most important archaeological discoveries in South America (Alva, 1994). Along with the lord himself, thirteen other tombs were discovered containing mummies inferred as closely related priest-politicians, warriors, and family members (Klaus, 2008). A plethora of gold jewelry and ornaments, 400+ ceremonial offerings, and several animals were found, making the richest unlooted burial scientifically documented in the New World (Klaus, 2008).

In the Upper Piura Valley of the Virú region, another early Moche polity existed likely consisting of select Moche artisans who produced unique, hybridized styles of metal and ceramic art (Shimada, 1994a: 75-77). Unfortunately, the combination of extensive looting and limited research leaves a great majority still unknown about the Moche and their presence in this particular area (Klaus, 2008). The same status holds true for other northern Moche polities, including the tomb of Moche I at La Mina

(Narvárez, 1994) and those at Dos Cabezas (Donnan, 2001, 2003). Despite not reaching as grand in scale to that of its neighbors, its status was still highly significant (Castillo and Donnan, 1994b; Klaus, 2008).

Later Moche History: The Southern Polity

At the heart of the Moche capital of Cerro Blanco or Huacas de Moche in the Moche Valley, the solidification of power was visibly evident from the cultural, political, and religious activities that flourished. In particular, two significant pyramidal structures stand out: Huaca del Sol and Huaca de la Luna. Serving as Moche political and religious centers, these multi-tiered structures displayed unquestionable power that only strengthened and solidified the prestige held by the city's rulers (Benson, 2012). By ca. AD 450, Huaca del Sol measured over 50 meters tall, consisted of more than 140 million mud bricks, and possessed four step-like sections, making it the largest solid-brick platform ever erected in the Americas (Benson, 2012). Built over centuries according to a widespread North Coast method introduced by Aldred Kroeber (1925, 1930), the labor efforts used to construct the massive monument were well organized as unique markings associated with specific teams designated their contribution to the project (Moseley, 2001). Using assigned teams to construct towers from adobe blocks, the structure would have risen in iterations, leaving earlier spaces to be filled by later crews (Campana 2000; Hastings and Moseley 1975; Meneses and Chero 1994, 249; Moseley 1975b; Shimada 1997; Benson, 2012). Similar to Gallinazo construction techniques, this segmented approach to Huaca assembly protected the structure from earthquakes but inevitably vulnerable to torrential El Niño rains and floods (Benson, 2012). The complex's purpose

likely served as an imperial palace and mausoleum for the heads of state (Moseley, 2001). Although its full excavation has yet to be finished, evidence of precious metals supports the notion it was a tomb for high-ranking individuals (Benson, 2012).

Similarly, the structural features of Huaca de la Luna encompassed interconnected platforms and richly decorated polychrome murals on its facades just like Huaca del Sol. However, this structure served more as a religious epicenter at Cerro Blanco in which human sacrifices were performed based on significant evidence uncovered at the outcrop and adjacent plazas (Bourget, 1998, 2016; Verano, 2008). Consisting of three platforms, four plazas, and measuring over 32 meters, the complex was built atop older buildings, making it more structurally sound (Benson, 2012). Additionally, iconographic depictions on its numerous walls included aggressive themes suggesting a hegemonic tendency in the southern Moche region (Strong and Evans, 1952; Wilson, 1988; Klaus, 2008). Painted images of mythical creatures such at the Human Decapitator along with other deities embodying anthropomorphic traits were depicted to frighten enemies and any beings refusing to appease them.

Moche Art and Craft Production

Originally, studies of multiple Moche polities involved combining them all together into a single style, thereby failing to recognize the diverse facets and dynamics of Moche culture (Klaus et al., 2018). However, the northern-southern Moche divide reveals an improved approach to understanding the complexity of Moche art and craft. To be precise, artistic material continues to yield valuable information about religion, social organization, and kingly power (Benson, 2012). For those studying Moche history,

several advantages may be derived from its art. First, despite an absence of a written language, the Moche employed a symbolic language in clay and metal to express highly complex concepts (Benson, 2012). Exercising exceptional creativity with few limitations to produce extraordinary work, Moche artists conveyed a prescribed symbolic language with greater naturalistic and spatial tendencies when compared to other pre-Hispanic Andean art (Benson, 2012). Second, the sheer abundance of arts and crafts, especially ceramics, makes it a reliable resource of study (Benson, 2012). Since wood and stone were scarce in the desert, clay ceramics easily endured dry climates while also serving as the principal art medium (Benson, 2012). However, differences between northern and southern Moche ceramics existed. The northern style often painted in negative images (Shimada, 1994b: 375), designed bottles with spout and bridge features, as well as loops at either side of long-necked globular bottles (Benson, 2012). Finally, the quality of Moche workmanship makes it one of the finest of all pre-Hispanic traditions as seen from the degree of skill required to produce master objects. Sophisticated ceramic firing techniques and color applications, coupled with extensive evidence of ceramic workshops and specialized shops, collectively reveal the Moche's priority of producing elite ceramics by a highly specialized artist class. In 1998, Uceda and Armas (1998, pp. 107-108) uncovered the remains of a man and woman associated with the production of ceramics at Huaca de la Luna. Buried in a ceramic workshop and covered with fine ceramics, this evidence strongly suggests the ceramists held elite status (Benson, 2012). Using mold technologies and hand modeling artisans incorporated sophisticated narratives detailing belief systems centered on fertility, death, and human sacrifice

(Benson, 1975; Bourget, 2006; Shimada, 1994). Such rich narratives in art form would only be surpassed by the ancient Greeks, but otherwise constitute the only other culture to generate incredible depictions of mythological and cosmological detail without a written language (Shimada, 2010).

In addition to ceramics, the Moche were renowned for the metallurgical work. Gold and coppersmiths primarily produced works for decorative, ceremonial, and symbolic purposes, as weapons and tools were not made of metal (Lechtman, 1993: 262). As evident from the tomb of the Lord of Sipán, gold headdresses, diadems, nose pieces, ear spools, pectorals, and bracelets all reveal the splendor of metalwork crafted by artists and coveted by looters. The fine lapidary and feather work produced by the Moche makes the intact treasure discovered at Huaca Rajada-Sipán even more spectacular. Elaborate examples of turquoise inlay, shell, beads, and gold once again emphasize the notion of Moche artists producing highly sophisticated workmanship.

Moche Unification and Eventual Collapse

Although centuries of dominance likely established a 'super-chiefdom' of unity along the northern coast by AD 450-550 (Shimada, 1999, pp. 495; Klaus, 2008), catastrophic El Niño-related events generated a series of political and social consequences that permanently damaged public faith in religious leaders and results in the collapse of the southern polity (Shimada et al., 1999; Klaus, 2008). Abandonment of Huaca del Sol and Huaca de La Luna, as well as a re-focus towards a new ideology at Galindo in the mid-Moche Valley, would help radically reshape social order by Moche V (AD 550 – 750) and create distance from the previous failed religion (Bawden, 1982,

1996, 2001, 2005; Klaus, 2008). This involved a new focus on urbanization and state-level organization at Pampa Grande, redistribution of the economy, specialization in production systems, as well an unprecedented complexity in sociopolitical dynamics (Shimada, 1976, 1994, 2001). Organizationally speaking, the structure of Moche social class consisted of a three-tiered vertical class rank where a small number of political and religious elite oversaw labor efforts at the construction of monuments (Klaus, 2008). Both artistic and architectural attributes at Pampa Grande reflect this class-based social structure (Shimada, 1994; Klaus, 2008). Definitions of iconographic depictions include themes of Moche leadership represented in a *curaca*, or elite lord, as part of a system that stratified sociopolitical relationships by rank and role (Moseley, 2001). Discovered burials also support this notion of discrete social classes (Donnan 1995; Milliare, 2002; Topic, 1982, Klaus, 2008). The existence of a middle class and opportunities for social upward mobility were most prevalent during Moche III-IV (Chapdelaine, 2001). Nevertheless, the efforts of elite lords to maintain hegemonic control over natural and human resources would come to an end by AD 700 – 700 because of internal conflict and additional El Niño disturbances (Shimada, 1994, pp. 248-252; Klaus, 2008). Some final pockets of Moche may have persisted as late as AD 850 (Uceda, 2010) but their eventual political decline concluded by this time.

The Sicán (ca. AD 850 – 1375)

Upon the collapse of the Moche at Pampa Grande circa AD 700/750, the Sicán culture rose to prominence and developed several ceremonial centers between AD 850/900 – 1100. Specifically referring to 'house' or 'temple of the moon' in the extinct

indigenous Muchik language, the term *Sicán* signifies the Batán Grande area. Its overarching coastal territory within the Lambayeque region included the Motupe, La Leche, Lambayeque, and Zaña valleys near the La Leche and Lambayeque Rivers. Its name also corresponds with three specific time periods encompassing post-Moche cultural developments: Early Sicán (AD 850 – 900), Middle Sicán (AD 900 – 1050/1100), and Late Sicán (AD 1100 – 1375) (Shimada, 1996). Although originally beginning as a small local polity, the Sicán achieved regional dominance throughout the north coast by establishing itself as an amalgamation of both local and foreign (regional) cultural influences (Shimada, 1996; Klaus, 2008). Its impact would reach as far as coastal Ecuador and south of modern day Lima to be regarded as "perhaps the most influential and dynamic tradition to emerge in the Andes…between two periods of empire building by the Huari of the central Peruvian highlands and the Inca" (Shimada, 1996).

Early Sicán

Little is known about this time period, beginning around AD 800/850 and lasting until AD 900 due to limited archaeological evidence. Of the material recovered, highly polished blackware ceramics reveal a similarity with Moche V pottery and suggesting a strong correlation to Moche culture (Shimada, 2000, pp. 52). At a minimum, the sharing and transmission of ideas did occur as archaeological research from various sites indicates the Sicán engaged in commercial trade with communities in present-day Ecuador, Colombia, and Chile. The signature production of black-finish ceramics featuring single spout, loop-handle bottles could have been traded for natural resources

such as emeralds and blue stone with trading partners. A common ceramic theme depicting an anthropomorphic-avian face draws a striking resemblance to that of the Sicán Deity of the Middle Sicán culture (Shimada, 2000, pp. 51). Collectively, the iconography featured in ceramic styles reflects a transformation in religious ideology and cosmology within the culture.

Middle Sicán

The emergence of the Middle Sicán period (AD 900-1100) marked a paradigm shift in cultural innovation in which a distinctive cultural identity emerged (Shimada, 2000). This cultural florescence, enabled by the decline of the Wari Empire and Middle Cajamarca polity, resulted in political and religious structures uniquely identifiable in multiple different areas: art and ideology, crafts and technology, funerary customs and monumental mounds, as well as long-distance trade and economy (Shimada, 1997, 2000). Within each of these respective areas, a centralized theme of religious ideology would materialize to illustrate the Sicán culture as a theocratic state (Shimada, 2000).

Art and Ideology

The representational style within artistic media including ceramics, metalwork and textiles focused on the iconographic depiction of the Sicán Deity (Shimada, 2000). Characterized as a mask face with upturned eyes, triangular nose, and stylized ears, this icon drew on motifs, conventions, and concepts from antecedent cultures, primarily Wari and Moche, to reinvent itself and strengthen the legitimacy of the new emergent Sicán religion (Shimada, 2000). These features in this new Sicán style established powerful

symbolic relationships with the sun, moon, and water (Shimada, 2000, pp. 52). Perhaps the most notable depiction of the Sicán Diety can be found on crescent-shaped *tumi* knives made of gold, or silver, and with embellished facial features (Shimada, 2000). An especially famous *tumi* originated from the looted Middle Sicán tomb at Huaca Las Ventanas at the site of Sicán, in which it serves as an ethnic representation of culture and history in modern day Peru.

Craft Production and Technology

As a result of the importance placed on ideological representations in art during the Middle Sicán, an equal emphasis would be placed on craft production and technology. A special focus on metallurgical technology exercised by expert craftsmen reveals the degree of organization and skill necessary to labor for raw materials, smelt metals, and produce highly sophisticated objects within a tightly integrated network of artisans (Shimada, 1985, 1998; Goldstein, 2007). Middle Sicán metalworkers devised methods designating the era in northern Peru the 'Bronze Age' (Shimada, 1996). Manipulating arsenical bronze to become stronger and more malleable, it demonstrated the superior quality of their work. They also generated sheet-metal technology from gold, silver and *tumbaga*, in which the copper content of the alloy would be altered through surface depletion to leave the impression of pure gold (Shimada, 1996). Since the production of sumptuary metal goods were more for ceremonial and funerary purposes, its significance embodied religious and cosmological meaning likely making the individuals responsible for their creation for an elite class (Klaus, 2008). According to Shimada and Merkel (1991, pp. 86), elites oversaw the manufacturing of precious

metal objects for funeral purposes while common laborers only possessed arsenical copper objects (Shimada, 2000, pp. 56).

Just like metalwork, ceramics often illustrated the Sicán Diety as well. Made with the use of molds, highly polished monochrome blackware became religiously prestigious, as it featured political and religious ideologies on vessels for cooking and storage, sculptures, and architectural ornaments (Shimada, 2000). Using paddle-and-anvil techniques to decorate pottery with geometric designs, fineware also possessed single or double-spouts (Cleland and Shimada, 1998, pp. 112).

Funerary Customs and Monumental Mounds

Based on investigations conducted at the Huaca Loro mound at the site of Sicán, by Izumi Shimada and the Sicán Archaeological Project (SAP), the Sicán society involved a highly rigid hierarchal structure in which a small, ethnically distinct noble class employed political, economic, and religious power over others to govern a theocratic state (Shimada et al., 2004). Evidence gathered from burials at Huaca Loro substantiates this notion of social stratification in four different ways. First, commoners interred in simple, shallow graves found on the peripheries of monuments contrasted drastically from the elite buried deep within shafted tombs inside Huaca Loro itself (Shimada, 2000; Shimada et al., 2005). Second, burial positions also served as a determinant of social status: commoners were buried in seated, extended, or flexed positions, while the elite were only buried seated (Shimada et al., 2004). Third, grouping and placement of bodies inside the elite tombs at Huaca Loro indicated social differentiation, where both East and West Tombs were designated for social and kinship

relationships (Shimada et al., 2004). Mitochondrial DNA analysis of women interred in the West Tomb revealed their relationship of kinship to the principal person, with women in the southern part of the tomb bearing a maternal link to one another (Shimada et al., 2004; Shimada et al., 2005). Alternatively, the women in the northern part of the West tomb neither exhibited a relationship with one another nor with the principal person (Shimada et al., 2004; Shimada et al., 2005). Finally, the quantity and quality of grave goods supports the notion of distinct levels of social status within the Sicán culture. Elite burials consisted of highly diverse goods of superior quality, including objects made with semi-precious stones, gold, silver, copper, feather, textiles and fine ceramics (Shimada, 2000, pp. 56). Alternatively, grave goods found within commoner burials included fewer items made from less valuable materials (Shimada, 2000, pp. 56).

With regards to the construction of the monument mounds such as Huaca Loro, considerable effort, planning, and resources went into its organization wielded by an authoritative class orchestrating operations. It serves as a reminder of how power possessed by the elite class, along with use of religious iconography, reinforced their relationship with the divine both during and after life (Shimada et al., 2004). Monuments of the Middle Sicán society consisted of two different kinds within the Lambayeque Valley. Low mounds with short central ramps provided immediate access to the top and represented a T-shaped structure (likely designated for public rituals), whereas taller mounds with zig-zagged ramps and steep sides provided better protection for elite burials within (Shimada, 2000, pp. 60; Shimada, Shinoda et al., 2004). Coordination of efforts to construct the mounds depended on the amalgamation of available materials and labor in a

concerted manner. The result would involve monumental structures completed in a relatively expedited fashion while reinforcing ownership of political and religious power in the process (Shimada, 2000).

Long-distance Trade and Economy

A diverse offering of grave goods found in elite tombs and made of exceptional quality also provides insight into the origin of such offerings. Materials such as exotic feathers, *spondylus* shells, emeralds, and other minerals came from parameters outside of Lambayeque and the La Leche Valleys. Spanning as far north as Colombia to perhaps the southern reaches of the Tiwanaku empire in the south-central Andes, the trade systems of the Middle Sicán consisted of nearly 1000 kilometers of well-established networks depended on beasts of burden for transport such as camelids (Shimada, 2000, pp. 59). Trade routes would have also provided unique opportunities to share concepts of identity related to Sicán religion and polity outside the region (Shimada, 2000, pp. 58). However, long-distance trade routes were also necessary to maintain economic power. Agricultural goods such as maize, cotton, beans, and raw metallic resources would have been traded and overseen by administrators of the elite class (Shimada, 1982, pp. 179). The demand for Sicán ceramics, metallurgy, and agricultural goods from trade partners would have also generated an increased need for expanded agricultural, smelting, and settlement operations (Hayashida, 2006, pp. 248-249). To oversee such growth and development, the elite class of the Middle Sicán would have exercised their cultural power and wealth to (1) control labor services and land allocation, (2) determine how access to access these resources would be acquired, (3) a govern the bureaucracy by

instituting a hierarchical centralized administration (Shimada, 2000, pp. 61; Klaus, 2008). Therefore, the economic growth and prosperity of the Middle Sicán not only occurred as a result of a cultural renaissance, but also drew and reinforced significant power for the elite class.

Late Sicán

Around AD 1050 and after only a few hundred years in power, the Middle Sicán state experienced a sudden political collapse. The onset of another El Niño episode initiated a severe drought lasting 30 years and causing social and political upheaval amongst the Sicán populace. Deep-rooted resentment by commoners directed towards the elite leadership manifested in various ways. For one, the general populace was comprised of ethnically Mochica individuals – descendants of the earlier Moche culture (Klaus, 2003, 2008). However, evidence from Mitochondrial DNA patterns suggests the elite of the Middle Sicán were closely related to northern Andean populations and likely migrated from coastal Ecuador into the Lambayeque Valley Complex sometime after AD 750 (Klaus, 2008, pp. 152). Bringing along with them their cultural and mortuary practices, this foreign entity would have worshipped and instituted its own ancestral cults and belief systems (Shimada et al., 2004). Direction to construct *huacas* for a foreign elite's deity, followed by catastrophic climatic conditions, likely resulted in the perceived failure of the elite priest-politicians to control forces of nature (Shimada, 2000, pp. 61). Since the elites were deemed mediators between commoners and the Sicán Diety, prolonged drought reflected an incapability to mediate nature for the Sicán people (Jennings, 2008). Furthermore, it would have triggered a violent revolt against the ruling

class, triggering the destruction and abandonment of Sicán. Although extensive research of the Late Sicán is still in need, further indications of the Sicán Deity incorporated into this time period vanished quite abruptly (Klaus, 2008). The establishment of a new capital city at Túcume, along with the return of political leadership to ethnic Mochica elites, would ultimately usher in a new era to follow the Sicán culture.

The Chimú Occupation (ca. AD 1375-1470)

The fracturing of political unity of the Sicán took a great toll on peoples, making matters worse with the continuation of repeated droughts over a period of 400 years by El Niño phenomena. Still, the Late Sicán era appeared to be relatively peaceful. Around AD 1375, an imperial polity emerged in the Moche Valley and began a process of military conquest of the north and central coasts of Peru. Better known as the Chimú, this culture would establish the largest pre-Hispanic coastal state in Andean history (Klaus, 2008). With its capital located at Chan Chan, the Chimú built its city measuring nearly 25 square kilometers and consisting of nine *Ciudadelas*, or monumental royal compounds organized along the lines of social hierarchy (Cavallaro, 1997; Klaus, 2008). These compounds consisted of walls measuring up to 10 meters tall, 650 meters long, covering 200,000 m^2 (Day, 1982) and serving multiple purposes including an elite residence for successive Chimú rulers, burial ground for their lineages, centralized storage location for goods, and administrative redistribution site (Parsons & Hastings, 1988). The unique nature of the U-shaped buildings at Chan Chan offered remarkable control of goods by preventing access to storerooms throughout the settlement (Parsons & Hastins, 1988). It also enabled the Chimú to establish an important hierarchal

structure. Other centers of power were acquired and incorporated into lower levels of Chimú government but none of them ever rivaled the importance of Chan Chan (Keatinge and Conrad, 1983). In the instance of Túcume, this co-opted administrative center with *audencias* was used to store and redistribute agricultural goods and other forms of tribute (Klaus, 2008) while also serving as a workshop for *Spondylus* crafts (Costin, 2016). Although found off the coast of present-day Ecuador, this highly valued shell played a vital role in the Chimú economy and deemed a luxury commodity. Used by the elite class in art, jewelry, and tools, this deep-water shell was associated with water and fertility, thereby often incorporated into ceremonies to thwart drought and other El Niño disasters (Pillsbury, 1996).

Within the Lambayeque Valley Complex, the demand for cultivable land was essential to meeting the needs of Chan Chan's growing population and fuel their political power. This meant allocating large quantities of agricultural resources to those labor resources responsible for production of artisanal crafts. Since the Chimú acquired the trade networks established by the Sicán, it is likely Sicán craftsmen and metalsmiths transferred their skills and traditions into Chimú craft production (Klaus, 2008). As a result, this enabled Chimú leaders to perform expansions of Chan Chan on three separate occasions (Klaus, 2008). Investigations from its architectural design and artifacts found at the site revealed evidence of craftsmen and technicians occupying the structures and engaging in metallurgical production, as well as textile weaving (Moseley, 2001). Political fortunes, wealth from precious metals, and expansion of irrigation networks created an ideal scenario for territorial expansion and land reclamation. Yet the rulers

and elite citizens at Chan Chan were not strictly focused on resources solely for the living. At one of the temple platforms, the remains of over 200 individuals (predominantly women) were excavated and deemed sacrificial victims accompanying the Chimú king into the afterlife. The combination of centrally managed hydraulic networks, hierarchal elites administering production of valuable craft, and *ciudadela* walls featuring Huari-inspired deities, all support the interpretation of the Chimú as a polity preoccupied with complex and large-scale operations permeating nearly every aspect of its society's political, economic, and religious practices. Even though such operations involved the production of craft such as ceramics and metallurgy, their fabrication was either for daily use or ceremonial purposes. Influenced by selective revival of Moche artistic conventions, ceramics often featured variations of black tones with themes of mythical characters, fruits, and animals. Metalwork pieces included hammered objects shaped into various forms, including jewelry, but almost always remained secular in nature (Klaus, 2008).

The Inka Occupation (ca. AD 1470-1532)

The conquest of the Chimú polity as part of the unstoppable process of Inka expansion initially began as a diplomatic approach in which local elite were offered goods and keeping their positions in exchange of submission (Ramírez, 1990; Klaus, 2008). However, Chimú lords refused to accepted their offers. Based on accounts documented by Cabello Balboa (Balboa, 1586 [1751]), the Chimú refusing to submit were fiercely defeated by Inka armies. This included King Chimú Capac, who was deposed around AD 1460 or 1470 by Topa Inca Yapanqui and forced to relinquish key

land-based sites located along the northern coast (Klaus, 2008). The result of such land seizure directly correlated to control of important production centers designated for hunting, fish, foresting, and mining (Ramírez, 1990, pp. 519-525; Klaus and Toyne, 2016). Despite conquering the Chimú, the highly organized and ingrained political and economic structures left behind made it particularly challenging for the Inka to transform (Ramírez, 1990, pp. 532; Klaus and Toyne, 2016). Furthermore, obstacles created by linguistic barriers, along with the distant centralized Inka operations in the highlands, resulted in little change of economic, political, or social systems (Klaus, 2008). For the region of Lambayeque, this would have involved ethnically Chimú elite administrators continuing their day-to-day operations of resources, but while paying allegiances to Inka authority (Klaus, 2008). Failure to obey would have resulted in imprisonment and deportation to Cuzco (Cabello Balboa (1586 [1751], pp. 331). As for the impacts on city centers and dwellings, a few hypotheses posit that they remained significant although assessments are mostly inferential. In the case of Túcume, the city continued to serve an important role in political and religious functions by symbolically converting the mountain site of Cerro La Raya into a revered monument dedicated to Inka sun worship (Heyerdahl et al., 1995; Klaus, 2008). A mummy bundle found within Huaca Larga was suggested as "the last Inca governor of Túcume who controlled the entire Lambayeque region" (Narváez, 1995a, pp. 96; Klaus, 2008), though this person's ethnic identity, geographic origin, or terminal late pre-Hispanic date are all suppositions by Heyerdahl and colleagues. Other data also supports the notion of both Inka and local society blending their traditions together. At Tambo Real in the La Leche Valley, local craft

workshops used for ceramics production revealed evidence of Cuzco Inka motifs on pottery but were fabricated with north coast technologies such as *paleteada* (Hayashida, 1998; Klaus, 2008), while recovered materials discovered at the Temple of the Sacred Stone included deposits of classical Inka figurines (Narváez, 1995b, pp. 107-111; Klaus, 2008). Collectively from this evidence, it becomes apparent how inhabitants of the Lambayeque Valley Complex maintained a standard of economic productivity and prosperity despite multiple imperial conquests since the Middle Sicán polity (Klaus, 2008).

ETHNOHISTORIC OVERVIEW OF SPANISH COLONIALISM IN THE LAMBAYEQUE VALLEY COMPLEX

Although the existence of the Inka Empire would have a lasting mark on history's perception of Peruvian indigenous cultures, the arrival of Europeans would fundamentally transform the continent in ways that represented a rupture with 14 millennia of prehistoric cultures and lifeways. Specifically, the impacts of Spanish colonization would generate systematic changes affecting the social organization, political economy, and religion of indigenous societies. An overview of such drastic change on Peruvian society will first provide the reader with a broad contextual understanding of this particular time in history, followed by a more nuanced portrayal of colonial life of indigenous peoples in the Lambayeque region. Ultimately, a critical look at ethnohistoric accounts will reveal how sole dependence on such sources in the study Peruvian history produces highly flawed and biased perspectives. Furthermore, these insights will reveal why archaeological methods, especially from bioarchaeology, provide

an alternative approach yielding more accurate, empirical evidence to interpret human behavior. Therefore, this chapter's purpose in reviewing ethnohistoric documentation is essential to not only caution the reader of ethnocentric ideas and concepts (Ramirez, 1996, pp. 152) but to also engage in a more constructive and factual narrative derived from original emic meanings (Klaus, 2008).

THE TRANSFORMATION: FROM FIRST SPANISH CONTACT TO COLONIAL DOMINATION

While Pizzaro is often attributed the infamy of initiating "contact" with the Inka, it was really European pathogens that constituted as the first contact between indigenous habitants and Spaniards. Diseases such as smallpox ravaged the Andes during the 1520s, as it was transmitted along trade routes beginning in Panama and contributed to the deaths of hundreds of thousands, if not millions (Cook, 1992). The arrival of Francisco Pizarro and his men along the western South American border in December of 1530 culiminated in a violent confrontation with Inka forces at Cajamarca two years later and initiated a series of events that would drastically change power dynamics within the region. This included toppling the city of Cuzco, consolidating the port city of Lima, and isolating Inka forces to a small area known as Vilacamba until its fall in 1572 (Klaus, 2008). Despite the sweeping Spanish action, a highly unstructured and disorganized takeover by conquistadors created significant internal conflict and chaos (Adrien, 1991; Klaus, 2008). Simultaneously, economic agendas that exploited natural and human resources produced the *encomienda* system, whereby colonial authorities instituted tax collection to fund a military presence in the region and indoctrinate the Catholic Church

as the state religion (Klaus, 2008). Although native powers strove to resist the hegemonic policies and practices of Spanish colonial forces, they were incapable of effectively defeating them. Inability to thwart European plans and resist their diseases made life in early Colonial Peru for native peoples extremely difficult. Resettlement of indigenous communities into centrally controlled Spanish-administrative districts, also known as *repartimientos*, forced millions of native Andeans to live under an oppressive political and economic system that solely served and supported the Spanish monarchy (O'Phelan Godoy, 1997: 14; Klaus, 2008). Further Spanish upheaval ensued by forcing native peoples to purchase goods on credit from Spanish merchants in Lima (Burkholder and Johnson, 1998: 87; Klaus, 2008). Even though these tactics for control were brutal, they, along with indigenous slave labor, were ineffective in achieving complete dominance. Therefore, Spanish officials implemented a *mita* system, in which a grand scale compulsory labor structure would force labor and production of goods. However, such reforms were flawed from the beginning, as powers within the colonial state ran rampant with corruption and were constantly challenged by indigenous insurrections (Klaus, 2008). An insatiable appetite for silver deposits created a demand for mining, yet this natural resource was already heavily depleted by the 1600s resulting in lower tax revenues and increasing socioeconomic stress and discord (Andrien, 2001; 64; Klaus, 2008). Continuation of horrific labor practices in the mines, coupled with crooked Spanish officials, made it impossible for any Spanish reforms to take hold even through the early 19th century. Ultimately, resistance movements would prevail and lead Peru to independence between 1808 and 1825 (Klaus, 2008).

Demography, Social Organization, and Settlement Patterns in Colonial Peru

The impacts of colonialism on Peruvian society presented a stark contrast to life prior to Spanish arrival. Complex and continually evolving, its impacts were reflected in three different aspects of society: demography, social organization, and settlement patterns (Klaus, 2008).

Although limited resources accurately count the population sizes of indigenous inhabitants prior to the arrival of the Spanish, Cook roughly estimates an indigenous population between 5.5 and 9.4 million people in 1520 (Cook, 1981, pp. 114; Klaus, 2008). However, the emergence of Old World epidemic diseases immediately after this time saw a drastic reduction in the populace by approximately 93 percent or 610,000 individuals (Cook, 1981, pp. 114). With smallpox and measles considered the most rampant diseases afflicting the native population, maladies including tuberculosis, influenza, bubonic plague and other illnesses were also transmitted from European sources (Cook and Lovell, 1992; Klaus, 2008). Other factors contributing to the decline in population involved forced migration and flight. Brutal working conditions and social strife resulted in outcomes of high mortality rates (Cook, 1981, pp. 239-242; Klaus, 2008). Nevertheless the significant drop in the indigenous population was countered by an influx in European inhabitants, as well as *mestizo* populations (Klaus, 2008). By the eighteenth century, Andean populations began to rebound after significant losses from epidemics during the 1690s to 1730s (Cook, 1981).

Colonial Peru consisted of five different vertically ranked social classes strictly delineated by economic and racial status. At the apex was the urban elite consisting of

powerful Europeans playing powerful, active roles as bureaucrats, clergymen, and businessmen (Klaus, 2008). Wealth, influence, family and other social connections determined membership into this class (Burkholder and Johnson, 1998, pp. 171-172). Recognized either as Spanish born or of Spanish-descent, these societal members instituted and maintained a capitalist economy originating from a European feudal system (Crow, 1992, pp. 255; Klaus, 2008). Although representative of a truly small group within Colonial society, their affluence afforded them no shortage of bounty in their lifestyles. Simultaneously, the rural elite, also comprised of Europeans, represented the other component of the privileged class by gaining power and wealth in ranching and farming (Klaus, 2008). Subordinate to the urban elite, this class easily wielded their authority to drive down costs by exploiting labor resources and using debt peonage (Klaus, 2008).

The middle or third class in colonial Peru consisted of *mestizos* or the descendants of Spanish-Andean unions (Klaus, 2008). Harsh discriminatory laws forced them to adopt Spanish culture, religion, and language, resulting in their eventual assimilation by the 18th century and employing them into roles as skilled laborers, artisans, and mid-level bureaucrats (Burkholder and Johnson, 1998, pp. 204-207). In certain circumstances, *mestizo* unions were sought after by Spaniards so they could access the political and economic resources of high-ranking Andean women and their lineages and thus improve opportunities to manipulate labor and fiscal systems (Spalding, 1991; Klaus, 2008).

The largest class within society during this time involved the indigenous poor. They were often the most exposed and vulnerable to epidemics and impoverishment, and

this resulted in dire inequality and severe destitution at best. Their movement from rural to urban areas often drew them into roles as low-wage laborers and engagement in illicit practices such as prostitution and theft (Burkholder and Johnson, 1998, pp. 179). Despite the abject poverty and human suffering caused by the construct of the *indio* under Spanish corporate rule, native populations retained elements of pre-Hispanic culture (Klaus, 2008, 2013). Aggressive measures including different laws, rights, tax, and labor obligations were integral to stripping ethnic identities and deconstructing traditional ways of life ultimately resulting in non-existent political and economic autonomy still experienced throughout much of Latin America to this day (Stern, 1982; Klaus, 2008). An additional intersectional layer of discrimination targeted indigenous women, since colonial Peru was a male-dominated society (Silverblatt, 1987). As primary producers of textiles and household goods, native women endured significant burdens from taxation (Silverblatt, 1987, pp. 129) and were viewed as inferior by powerful ecumenical forces within the Catholic Church (Klaus, 2008).

The fifth and final class involved African slaves brought to Peru in order to fill labor shortages, as in some places indigenous labor pools were no longer viable to maintain colonial power structures (Klaus, 2008). Thus the principles of ethnogenesis formulated by Spanish colonists not only involved actively dismantling the ethnic identities of pre-Hispanic peoples within Peru, but also dehumanized individuals from an entirely different continent to bolster their proto-capitalist system throughout Latin America.

In regard to organizational settlement, Colonial Peru reproduced European patterns of urban living, in which city centers consisting of plazas, religious and political institutions all contributed to the powerful representation and influence of the urban elite (Klaus, 2008). Entire towns and cities were based on the "orderly" concept of grid lines. The closer in proximity to the center of town that featured the centers of both secular and religious authority, the more highly ranked the neighborhoods (Klaus, 2008). Racial segregation added another boundary demarcating the different layers of stratification within this highly rigid social order (Klaus, 2008). Although multiple urban sites existed at the time, the majority of Peru consisted of rural estates structured as *haciendas*, with wealthy landowners overseeing the activities of land occupants. Simultaneously, rural settlements consisting of hundreds of indigenous inhabitants dwelled on parcels better known as *reducciónes* (MacCormack, 1991; Saignes, 1991; Klaus, 2008).

The Economy of Colonial Peru

The economic motivations for colonizing Peru were multifaceted and stemmed from short-term and long-term goals: Spaniards sought to become wealthy quickly and expand market economies (Wolf, 1982; Klaus, 2008). The establishment of *encomiendas*, or forced labor systems upon indigenous inhabitants to generate mercantile production, enabled Spanish colonists to earn profits from livestock and crops, mining, and textile mills (Andrien, 2001, pp. 77). However, the system failed because native Andeans, who were expected to buy from these same markets, endured exorbitant taxation and inhumane labor conditions, thus making it impossible to produce sufficient supply to meet European demand (Davies, 1984; Klaus, 2008). Nevertheless, exploitive

measures made it inevitable for Andeans to remain dependent on colonial economies and impossible to become economically independent (Stern, 1982). Toledan policies instituted and reinforced structural relationships in which low wages for seasonal work became protection from *mita* obligations (Klaus, 2008). Since low wages made workers incapable of generating sufficient funds to satisfy legal obligations to Spanish employers, crippling debt became a common economic outcome for many indigenous peoples (Andrien, 2001, pp. 87; Klaus, 2008).

As time evolved, the economic roles of Andeans in market economies began to change with more direct involvement from laborers and consumers (Klaus, 2008). The 17th century saw greater diversification and self-sufficiency of native Peruvians, primarily due to a decline in silver prices, the boom and bust of the sugar industry, and the vagaries of transatlantic trade (Klaus, 2008). Yet, colonial pressures from Bourban Reforms, along with natural disasters, political volatility, and effects of new epidemics, made economic exploitation of Andeans a mainstay through the 19th century (Andrien, 2001, pp. 9; Klaus, 2008).

Spanish Catholicism in Colonial Peru

The Roman Catholic Church held a central role in the colonial Latin America, permeating all aspects of daily life as the key institution responsible for the acculturation and assimilation of indigenous peoples (Burkholder and Johnson, 1998, pp. 92; Klaus, 2008). While government bureaucracies imposed political and economic policies under the Spanish crown, the Church was a major accomplice in achieving these objectives but with an agenda focused on supposed spiritual and moral salvation. Specifically, the

Catholic Church sought to impose Western beliefs and evangelize local populaces in order to "educate" local peoples on proper social and political ideals, while ensuring Catholic religious supremacy in the region (Klaus, 2008). A variety of methods were used to execute such spiritual missions, placing the Church in a unique position to both wield its power while simultaneously becoming very wealthy in the process.

One such method involved protesting *encomiendas* by offering symbolic sanctuary from secular labor (Crow, 1992, pp. 207). Although early missions held no authority to prohibit labor tributes, the Church exploited natives by making it appear inherently at odds with the state in order to gain followers and convert them (Crow 1992, pp. 207; Klaus, 2008). Its efforts resulted in the assimilation of many indigenous peoples seeking refuge from the Spanish Crown, which was of course bureaucratically and financially thoroughly intertwined with the Catholic Church (Klaus, 2008).

Another method of forced indoctrination of Catholicism in the Andes involved the systematic destruction of any cultural goods, artifacts, and heritage associated with indigenous religious practices. Such measures involved multiple phases of the so-called "extirpation of idolatries" that over several decades searched villages, destroyed shrines, desecrated ancestral mummies, and eliminated *huacas* affiliated with any pre-Hispanic culture (Klaus, 2008). Failure by societal members to comply with such dogmas involved a spectrum of different punishments reflecting many of the same practices exercised during the Spanish Inquisition (Klaus, 2008). Depending on the severity of the transgression committed, punishments ranged from public humiliation, lashings, imprisonment, and death (Andrien, 2001, pp. 175). Although strong proponents

advocated for these detection-punishment-education practices, they became highly unpopular since such campaigns were violent, disruptive, oppressive and ultimately a ineffective strategy (MacCormack, 1991)).

The final resort taken in evangelization emerged after several extirpation campaigns failed under since Spanish contact. The hybridization of indigenous cultural and religious precepts with traditional tenants of Catholicism yielded a Catholic-Andean religious fusion, in which Andean religion played a subordinate but not obliterated role (Griffiths 1996, pp. 7; Klaus, 2008). According to Griffiths (1996, pp. 7), a range of configurations occurred with colonial Andean Christianity especially of a "nepanlistic" nature where the involved individual or group could not return to a disfigured past nor fully assimilate into the present (Klaus, 2008). The most frequent outcomes experienced by Andeans included (1) incomplete conversion, with misinterpretation of Christianity, (2) overt conversion but without full understanding despite participation, and finally (3) complete conversion with full belief and understanding of Christianity (Klor de Alva, 1991). However, the interplay between Andean traditions and Catholicism involved dynamic results involving an accommodation of beliefs rather than simplistic fusion (Griffiths, 1996, pp. 16; Klaus, 2008). Substituting European for indigenous practices served as a means to preserve Andean beliefs and traditions by grafting new meanings onto preexisting frameworks (Griffiths, 1996, pp. 16; Klaus, 2008). Using clandestine tactics, native value systems were incorporated into configurations of European religious order resulting in the convergence of ideologies, if not the survival of Andean ideologies .

COLONIALISM IN THE LAMBAYEQUE VALLEY COMPLEX

Although located far from the principle Peruvian political and economic colonial centers of Lima and Cuzco, the Lambayeque Valley gained formal attention of Spanish conquistadors beginning when Pizarro passed through the townships of Olmos, Motupe, Jayanca, Túcume, Llampeyec (Lambayeque), and Zaña in 1532 (Mendoza, 1978, pp. 178-179; Klaus, 2008). Shortly after in 1534, Trujillo became the administrative center for the north coast, in which land grants or *encomiendas* divided the Lambayeque region (Klaus, 2008). Details describing colonial life in the Lambayeque region are scant at best since an official chronicler was never appointed to the north coast, thus resulting in limited ethnohistoric documentation (Ramirez, 1996). In comparison to the southern highlands, available information demonstrates unique historical, linguistic, social, and ethnic characteristics of the north coast, however such interpretations cannot be made *a priori* (Klaus, 2008). Therefore, an individual assessment of these different facets of the colonial north coast (revealed from demographic, sociopolitical, economic, anti-resistance, and religious evidence) is not only necessary but also highly worthwhile (Klaus, 2008).

Demographic Trends in the Lambayeque Valley

Just as for Peru overall, depopulation due to disease played a major role in Colonial population structures and densities on the north coast. Lambayeque saw significant losses, but the narrow and circumscribed river valleys to the north and south suffered far worse, as those settings provided ideal conditions for the introduction and spread of disease (Cook, 1981, pp. 143; Klaus, 2008). Accounts dating from 1546

describe outbreaks of typhus and plague, along with subsequent epidemics of measles and smallpox between 1558 and 1561 (Cook, 1981, pp. 135-136; Klaus, 2008). Even though epidemics were key contributing factors, internal civil conflicts preceding the arrival of Pizzaro affected the populaces of Jayanca and Túcume to some degree (Cabello Balboa, 1586 [1951]; Klaus, 2008). Details describing the extent to which this affected population numbers remains unclear since interpretation of such historical events are ambiguous and unreliable (Klaus, 2008). However, migration was known to contribute significantly to disproportionate ratios of adult males into Colonial townships such as Chiclayo, Chuspocallana, and Reque for labor needs in vineyards, plantations, and orchards (Klaus, 2008). Since *mita* labor requirements were still in effect, many men relocated in order to escape tributary demands (Klaus, 2008). Nevertheless, coastal communities with greater economic stability and potential experienced less depopulation (Cook, 1981, pp. 131-132; Klaus, 2008).

Change in the Sociopolitical Landscape of the Lambayeque Valley

Royal visits to the Lambayeque frontier were uncommon since the region often fell outside of the general focus of the Spanish Crown, especially in the early days of colonization (Klaus, 2008). As a result, sociopolitical changes did not immediately affect native Muchik activities, such as traditional agricultural practices upon conquest because similar practices of tribute payment had long taken place under the guise of a foreign authority (e.g., ethnic Sicán, Chimú, Inka) (Klaus, 2008). As more Spaniards populated the region, extraction of native labor also increased, making native tributaries equivalent to 'free' native labor (Klaus, 2008). This took a toll on the Muchik populace and by

about 1580 or 1590, a full-blown rupture was underway. One way this manifested was the significantly altered role of the traditional socioeconomic institution of the *curaca* who once filled the role as the principal lord but now became a tributary labor collector and culture broker (Klaus, 2008). Individuals in this capacity held power over the fates of native peoples and gained significant power derived from the number of subjects he controlled, making people a determinant of wealth rather than land or material goods (Klaus, 2008).

Prior to Spanish conquest, pre-Hispanic institutions of *curaca* lordships were founded on the principle of the *parcialidad*, or corporate groups constructed on the basis of kinship and economic specialization (Klaus, 2008). One of the most significant projects resulting from *parcialidades* included irrigation systems. The *curaca* was never allowed authority to rule alone, but rather as a dualistic, cooperative system with lesser lords who structured communal labor forces and the redistribution of goods (Ramírez, 1996, pp. 21-22; Klaus, 2008). Furthermore, an agreement between the *curaca* and citizens provided a system of checks and balances to ensure lords carried out their duties responsibly. Those who failed to uphold their obligatory communal duties experienced punitive recourses of legal rebellion and murder at the hands of their citizens (Ramírez, 1996; Rostworowski, 1961; Klaus, 2008). This communal dynamic completely changed in postcontact Lambayeque. *Curacas* who chose not to pledge their allegiance to Spanish authority endured the punishment of removal, torture, or death. Work objectives transformed with the sole objective of benefitting the colonial administration instead of the community (Klaus, 2008). As a result, native inhabitants sought refuge from tributary

demands that were impossible to meet. In an effort to entice communal members to join their respective *parcialidad*, competition grew between *curacas* in order to grow labor resources and power (Klaus, 2008). The new relationship, dictated by Spanish tenants of market economy and labor exploitation, broke the cooperative dynamics between *curacas* and native peoples. As inhabitants could no longer trust *curacas*, their ability to engage in rebellion or carry out reprisals against their leadership became improbable due to protection by Spanish forces (Ramírez, 1996, pp. 46; Klaus, 2008). Ultimately, the end result involved a watershed moment for indigenous livelihood: "The result of the transformation of the *curaca* in Lambayeque was nothing less than the collapse of the indigenous system of socioeconomic reciprocity and well-being" (Klaus, 2008, pp. 318).

Economic Restructuring and Resettlement

In a linked fashion, negative consequences unfolded for indigenous inhabitants upon the implementation of European economic practices such as agribusiness, labor, and land tenure, including displacement, poverty, and high mortality (Klaus, 2008). Programs aimed at resettling native peoples involved consolidating villages into larger settlements, while stripping away communities of their farm-rich ancestral territories. Better known as *reducciónes*, the first established instance in the Lambayeque Valley was in 1534, well before it became "official" Spanish colonial policy (Mendoza, 1985; Klaus, 2008). Consisting primarily of Muchik farmers, Spaniards forced people to relocate and cultivate crops on nutrient deficient lands or floodplains, making survival nearly impossible (Klaus, 2008). Spanish authorities confiscated more native territories from indigenous polities so as cattle ranching and the cultivation of sugar cane became

prevalent economic activities in the region. The outcome resulted in dire environmental and social effects, with the appropriation of irrigation sources to sustain cane fields (Ramírez, 1996, pp. 74; Klaus, 2008) and the importation of African slaves to toil in its production. Muchik peoples supplemented labor pools on *haciendas* or canal projects in their construction and repair (Ramírez, 1974, pp. 18; Klaus, 2008). Eventually, sugar estates dominated the local economy as the demand for sugar surged until the early 1700s, when the industry collapsed due to high production costs and crop destruction during devastating El Niño events in 1720 and 1728 (Klaus, 2008). Unable to recoup their losses, many *haciendas* fell into bankruptcy whereby local elites lost their status and sold to new owners who diversified their businesses with the cultivation of other cash crops (Klaus, 2008).

Resistance of Colonial Spanish Authority in the Lambayeque Valley

Although resistance amongst populaces of Lambayeque did occur, they differed from the movements often associated with the south-central Andes that were more violent or millenarian in nature (Klaus, 2008). Since Chimú and Inka rulers dominated the Lambayeque region prior to Spanish contact had preconditioned local communities such that local peoples were more accustomed to foreign political economies and the demand for high tributaries (Klaus, 2008). However, this is not to say pre-Hispanic peoples willingly embraced hegemonic practices by colonial powers. Instead resistance was often channeled and directed towards *curacas* who broke ties of reciprocity with their subjects. For example, Xancoll Chumbi, the lord of Sinto, along with the lord Chalcochima were all murdered by their outraged citizenry (Figuera and Idrogo 2004, pp. 65; Klaus, 2008).

Ultimately, non-violent forms of resistance remained the predominant method of choice whereby tributary resources were hidden from collection, resulting in less consumable products for Spanish profit (Klaus, 2008).

Religion in Colonial Lambayeque

An understanding of religious practices in colonial Lambayeque remains unclear and incomplete due to a lack of records. Of the little that is known, a series of Catholic churches were constructed under the guise of the Franciscan order as early as 1536 in the townships of Mórrope and Pacora, followed by the construction of much larger churches including Santa Lucia in Ferreñafe (1552) and Nuestra Señora de Collique in Chiclayo (1559) (Klaus, 2008). The establishment of Catholic institutions signifying a presence in the region which likely prohibited the practice of other religions. Despite infrequent examples of religious oppression in ethnohistoric records, a few detailed anecdotes demonstrate how Spanish authorities insisted on religious allegiance and admonished any measures of resistance (Klaus, 2008). For instance, according to passages in *Ordenanzas de Jayanca* from 1566, Gregorio Gonzales de Cuenca prohibited the practice of indigenous religion while maligning the character of his native practitioners (Figueroa and Idrogo, 2004, pp. 117-118). Another account in 1732 described a formal complaint capturing the unequal power dynamic between the Dominican friar Félix de Moncada and his parishioners of Santa María Magdelena de Cao in the Chicama Valley, where indigenous community members were forced into slave labor to harvest his sugar plantation, graze his goats, and divert community water sources for purely personal uses (Andrien, 2001, pp. 186). Local lore describe more horrific practices of terrorizing local

communities with dramatic reenactments of purgatory and marauding demons (priests in masks rampaging through local communities such as Túcume on horseback at night) so that people would convert to Christianity (Heyerdahl, 1995, pp. 212-213; Klaus, 2008). Yet other vignettes portray further complex entanglements with Christianity, such as the miraculous appearance of the Christ child in 1649 in the *reducción* of Eten, followed by apparitions of the patroness of the city, Mary Magdalene. Overall, these different stories provide a wide range of interpretations that help support an understanding of colonial life from a bioarchaeological lens.

CONCLUSION

The north coast of Peru experienced some of the most dynamic representations of pre-Hispanic cultures known to the continent of South America and spanning over 14,000 years. Constantly evolving, transforming, and adapting its social, political, and economically dimensions, the cultures collectively produced innovative and resourceful solutions to major obstacles including never-ending, extreme environmental conditions. The pinnacle for such remarkable achievements occurred during the Middle Sicán period, in which the culture flourished and significantly influenced other civilizations that would later follow. The amalgamation of Gallinazo, Moche, Sicán, and Chimú traditions is far from fully understood, but they formed some of the most distinct and recognizable representations of the Lambayeque Valley Complex that still exist to this day.

A portrait of Peru under colonial Spanish rule reveals the drastic transformation its society underwent by leaving no aspect of its civilizations or cultures untouched. Even upon first contact, devastating consequences resulted from a lack of immunity to

Old World pathogens and decimated indigenous populations. Increased presence of Spanish colonial authority throughout Peru, including the Lambayeque Valley, escalated over time to affect all facets of life, including social organization, political economy, and religious ideologies. Socially, a highly rigid and discriminatory hierarchal structure instituted by European elites dominated all other classes including rural landowners, mestizo groups, indigenous poor, and African slaves. Their motivation for greater wealth and influence resulted in the establishment of a European capitalist economic model and involved forced labor systems of brutal oppression in mining, farming, and textile industries. Under these economic parameters, Andean dependence of colonial markets added another layer of exploitation reinforced by low wage labor and indebted relationships with Spanish employers. Furthermore, the seizure of valuable native lands for European agribusinesses overturned traditional communal structures of labor practices and the redistribution of goods. Religiously, compulsory indoctrination and evangelization of native groups in the Catholic Church suppressed traditional indigenous religious practices while mandating Christian ideologies to affirm European standards as "morally superior".

These hegemonic practices generated an incredible force of Spanish tyranny on indigenous peoples, yet resistance movements occurred and varied in response. Spanish colonizers were met with violent reactions in the south-central Andes, however movements in the Lambayeque Valley region involved a more passive approach, since peoples in the area had already been well conditioned by the practices and ideologies of foreign groups. In withholding resources and challenging the authority of *curacas*, local

cultures exercised their own dissent by effectively targeting market supplies essential for Spanish gain. Despite these efforts, the pressures of Spanish colonialism would ultimately overpower the pre-Hispanic peoples remaining and fundamentally alter their way of life in the Andes.

For these reasons, bioarchaeology plays a critical role in the study of pre-Hispanic cultures. Overwhelming bias, inaccuracies, and falsehoods about indigenous groups documented in ethnohistoric sources fail to capture and describe the multiple facets contributing to native beliefs and practices. Moreover, the intentionality and purpose behind specific behaviors can neither be fully understood nor appreciated without emic meaning. Therefore, the bioarchaeological interpretation of Andean societies provides a narrative of people otherwise excluded from historical sources and accurately validates their untold experiences.

CHAPTER 5

MATERIALS AND METHODS

The preceding chapters in this thesis established the relevant theoretical, archaeological, bioarchaeological, and ethnohistoric contexts for this study. In this chapter, the materials and methods used to test the three research hypotheses presented in Chapter 1 are presented. Here, an overview of the skeletal samples used in this thesis is presented, followed by a description of methods used in statistical and paleoepidemiological approach used to compare and contrast prevalence patterns of cranial modification over time in the Lambayeque Valley Complex.

Materials

The skeletal materials used in this study include a collection of remains excavated from multiple mortuary sites throughout the Lambayeque Valley Complex on the north coast of Peru. A total of 1,691 individuals from 28 different archaeological sites were examined in this study. To determine whether the recorded individuals were applicable for this study, a review of skeletal completeness was performed. A total of 768 individuals were immediately eliminated due to the absence of individual crania and/or significant fragmentation. The remaining 923 individuals were assessed for the presence or absence of cranial modification, along with the directionality of observed modification

(or bias). The following description of archaeological sites excavated from 2001 to 2019 provides useful contextual information regarding the locations, social contexts, and other details, especially in multiple instances where burials originated from multiple timeframes from a single site.

Table 2. Skeletal Sample Information by Archaeological Site

Site	N	N Observable	Time Period
Huaca Ventarrón-Arenal	94	22	1,3,4,5
Huaca Collud	20	9	1,4
Zarpán	52	22	1,3,4
Morro de Eten	1	1	1
Sipán	22	2	2
Úcupe	21	8	5
Huaca Santa Rosa	23	2	3
Pampa Grande	20	9	3
La Inmaculada	5	1	3
El Triunfo	12	3	3,4
Huaca Loro	42	32	4
Huaca Sontillo	1	1	4
Huaca Rodillona	3	2	4
Huaca Las Ventanas	76	21	4
Matrix 101	155	43	4
Huaca Sialupe	13	4	4
Illimo	23	5	4
Cerro Cerrillos	31	26	4
Cascajales	5	1	5
Olmos	66	61	4
La Pava	29	17	4,5
Chotuna	34	25	6
Chornancap	61	27	5
La Caleta de San José (CSJ)	23	7	5
Jotoro	42	28	4,5,6,7
Chapel of San Pedro de Mórrope (CSPM)	329	255	7,8
Church of Santa María de Magdalena de Eten (CSMME)	235	121	8
Chapel of the Niño Serranito (CNS)	253	168	7
Total	**1691**	**923**	

Time Periods: 1=Formative/Cupisnique; 2=Middle Moche; 3=Late Moche; 4=Middle/Late Sicán; 5=Chimú; 6=Inka; 7=Early-to-Mid Colonial; 8=Mid-to-Late Colonial

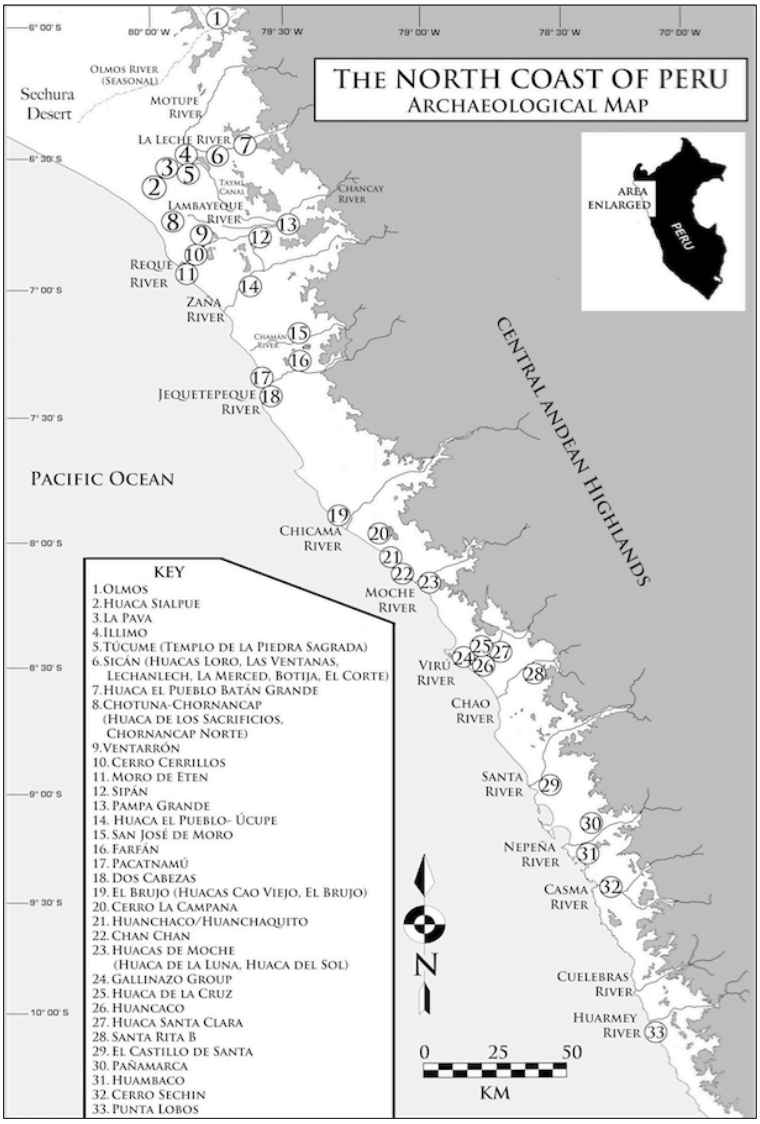

Fig. 7. Archaeological sites on the north coast of Peru. Image courtesy of Haagen Klaus.

ARCHAEOLOGICAL CONTEXTS

Formative/Cupisnique Period

As a companion to the pre-Hispanic huacas of the lower Reque drainage within the Lambayeque Valley Complex, the remnants of Huaca Ventarrón is one of the largest and earliest examples of monumental architecture in the region (Alva Meneses, 2012). Within the central complex itself is the archaeological site of Arenal. Excavations conducted by Ignacio Alva Meneses beginning in 2007 revealed construction of the mound took place over various phases, beginning around 2300 BC with the Temple of the Fish during the Late Preceramic era (Alva Meneses, 2012). Around 2000 BC the second phase involved construction of the Red-White Temple. Additions included staircases and accommodated later expansions such as the Green Temple dating around 1800 BC (Alva Meneses, 2012). As the center of emergent social and ritual complexity in the Lambayeque region, it would ultimately be abandoned not long after 1800 BC due to El Niño phenomena (Alva Meneses, 2012). Although funerary contexts were not documented at Ventarrón between 2300 – 1800 BC, burials were found in and around the abandoned huacas (Alva Meneses, 2012). According to Millaire (2015), the "sacred nature of ruins" phenomenon likely made it a desirable landscape for ancestral groups to reinforce their claims to identity, political legitimacy, territory, and cosmology (Alva Meneses, 2012). Additionally, skeletons found at Ventarrón indicate a diverse series of burial contexts linking them to multiple time periods, including the Middle-to-Late Sicán and Chimú eras, as well as serving as a diachronic representation of social complexity since the Cupisnique period (Alva Meneses, 2012). The area encompassing the hillside

along the temple at Ventarrón involves a series of monumental buildings extending approximately 30 ha and with a three-tiered slope. Known as Arenal, this series of structures corresponds to the same time sequence of Ventarrón based on technologies used to construct this most extensive ceremonial center in the region (Alva Meneses, 2012). In 2007, excavations at the site revealed the site was used as a necropolis during the Formative Period based on visual reference and its ancestral ties (Alva Meneses, 2012). Despite extensive damage due to looting, remains of intrusive tombs were recorded and consisted of rectangular chambers of stone slabs (Alva Meneses, 2012). Evidence of Late Moche burials indicates the site was reused after the temple's abandonment earlier. For this study, 94 skeletons were collected from Ventarrón-Arenal in which 22 individuals were scored for cranial modification.

Shortly after Ventarrón's abandonment, additional construction took place at Collud where the twin huacas of Collud and Zarpán were erected. Due to their close proximity to one another, Ventarrón, Arenal, Collud and Zarpán make up the Ventarrón Archaeological Complex. Designed and executed by Cupisnique peoples, Huaca Collud consisted of a three-tiered monument platform measuring 140m x 70 x and 7 m tall (Alva Meneses, 2012). It featured cosmological symbols and different creatures on polychrome murals in Cupisnique style along with elaborate staircases (Alva Meneses, 2012, pp. 195-199). Huaca Collud produced 20 skeletons applied to this study, with 9 suitable for cranial modification scoring and originating collectively from the Cupisinique and Mid-to-Late Sicán periods. Located east of Collud stands Zarpán, a sprawling compound cover 24 ha and featuring a stone-slab exterior dating from the Formative era (Alva

Meneses, 2012). Its main structure, measuring 50m long and 2.5 m tall, reflects some degree of Chavín influence due to references of the water cult (Alva Meneses, 2012). From this site, 52 skeletons were used in this study, in which 22 were scored for cranial modification.

Discovered in 1978 by Carlos Elera, the Cupisnique archaeological site of Morro de Eten lies on the southern margin of the Reque drainage. Featuring a small mountaintop temple complex and cemetery zone, the site sits at the edge of the Pacific Ocean. Dating from 1,000 to 650 BC, this site was contemporaneous with the Cupisnique burials at Huaca Ventarrón. Erosion of temple floors since 2001 exposed skeletal remains of multiple individuals, whose location, demographic profile, and mode of decomposition reflected sacrifices later in time, suggesting some of the earliest known victims of violent ritual killing on the north coast (Klaus, 2014). Although multiple skeletons were found at this site, only one was used and scored for scored for cranial modification in this study.

Moche

In 1987, an incredible archaeological discovery was made involving 16 elite Early and Middle Moche tombs at Huaca Rajada, Sipán located in the mid-Reque drainage in the Lambayeque River Valley Complex. The significance of the tomb led to a new understanding of burial for the highest echelon of Moche society, especially in how the royalty of the Moche were interred over time (Alva, 2001). This high-status monumental funerary platform is considered by far one of the most important archaeological discoveries in South America, as the main tomb containing the Lord of Sipán was found

intact and untouched by grave robbers. Consisting of two large, eroded pyramidal structures of adobe and a third, lower and smaller funerary platform, the adobe graves involved three complex tombs. Interred in Tomb I, the Lord of Sipán held considerable power during the Moche reign. The large funerary chamber in Tomb 1 provided sufficient space to accommodate eight other individuals, including three adult males, three adult females, one child, and one adult female beside the child. Collectively, the arranged space with individuals surrounding the principle person, along with the number of retainers emphasizes, his status as part of the upper hierarchy of Moche Society (Alva, 2001). Additionally, the principal ornaments related to the rank of this interred individual in its original context provided insight into the use of social, ritual, and military symbols of power (Alva, 2001). Among them were the first every recovered Moche gold and silver scepter in an archaeological context (Alva, 2001). Additionally, an array of highly valuable grave goods including gold necklaces, crescent headdresses, and backflaps adorned the Lord of Sipán, without a doubt explicitly his rank in Moche society. Tomb 2 contained the remains of an individual, likely a priest, who also originated from the same era as Tomb 1. Although also abundant in grave goods, the quality of Tomb 2's contents did not possess the same degree of quality as found in Tomb 1 (Alva, 2001). Evidence from Tomb 3 revealed that its construction comprised the oldest portion of the funerary platform, possibly four or fiver generations prior to the Lord of Sipán in Tomb 1 (Alva, 2001). Simpler and smaller in context, the remains interred here belonged to the Old Lord of Sipán, who was enveloped in reed mats and textiles rather than coffins as found in Tomb 1 and 2. From the placement of several

valuable ornaments upon this individual, including gold necklaces and backflaps, a communicated symbols of power, rank, and identity that endured for generations (Alva, 2001). Additional tombs with individuals and grave goods did not exhibit the same degree of elaborate offerings or funerary treatment, however were deemed important based on their proximity to Tombs 1, 2, and 3. According to Alva, the interments of these individuals indicated the supreme political and religious authority they wielded during their time (2001). Furthermore, the evidence provided from the tombs enabled archaeologists to confirm that the behaviors illustrated on iconographic depictions from Moche ceramic vessels actually occurred (Alva, 2001). As a result, the findings from this discovery provide an unprecedented understanding of the highest social class in Moche society. Of the 22 individuals recovered from Sipán, two were scored for cranial modification in this study.

The site of Úcupe consists of multiple archaeological excavations dating to various pre-Hispanic time periods in the provincial Zaña Valley (Klaus, 2008). As an administrative center, this location featured an architectural complex known as Huaca El Pueblo de Úcupe. Inside the truncated adobe platform mound contained the tomb chamber of an elite individual named Lord of Úcupe, originally dating from the Middle Moche period (Bourget, 2014; Klaus et al., 2018). Buried with funerary masks, diadems, and other metal finery, these contents and aspects of the tomb's organization closely resembled the burial practices at Sipán (Bourget, 2014; Klaus et al., 2018). Alongside, a few dozen contemporaneous Moche commoners were also excavated (Klaus et al., 2018). In a separate investigation, rescue operations in 1996 directed by Carlos Wester of the

Brüning Museum recovered multiple Chimú burials presumably of Muchik peoples (Klaus, 2008). Disturbed by modern looting and construction, the graves contained multiple individuals dating from AD 1350 to 1470 and interred in ethnic Moche and Chimú burial positions, suggesting purposeful communication and differentiation of the two ethnicities (Klaus, 2008). Of the 21 individuals recovered, 8 were scored for cranial modification.

Investigated in 1991 as part of a major Middle/Late Moche site under the Archaeological Project of Sicán, Huaca Santa Rosa covers over 25 ha of terrain and corresponds to three different sectors of cultural activities based on archaeological evidence (Bracamonte Lévano, 2015). Located to the north of Sipán, Sector I features three large connected pyramids, platforms, and plains, while Sectors II and III consist of multiple mounds to the west. Data corresponding to ceremonial architectural assemblages suggests the unique spaces at Huaca Santa Rosa were made of material used by different groups between AD 300 – 650 (Bracamonte Lévano, 2015). Perhaps most important related to this site involves information about mechanisms which caused the collapse of the Muchik culture and emergence of the Lambayeque state (Bracamonte Lévano, 2015). Ceramic styles fusing local and foreign traditions serve as tangible evidence that complex changes in local cultural phenomena occurred at Huaca Santa Rosa (Bracamonte Lévano, 2015). A series of tombs containing ceramics, coupled with architectural context, were identified as typical funerary patterns associated with the Late Intermediate period. Burials associated with this timeframe included the remains of children exhibiting malnutrition as well as sharp force trauma. However, additional

tombs dating from the Chimú occupation indicates Huaca Santa Rosa remained inhabited after the fall of the Moche (Bracamonte Lévano, 2015). Some evidence suggests the site itself may have been a companion or subordinate center of power to Sipán. Of the 23 individuals documented at Huaca Santa Rosa, two were scored for cranial modification in this study.

Located 54 km inland from the Pacific Ocean, the archaeological site of Pampa Grande served as a major regional capital during the Late Moche period (AD 600 – 750) in which it occupied an urban area of more than 400 ha and housed 22 different huacas, including the largest known as Huaca Grande (Shimada, 2010). Excavations beginning in 1973 and led by professionals for the Royal Ontario Museum Project, including Izumi Shimada, revealed two classes of structures: elite huacas and common household dwellings. Due to the substantial quantity of reliable data from this archaeological site, Shimada was able to reconstruct a model of pre-Hispanic urbanism as well as the sociocultural and economic environment in which the site was built and abandoned (1994). Despite limited presence of skeletal remains documented at Pampa Grande, individuals found were typically located inside domestic complexes or workshops. In total, 20 individuals were used for this study, with nine scored for cranial modification.

Additional archaeological sites associated with the Late Moche period include La Inmaculada and El Triunfo. Currently under investigation by Walter Alva and the Museo Tumbas Reales de Sipán, burials at these two locations appear to share common qualities including that the remains pertained to Late Moche commoners. Five documented

skeletons at La Inmaculada yielded only one cranium scored for cranial modification, while three crania out of a total of 12 were scored from El Triunfo in this study.

Middle and Late Sicán

Located at the capital (religious-funerary precinct) of Sicán in the mid-La Leche Valley, an archaeological site consisting of monumental mounds stands dating from the Middle Sicán period. As one of the six principle mounds, the site of Huaca Loro contributed to a truncated adobe pyramidal structure built sometime between 950 and 1050 BC and measuring 80 x 80 x 35 m high (Shimada, 2000; Shimada et al., 2004). Its location at the capital made it a dedicated temple for ancestral cult worship and ritual site for water and fertility ceremonies. A series of still-ongoing investigations at the site began with the initiation of the Sicán Archaeological Project in 1978 under the direction of Izumi Shimada. Excavations conducted between 1991 and 1996 resulted in the study of two elite Middle Sicán tombs designated as the East and West Tombs at Huaca Loro (Shimada et al., 2004). Their significance is considerable due to the undisturbed state in which they were found, allowing for considerable understanding of mortuary analysis *in situ*. For these elite members, burials consisted of deep shaft tombs dug at least 5 meters below the surface with arsenical-copper tools (Shimada et al., 2004). Several individuals were interred within the structure but centrally organized around a principal male and accompanied by 1.5 tons of diverse grave goods including ceramics, textiles, arsenical-copper objects, as well as numerous gold objects such as jewelry and accessories. In addition to the prominent men, women, and adolescents buried inside the huaca, an elite cemetery under and around the mound contained the remains of more elite individuals

within a complex two-tiered nested structure. They too were buried with a variety of grave goods indicating membership of a high social class. Excavations adjacent to the East Tomb yielded additional burials commoners. Shimada et al. (2004) hypothesized and confirmed that proximity to the Huaca Loro temple determined social status among the deceased, with those buried closest belonged to a higher social status. In total, 42 skeletons from this site were used for this study, with 32 scored for cranial modification.

Although monuments such as Huaca Loro served as a key site to unify the community in the religious city of Sicán, other monuments contributed pyramidal mounds. Huaca Sontillo and Huaca Rodillona share similar architectural styles to that of Huaca Loro, however evidence suggests that different elite lineages from the Middle Sicán fashioned their own cemeteries here (Shimada et al., 2004). Both investigated as part of the Sicán Archaeological Project, test and salvage excavations in 2003 revealed Huaca Sontillo contained both elite and non-elite burials but was significantly damaged due to looting. Simultaneously, Huaca Rodillona, (a.k.a. Huaca Lercanlech) stood as the largest of the pyramids at Sicán measuring 100 m x 100 m x 40 m in height and was built sometime between AD 1000 and 1100. Consisting of a two-level T-shaped platform, it possessed a restricted access area suggesting the structure was used for more exclusive elite activities (Shimada, 1982). Consisting primarily of common burials, work in 2019 discovered the first presumptive elite burial at the site. For this study, one skeleton from Huaca Sontillo was scored for cranial modification, while two of three skeletons discovered at Huaca Rodillona were suitable for head shaping analysis.

Huaca Las Ventanas is yet another of the six principle monuments contributing to the truncated pyramid at the capital of Sicán. As in the case of the other huacas, both excavations and ground-penetrating radar indicated it was originally intended for use as a planned cemetery with shaft tombs, but additions were applied later on (Farnum, 2002). Excavations conducted between 1991 and 1992 revealed Las Ventanas to be different in funerary context from other huacas, as placement of remains and tomb layout suggested a different lineage or contributing corporate group (Farnum, 2002). Individuals found within the tomb were buried with grave goods such as blackware ceramics, *tumbaga* sheet metal, camelid bones, assorted beads, while the interior surface of the tomb was lined with painted cotton cloth (Shimada, 2000). For this study, 76 skeletons were included in the sample, with a total of 21 scored for cranial modification.

The late Middle Sicán archaeological site of Matrix 101 originates from a unique series of human sacrifice events in response to a catastrophic El Niño event beginning sometime around AD 1020 (Klaus et al., 2016). Sicán political and religious leadership came to an abrupt halt after severe drought and torrential rains caused local populaces to revolt against Sicán elites who lived comfortably at the expense of local labor, well-being, and resources (Klaus et al., 2016). In 2011, leading archaeologists from the Museo Nacional Sicán discovered an anomaly located at the center of the Great Plaza between the Huaca Las Ventanas and Huaca Loro, in which a multi-tiered, inverted cone structure dating from the Late Middle Sicán period (Klaus et al., 2016). Upon extensive investigation, the remains of other individuals were discovered but only a few exhibited signs of violence such as throat-slitting, bludgeoning, impalement. Several individuals

may have been entombed alive. Predominately comprised of adult males, paleopathological evaluation of diet, oral health, and lifestyle of the individuals indicates their membership in the elite social strata, suggesting that the ethnic elite of Sicán sacrificed their own during an unprecedented mega-El Niño event resulting in the demise of the Middle Sicán polity and religion (Klaus et al., 2016). Of the 155 most complete skeletons documented at this site, 43 could be scored for cranial modification.

The archaeological site of Huaca Sialupe also originates from the Middle Sicán era and is noteworthy for the pottery workshop discovered 25 km southwest of the capital of Sicán in the lower La Leche valley excavated between 1999 and 2001 (Shimada et al., 2004). Extensive research performed by the Sicán Archaeological Project revealed lumps of clay and unfired sherds from this location corresponding with ceramic objects used by the elite at Sicán at Huaca Loro (Klaus, 2003). Adjacent to the workshop were features of a relatively small cemetery containing both primary and secondary burials. Discoveries made at Huaca Sialupe made it one of the best-documented cases of intentional alteration of burials (Shimada et al., 2015). Interest in this site stems from the small cemetery contiguous to the workshop and the inferred Muchik ethnicity of the interred individuals (Klaus, 2003; Shimada et al., 2015). Of the 13 skeletons used for this study, 4 were deemed suitable for cranial modification scoring.

Located approximately 5 km west of Sicán lies the site of Illimo. This Middle Sicán satellite center also possessed a small pyramidal mound better known as Huaca Pintada or the painted temple. Rescue operations performed by the National Brüning Archaeology and Ethnology Museum recovered a series of Middle Sicán burials dating

from AD 900 to 1100, including that of an elite individual named "The Warrior of Illimo," who along with several others, was buried in a cemetery identified as traditionally Muchik based on funerary elaborations (Klaus, 2008). Stylistic evidence derived from burial masks, tumi knives, beaded necklaces, and gilded earspools suggest possible resistance to Middle Sicán ideology and icons, while simultaneously conveying strong ethnic ties to Mochic identity and heritage (Klaus, 2008). However, generally speaking, the burials at Illimo suggest cultural cohesion via death rituals, such as representations of the Sicán Diety, to promote social integration of the living and dead on a symbolic level (Klaus et al., 2004; Klaus, 2008). In total, 23 skeletons from Illimo were applied to this study, in which five were scored for cranial modification.

Sitting at the far southern margin of the Lambayeque Valley Complex and atop the Reque drainage is the site of Cerro Cerrillos. In 2002, rescue excavations under the direction of Jorge Centurión of the Brüning Museum uncovered a U-shaped temple comprised of two platforms and the remains of several individuals who endured violent mutilation and human sacrifice, including throat-slitting, semi-decapitation, and chest opening (Klaus, 2008; Klaus et al., 2010). According to Klaus et al., (2004b) the lack of politically-charged Middle Sicán symbolism associated with the individuals dating from AD 900 to 1100, suggests the site functioned under the agency of local Muchik peoples rather than members of the Sicán elite. Exhibited traits of Muchik mortuary tradition with simple, shroud-wrappings used to carefully bury the victims reinforced this notion (Klaus, 2008; Klaus et al., 2010). Analysis of pathological conditions (e.g., linear enamel hypoplasia, porotic hyperostosis, periostitis, dental caries, and antemortem tooth loss)

collected from the sacrificed individuals aligned with social experiences of commoner Muchik rather than elite Sicán social groups (Klaus et al., 2004b, 2010; Klaus, 2008). Of the 31 skeletons from Cerro Cerrillos applied to this study, 26 were scored for cranial modification.

The archaeological site of Cascajales refers to another Late Sicán center in which rescue excavations in 2005 yielded the presence of several Late Sicán burials dating from AD 900 to 1470 (Klaus, 2008; 2012). Included were the remains of a decapitated individual who, along with others, was buried in Muchik-style dating to the Late Sicán era. From this site, five skeletons were applied to this study, with only one scored for cranial modification.

In 2013, the discovery of an ancient cemetery during a public works project resulted in emergency excavations carried out at Olmos. Dating from the Middle Sicán period and located along the far northern reaches of the Lambayeque Valley, skeletons from the cemetery were found beside Huaca Juliana, which once housed a major pyramid complex. Although displaying traits associated with common burial patterns of local Muchik inhabitants, the individuals buried at Olmos appeared to represent the healthiest group of people ever documented in the prehistory of the coastal northwestern Lambayeque region (Klaus, 2015). The location of Olmos provided unique advantages to its inhabitants such as greater precipitation benefiting agriculture, as well as some degree of isolation, ultimately affording essential protection from epidemiological outbreaks during colonial periods (Klaus, 2015). Limited evidence of the Sicán Deity and culture associated with the burials suggests the Muchik peoples of this area lived relatively

independent from the oppressive direct rule connected to the Middle Sicán economy and political structure, resulting in less observable biological and social stress (Klaus, 2015). A total lack of skeletal trauma associated with activities such as raiding or warfare indicated relatively stable economic and social conditions at Olmos, ultimately providing a distinct portrayal of pre-Hispanic living during the Middle Sicán era. Of the 66 individuals documented from the burials, 61 were scored for cranial modification.

The site of La Pava is another example of a major secondary center in the ancient city of Túcume, in which construction of the moment began during the Middle Sicán period and continued well into the Chimú occupation (AD 900 – 1470). As in many other instances, the burials here suggest individuals were mid-status commoners of Muchik ethnic identity and biocultural origins. Of the 29 skeletons documented for this study, 17 were scored for cranial modification.

Fig. 8. Results of cradle board use. (a) Pronounced occipital flattening, Cerro Cerrillos Burial 15. **(b)** Pronounced mid-sagittal depression, La Pava Burial 14. Photos courtesy of S. Scholes.

Chimú and Inka Periods

Belonging to one of the largest monumental satellite centers responsible for political and religious activities during the Middle Sicán, the Chotuna-Chornancap Archaeological Complex in the Lambayeque Valley continued to operate well after the Late Sicán dynastic period, and during the foreign imperial reigns of the Chimú and Inka. Evidence of residential and production sites associated with this local Muchik ethnic group parallel the rise of the Moche polity (AD 100 – 800) (Turner et al., 2013). However, excavations conducted from 2008 to 2011 under the direction of Carlos Wester and Fausto Saldaña, indicate it was also a known location for violent human sacrifice (Klaus et al., 2016). Rituals performed during the Inka occupation (AD 1470 – 1532)

were especially significant because of the multiple sub-adult and adult female victims found, making it unprecedented for its local, regional, and diachronic patterns of sacrifice (Turner et al., 2013, Klaus et al. 2016). Analysis of the physical remains suggests the victims were commoners due to evidence of frequent childhood metabolic stress and poor oral (Klaus et al., 2016). However additional details concerning why these individuals were chosen remains unknown since no evidence readily provides pre-sacrifice ritual program explanations (Turner et al, 2013). Of the 61 individuals found at Chornancap, 27 were scored for cranial modification. Simultaneously at Chotuna, 34 skeletons were documented with 25 scored for head shaping.

Fig. 9 Chornancap Burial 61 Principle Personage, artificial cranial modification, right lateral view. Photo courtesy of Haagen Klaus.

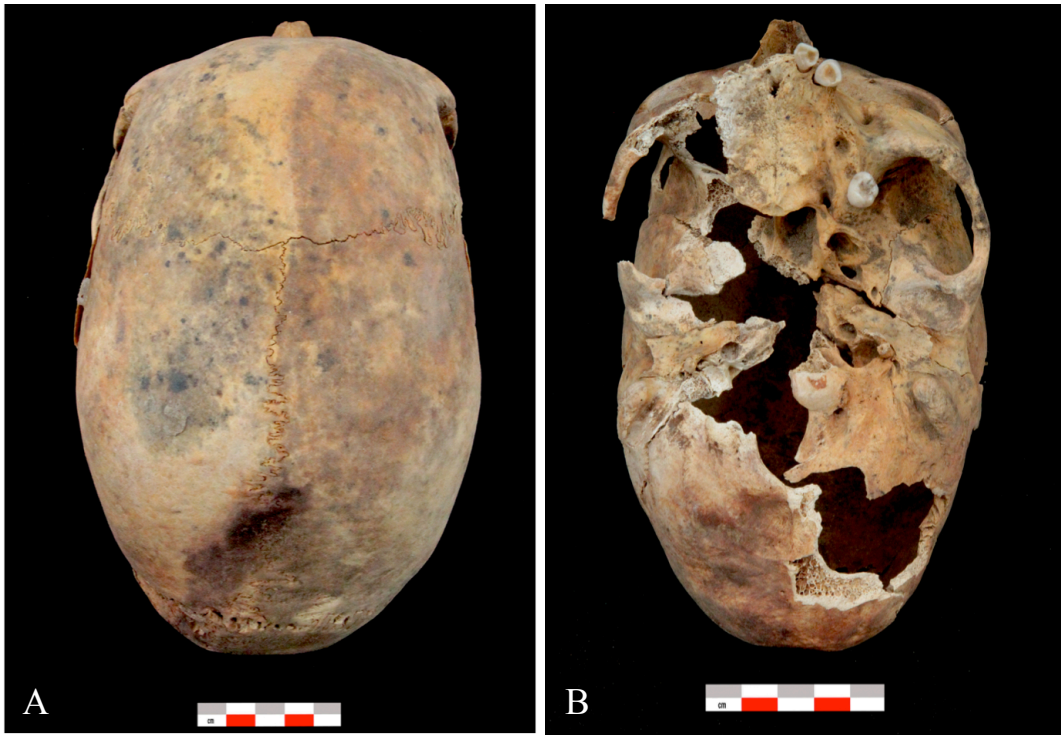

Fig. 10 Chornancap Burial 61 Principle Personage, artificial cranial modification. **(a)** Superior view. **(b)** Inferior view. Photos courtesy of Haagen Klaus.

Although known as a modern-day fishing village located near the mouth of the Lambayeque River, the site of La Caleta de San José (CSJ) extends far back to the Moche period. In 1998, emergency excavations conducted by the Museo Brüning uncovered a cemetery containing Chimú burials dating from AD 1350-1470 (Klaus, 2008). Burial patterns at the graves exhibited ethnically Muchik rituals at the site, along with unmistakably Chimú ceramics (Klaus, 2008; Klaus et al., 2016). Alongside numerous grave goods in some of the burials, *Spondylus* shell and *crisoles* were found, indicating important individuals were buried here (Klaus, 2008). Of the 23 skeletons from this site, seven were scored for cranial modification.

The site of Jotoro is another example of an archaeological site once home to a community of Chimú and Inka inhabitants who lived on the northern edge of the Poma Forest adjacent to Jotoro Mountain. Additionally, a cemetery found at the site contained burials of mid-status individuals and commoners dating from AD 900 to 1532, with many showing ethnically Muchik traits during the Chimú and Inka time periods. Of the several tombs discovered, many featured a unique "boot-shape" associated with burials styles from southern Ecuador. Of the 42 skeletons documented for this study, 28 were scored for cranial modification.

Early-Mid and Late Colonial Periods

The town of Mórrope is located 30 km northwest from the modern city of Lambayeque and sits at the edge of the Sechura desert. Not long after the Spanish invasion in the 1530s, the Chapel of San Pedro de Mórrope was founded as a mission church along a well-established pre-Hispanic route that also held significance for the Spanish Crown due to its far-reaching links between Piura, Trujillo, and Lima (Klaus, 2008). With this development, the colonial town of Mórrope was founded and experienced exponential population growth (Klaus, 2008). Dynamics between traditional Muchik peoples and Spanish priests resulted in a series of repressive measures against local populaces. In 2005, Haagen Klaus and Manuel Tam sought to address the impact of these measures by establishing the Lambayeque Valley Biohistory Project and interpreting mortuary patterns from Mórrope burials (Klaus, 2008). Skeletal remains originating from the Chapel of San Pedro de Mórrope revealed interments spanning the

Early/Middle Colonial and Middle/Late Colonial periods (AD 1536 – 1750), in which 329 individuals were used in this study and 255 were scored for cranial modification.

Another series of archaeological sites with Colonial affiliation were found at the settlement of Eten, located in the southwest corner of the Lambayeque region and at the mouth of the Reque river. The unique environment of Eten made its location ideal for living from marine-rich coastlines as well as lagoon microenvironments found more inland (Klaus and Alvarez-Caleron, 2017). A local cultural sequence that spans Preceramic to Chimú occupations also make it a particularly interesting area of study. Efforts made by German ethnologist Hans Heinrich Brüning in the late 19th century to capture local oral traditions details the town's Muchik name as Ätim or "the first light of dawn" (Klaus, 2008). Upon contact with a Franciscan missionary during the early Colonial era, the site gained an ecclesiastical presence and resulted in the construction of a mission *ramada*-style church (Klaus and Alvarez-Caleron, 2017). Ätim was renamed Santa María de Magdalena de Eten and a larger church was later built to accommodate the growing population, known as Church of Santa María de Magdalena de Eten (CSMME). The church gained popularity due to apparitions of the Christ Child in the 1640s, making it a pilgrimage to this day (Klaus and Alvarez-Calderon, 2017). Folklore claims the church's abandonment sometime between 1740 and 1760 was due to a tsunami, however unstoppable sand dunes forced resettlement of the populace, taking with them the original structures that were rebuilt elsewhere (Klaus and Alvarez-Calderon, 2017). Another story of the Christ Child appearing and saving a distressed Spanish vessel off the coast in 1776 resulted in commemoration of the event with the

construction the Chapel of the Niño Serranito (CNS) (Klaus and Alvarez-Calderon, 2017). Although archaeological excavations at the site recovered a mortuary sample from the Late Colonial/Republican era, a series of stratigraphic and architectural evidence revealed an earlier church existed underneath CNS and was none other than the first mission church of Eten from the Early Colonial era (Klaus and Alvarez-Calderon, 2017). Along with remnants of CSMME and CNS, excavations conducted between 2009 and 2011 resulted in the documentation of 253 burials. However, several assemblages of remains including isolated bones, commingled and disturbed contexts suggested several hundred people were buried in the reused cemetery space (Klaus and Alvarez-Calderon, 2017). Absence of pre-Hispanic burials elsewhere in Eten indicated the colonial cemeteries were placed on previously unoccupied ground (Klaus and Alvarez-Calderon, 2017). Of the 235 skeletons recorded at CSMME, 121 crania were scored for cranial modification. Simultaneously, 253 skeletons were recorded at CNS and 168 were scored for cranial modification.

Methods

Age and Sex Estimations

Osteological age and sex estimations are often one of the most fundamental cornerstones to bioanthropological of past human populations and are key variables to trace patterns of stress, fertility, mortality, and human migration in relationship to health, lifestyle, and history (Storey, 1992, pp. 137; also, McCaa, 2002).

Estimation of biological sex is an essential element in skeletal analysis in order to evaluate the distribution of a disease or condition as it may vary meaningfully among people of biological males/female sex and cultural constructions of gender. Although skeletal sexual dimorphism in modern humans permits potential assignation of sex, sex estimation in archaeological contexts enables exploration of associations between sex and cultural or other skeletal variables (Nikita & Michopoulou, 2017). Biological sex estimation, including a spectrum of morphologically dimorphic characteristics of the adult *os coxae* and cranium, were the principle features used to establish sex using the scoring criteria of Buikstra and Ubelaker (1994) and previously conducted by Klaus and colleagues in their various research projects.

With regards to cranial modification, Dingwall (1931) first noted most ancient cultures did not distinguish cranial modification between boys and girls. Tiesler's (2012) extensive and authoritative contemporary research on the subject also echoes this conclusion, where no exclusive shape or preference has been noted among the sexes for those areas systematically covered.

Age Estimation

Age-at-death estimation also plays an important role since these data are needed to address nature of biological stress amongst certain groups versus others as well as account for the age-related variation that can fundamentally shape presence/absence relationships in skeletal samples (Klaus, 2008, 2014). A variety of age estimation methods exist, with several unresolved debates contributing to common pitfalls. Although the data used in this study came from pre-recorded information, the first step in

this process generally consists of segregating adult from subadult skeletons to then examine data collected from the pubic symphysis, auricular surface, cranial suture closures, and dental ware (Brooks and Suchey, 1990; Lovejoy et al., 1985; Meindl and Lovejoy, 1985; Smith, 1984). For subadult age estimations, focus involves dental development and eruption, as well as epiphyseal union (Scheuer and Black, 2000; Ubelaker, 2000).

Assessment of Cranial Modification

For this study, Buikstra and Ubelaker's (1994) scoring protocols were used to assess the various characteristics of cranial shape, planes of pressure, and bandage/binding artifacts used in shaping. Beginning with general classification of cranial shape, each cranium was evaluated for tabular, circumferential, or some other kind of head form. The most common categories in the Andes involve annular, in which bandages force the head into a conical (circumferential) form, and tabular, in which stiff pads or boards flatten the front and back of the head while allowing for parietal expansion (Dembo and Imbelloni, 1938, pp. 249-277). These two modification categories affect the skull differently (Antón, 1989). Anterior and posterior compression create tabular forms, producing a pronounced broadening of the crania, whereas circumferential pressure associated with annual forms yield a more tubular and elongated head shape with a reduction in cranial breath (Torres-Rouff, 2003). For this reason, evaluation of crania for modification from both posterior and anterior aspects was performed according to Buikstra and Ubelaker's scoring protocol. Posteriorly, assessment involved observation of pressure applied at the lambda, squamous portion of

the occipital bone, or below the inion of each cranium. Scoring of pressure in relationship to transverse plane was then categorized as either perpendicular or obtuse on crania, followed by any observations of sagittal and lambdic elevation, or lambdic depression. Anteriorly, indication of symmetrical reshaping, bregmatic elevation, and/or post-coronal depression was also recorded. Finally, from both posterior and anterior aspects, examination of pad impressions, location, shape, and impression of bindings were scored to decipher the type of modification technique applied. Since these methods rely exclusively on visible coding of modification, the most important feature in this study reinforces original classification categories instituted by Dembo and Imbelloni: cranial breath versus length.

Statistical Methods

To reiterate, this thesis seeks to test three separate hypotheses. They include Hypothesis I, which addresses the correlation between social complexity and cranial modification: As civilizations became more complex, head shaping became more common in the Lambayeque Valley Complex. Hypothesis II posits cranial modification practices were not based on social class. Finally, Hypothesis III asserts cranial modification in the Lambayeque region was an outcome of childcare practices and not intentional identity inscription. In order to test these hypotheses, multivariate statistical methods were applied to study patterns of pathological prevalence over time. For many similar bioarchaeological research questions, past studies have examined only crude prevalence rates. The calculation used to test for crude prevalence (*P)* of a given disease is as follows:

$$P = \frac{\mathbf{p}}{\mathbf{q}}$$

The number of individuals affected by the pathological condition is represented by p, while q represents the total sample size.

Without question, crude prevalence is relatively simple and straightforward. However, it is driven by the overall average rate of disease and fails to take into account confounding factors that may become unequally distributed among populations in comparison (LaMorte, 2016). Furthermore, skeletons are samples, and they can never be either conceptually or mathematically "populations" (Boldsen and Milner, 2012). Since the tabulation of disease frequency in a skeletal assemblage can be misleading, an approach factoring probability of a phenomenon is necessary (Boldsen and Milner, 2012; Klaus, 2014). For this reason, the application of an odds ratio test can serve as a better alternative to crude prevalence and better estimation of true prevalence.

Odds ratios are derived from a basic risk ratio, or age-specific prevalence in proportion to the sample size differences is represented by the following calculation:

$$\frac{\mathbf{p_1}}{\mathbf{q_1}} \cdots \frac{\mathbf{p_n}}{\mathbf{q_n}}$$

The risk ratio thus becomes the foundation of the odds ratio (OR), in which a measurement of prevalence yields an estimate of age-structure related risk associated with exposure to a disease or condition:

$$\frac{\frac{p_1}{1-p_1}}{\frac{q_1}{1-q_1}} \cdots \frac{\frac{p_n}{1-p_n}}{\frac{p_n}{1-q_n}}$$

There are multiple advantages to using an odds ratio. With regards to cranial modification, it can describe the strength of relationship between its absence or presence (Klaus, 2014). It is also useful when trying to determine if prevalence is different between samples since it represents the ratio of probability a condition occurs in one group to the odds of it occurring in another (Klaus, 2014). Furthermore, and perhaps most importantly, it can calculate the odds of a condition by taking into account proportional differences in sample sizes and structures (Waldron, 1994, 2007). Therefore, they are well suited for non-normal distributions of archaeological skeletal data (Klaus, 2014).

The process of generating an odds ratio involves estimating skeletal mean age-at-death and assigning them to an age cohort. The sum of age-specific prevalence rates divided by the total sample size provides the common (or overall) odds ratio (ÔR) relative to the age-specific prevalence in two populations as a single figure (Waldron, 1994, pp. 63; Clayton and Hills, 1993) and the significance of difference can be tested using a simple *chi*-square ratio. The benefit to using an odds ratio test when comparing the prevalence of a pathological condition between populations stems from the manner in which the ÔR is readily understood (Waldron, 1994, pp. 70). However, its key disadvantage involves loss of information when a higher prevalence in a younger age class may be canceled out by a low prevalence in an age class and the ÔR reaches unity

(Waldron, 1994, pp. 74). Therefore, it is important to simultaneously scrutinize the results of both age-specific odds ratios and common odds ratios (Klaus, 2008). It also involves data reduction since it can only compare binary variables (presence/absence). Therefore, odds ratios cannot be used to interpret severity or other forms of more complex gradated expressions (Klaus, 2008).

To test the hypotheses using odds ratios, two comparative sample groups from different time periods were categorized as Samples A and B. From each respective sample, each individual's skeletal mean age-at-death was estimated and then assigned to an age class. For this study, a six age-class system was used based on the methods of Paine (1989) and Milner et al. (1989) as shown in Table 3.

TABLE 3. Age classes and associated summary age ranges

Age Class	Summary Age Range
1	0 - 4.9 years
2	5.0 - 14.9 years
3	15.0 - 24.9 years
4	25.0 - 34.9 years
5	35.0 - 44.9 years
6	45 years and older

Using a custom program written in SAS 9.4, odds ratios were calculated for each age class to factor age-specific prevalence in relationship to the respective sample size. Since the individual odds ratios are insufficient to interpreting the condition in an entire sample size, a common odds ratio (ÔR) was also applied. In performing this function, the common odds ratio related age-specific prevalence between two populations as a single, direct summary statistic (Klaus, 2008). The program calculated the χ^2 value for the ÔR along with the associated upper and lower limits of the 95 percent confidence interval. In some instances, odds ratios were not calculated in specific age classes due to insufficient data detailing absence or presence of the condition. Furthermore, zero values in cells would significantly and artificially deflate ÔR values or prevent them from being calculated at all due to the problem of dividing by zero which produces an undefined number (Klaus, 2008). Yet, the absence of a condition can be highly meaningful. Zero prevalence cannot be ignored. In those cases, zero values were replaced with 0.1, a non-zero value allowing for calculation of the odds ratio but is small enough not to have a significant effect on the mathematical comparison of prevalence.

Therefore, a few interpretations must be emphasized: (1) values equal or greater than 1.01 signify higher prevalence in the first population being compared; (2) values equal to or less than 0.99 represent a greater prevalence in the second sample. This means true prevalence for the second population can be calculated by dividing that OR or ÔR by 1.0.

CONCLUSION

This chapter described the materials and methods used to test the three hypotheses described in Chapter 1. These spanned the description of the archaeological contexts, skeletal sample sizes, sex and age estimation, along with the evaluation of the data collection protocol used to score cranial modification styles. Statistical methods using odd ratios to compare samples based on age-specific prevalence and time period were also covered. The next two chapters will present the findings and interpretations from these tests, along with their significance in relationship to meanings of identity and in the Lambayeque Valley Complex of northern Peru.

CHAPTER 7

RESULTS

In this chapter, the results from this bioarchaeological study of cranial modification based on skeletal remains from the Lambayeque Valley Complex are presented. The data are used to test the three hypotheses of cranial modification. Specifically, it addresses the research questions related to prevalence and patterning of cranial modification during specific time periods and over time, association of its practice with social class, and whether any overarching meanings may be associated with its practice.

ANALYSIS BASED ON TIME PERIOD: CRUDE PREVALENCE PATTERNS

To conduct a statistical analysis of cranial modification prevalence over time, first an assessment of head shaping was performed on skeletal samples from eight individual time periods (Table 4).

TABLE 4. Time periods and associated names

Time Period	Name
1	Formative/Cupisnique
2	Middle Moche
3	Late Moche
4	Middle/Late Sicán
5	Chimú
6	Inka
7	Early-to-mid Colonial
8	Mid-to-late Colonial

Figure 11 and Table 5 present the crude prevalence of cranial modification for the Formative/Cupisnique time period. Head shaping during this timeframe was common, in which the percentage of individuals who scored present (64.71%) for cranial modification was nearly two times that of individuals who scored absent (35.29%) for the condition.

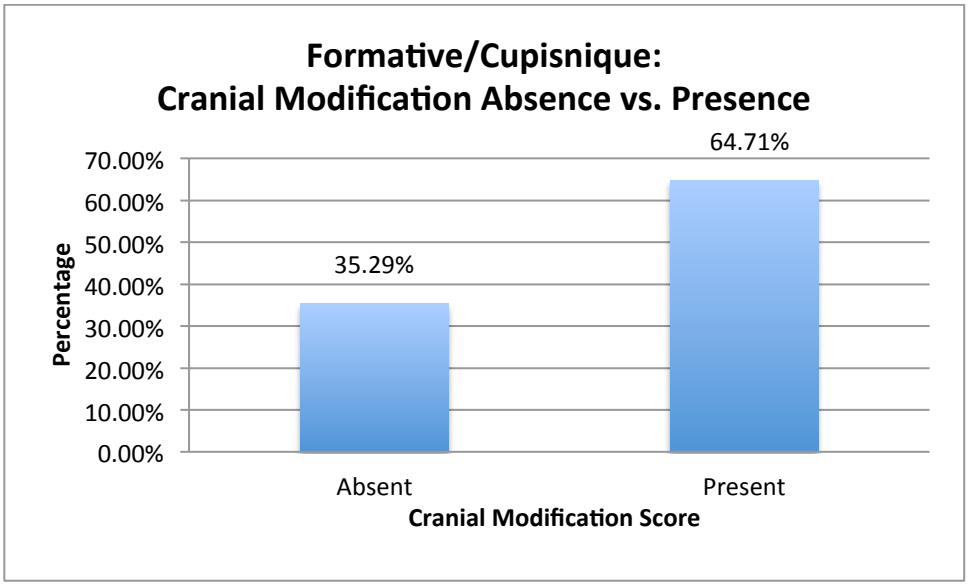

Fig. 11. Cranial modification of the Formative/Cupisnique era (Time Period 1).

TABLE 5. Cranial modification prevalence by individual during the Formative/Cupisnique era (Time Period 1)

Cranial Modification Scoring	*N* Individuals	Percent
Present	11	35.29%
Absent	6	64.71%

Figure 12 and Table 6 present the crude prevalence of cranial modification for the Middle Moche time period, in which all observable skeletal remains (n=1) showed a presence (100%) of head shaping.

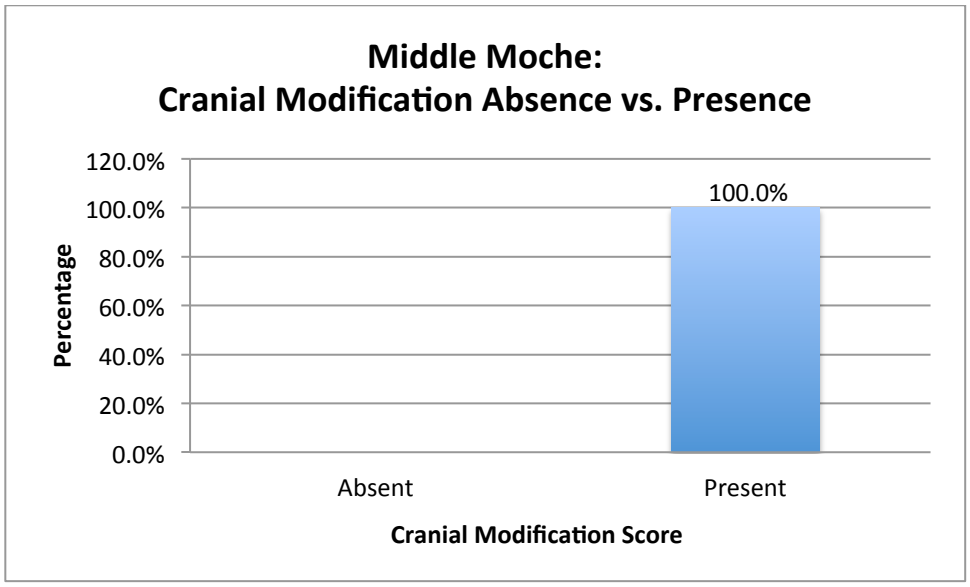

Fig. 12. Prevalence of cranial modification during the Middle Moche era (Time Period 2).

TABLE 6. Cranial modification prevalence by individual during the Middle Moche era (Time Period 2)

Cranial Modification Scoring	*N* Individuals	Percent
Present	1	100.00%
Absent	0	0.00%

Figure 13 and Table 7 present the crude prevalence of cranial modification for the Late Moche time period. A greater percentage of individuals scored present (55.9%) for cranial modification than absent (44.1%).

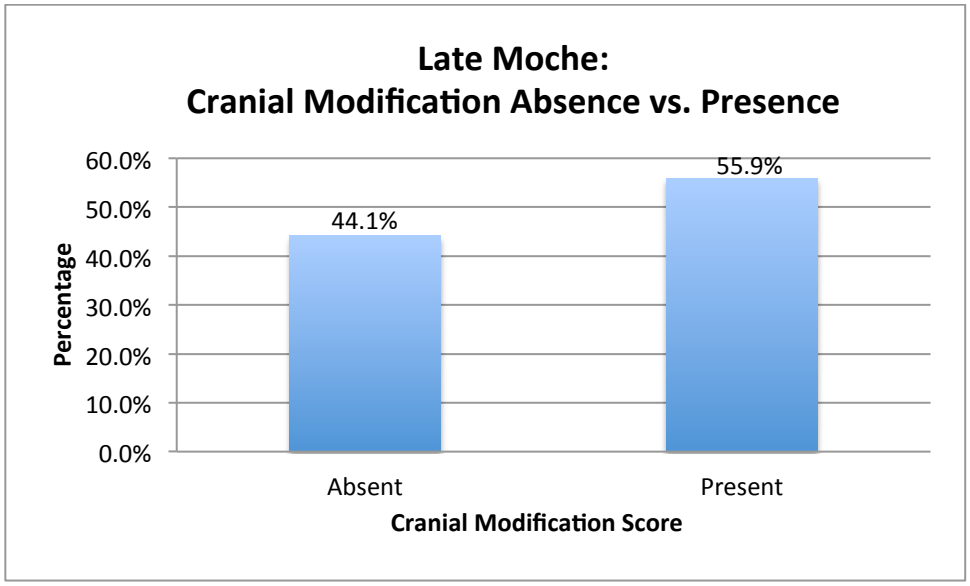

Fig. 13. Cranial modification of the Late Moche era (Time Period 3).

TABLE 7. Cranial modification prevalence by individual during the Late Moche era (Time Period 3)

Cranial Modification Scoring	*N* Individuals	Percent
Present	19	55.90%
Absent	15	44.10%

Figure 14 and Table 8 present the crude prevalence of cranial modification for the Mid-to-Late Sicán time period. A marginally greater percentage of individuals scored present (55.7%) for cranial modification than absent (44.3%).

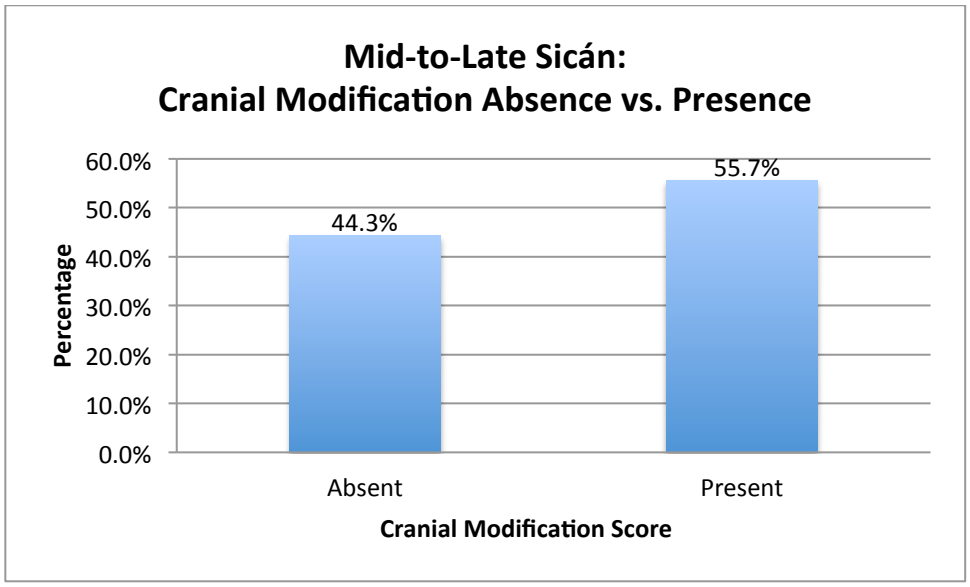

Fig. 14. Cranial modification of the Middle-to-Late Sicán era (Time Period 4)

TABLE 8. Cranial modification prevalence by individual during the Middle-to-Late Sicán era (Time Period 4)

Cranial Modification Scoring	*N* Individuals	Percent
Present	123	55.7%
Absent	98	44.3%

Figure 15 and Table 9 present the crude prevalence of cranial modification for the Chimú time period. The percentage of individuals scored as absent (68.5%) for cranial modification measured more than two times than of those present (31.5%).

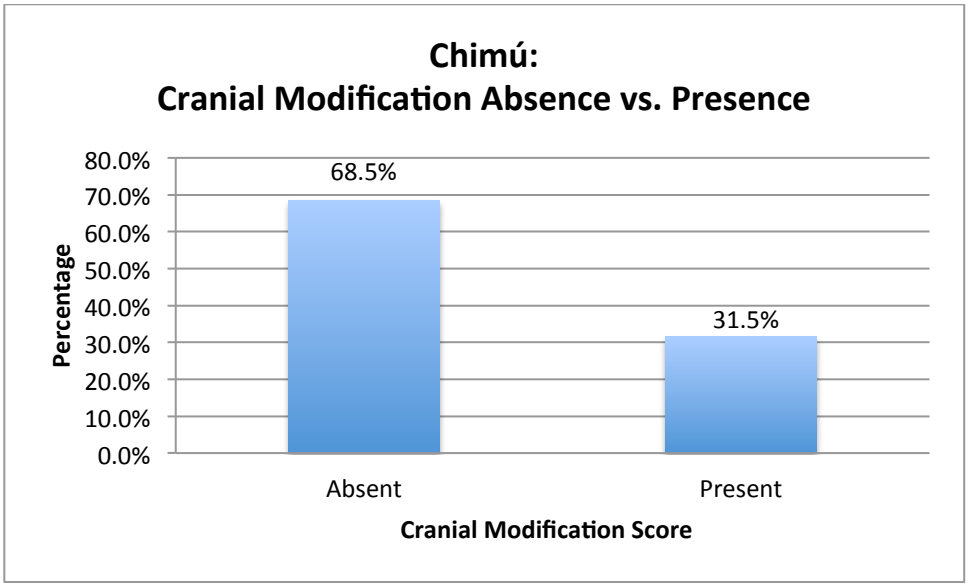

Fig. 15. Cranial modification of the Chimú era (Time Period 5)

TABLE 9. Cranial modification prevalence by individual during the Chimú era (Time Period 5)

Cranial Modification Scoring	*N* Individuals	Percent
Present	23	31.5%
Absent	50	68.5%

Figure 16 and Table 10 present the crude prevalence of cranial modification for the Inka time period. Head shaping presence (74.2%) scored three times higher than that of absence (25.8%).

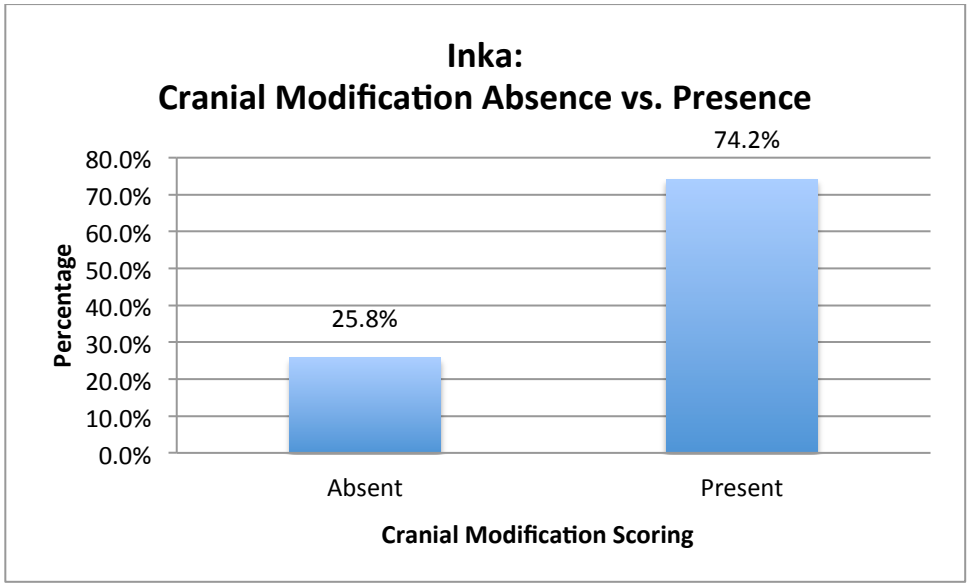

Fig. 16. Cranial modification of the Inka era (Time Period 6)

TABLE 10. Cranial modification prevalence by individual during the Inka era (Time Period 6)

Cranial Modification Scoring	*N* Individuals	Percent
Present	23	74.2%
Absent	8	25.8%

Figure 17 and Table 11 present the crude prevalence of cranial modification for the Early-to-Mid Colonial time period. The absence of modified crania was overwhelmingly absent (92%).

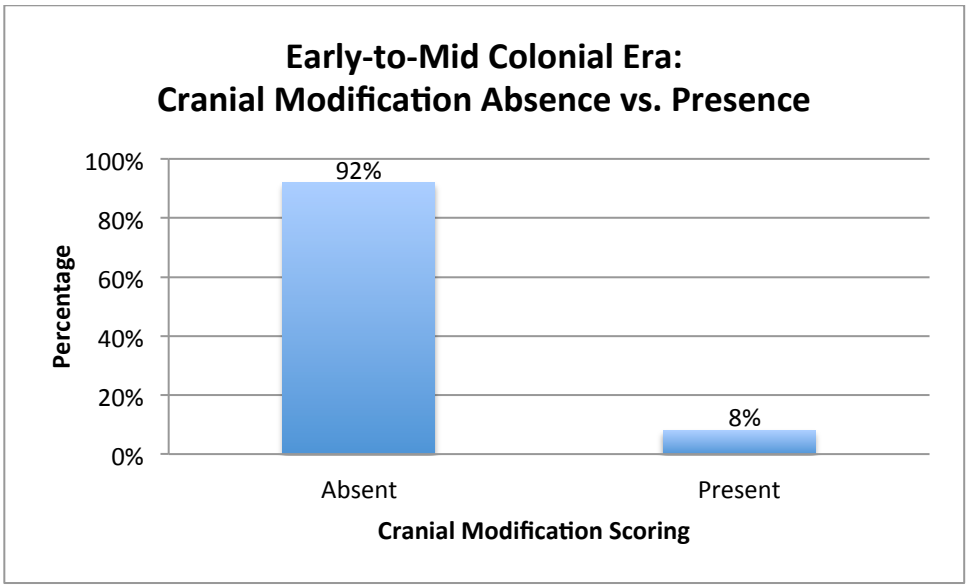

Fig. 17. Cranial modification of the Early-to-Mid Colonial era

TABLE 11. Cranial modification prevalence by individual during the Early-to-Middle Colonial era (Time Period 7)

Cranial Modification Scoring	*N* Individuals	Percent
Present	23	8%
Absent	261	92%

Figure 18 and Table 12 present the crude prevalence of cranial modification for the Mid-to-Late Colonial time period. Head shaping was nearly completely absent (99.6%) among the entire sample, with only a small number (n=1) of crania reflecting its presence (0.4%).

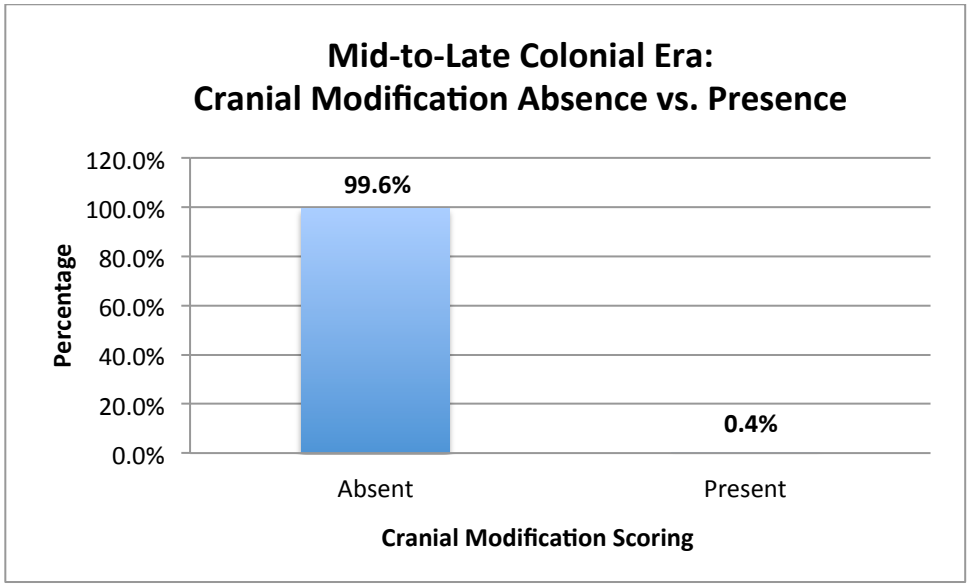

Fig. 18. Cranial modification of the Mid-to-Late Colonial era

TABLE 12. Cranial modification prevalence by individual during the Middle-to-Late Colonial (Time Period 8)

Cranial Modification Scoring	*N* Individuals	Percent
Present	1	0.40%
Absent	260	99.60%

Figure 19 presents the crude prevalence of cranial modification across all time periods. Analysis reveals head shaping was relatively common from the Formative/Cupisnique to the Inka time period. However, presence of cranial modification plummets drastically in the Early-to-Middle Colonial period. By the Middle-to-Late Colonial era, presence of cranial modification is virtually non-existent.

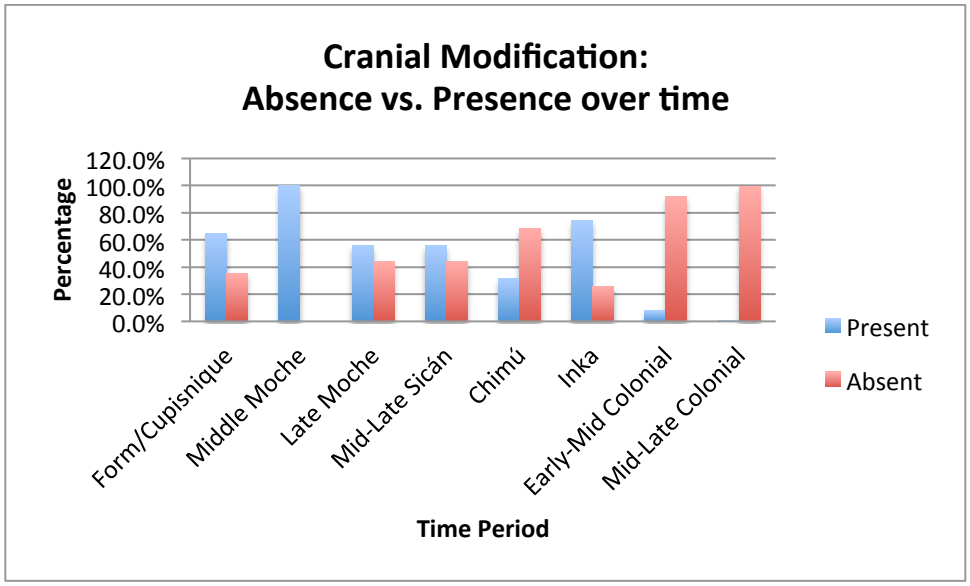

Fig. 19. Prevalence of cranial modification over time.

ODDS RATIO COMPARISONS AND PREVALENCE OF CRANIAL MODIFICATION BY TIME PERIOD

Odds ratio analysis was performed on seven different comparative sets of skeletal samples in order to measure the prevalence of cranial modification based on time period. The first comparison (Table 13) presents the Formative/Cupisnique era (Time Period 1) and the Middle Moche era (Time Period 2). The odds ratio analysis for this comparison indicates a higher prevalence of head shaping in Sample A ($\hat{OR} = 1.09$) and is not statistically significant ($X^2_1 = 0.002$).

TABLE 13. Odds Ratio Analysis: Time Period 1 vs. Time Period 2

Sample A = Formative/Cupisnique				Sample B = Middle Moche				
Age class[a]	Absent	Present	N	Absent	Present	N	N_T	OR[b]
1	0[c]	0	0.2	0	0	0.2	0.4	1
2	0	1	1.1	0	1	1.1	2.2	1
3	2	0	2.1	0	0	0.2	2.3	0.05
4	0	1	1.1	0	1	1.1	2.2	1
5	1	3	4	0	0	0.2	4.2	3
6	1	4	5	0	0	0.2	5.2	4

Pathological condition: Cranial Modification
Common odds ratio = 1.09
$\chi^2_{1=}$ 0.002
Lower 95% confidence limit = 0.41
Upper 95% confidence limit = 29.23

[a] Constructed age classes for this analysis were: age class 1 (0.0-4.9 years), age class 2 (5-14.9 years), age class 3 (15-24.9 years), age class 4 (25-34.9 years), age class 5 (35-44.9 years), and age class 6 (45 years+).

[b] An odds ratio values $\geq$1.01 represent higher prevalence (represented as a direct proportion) in the first population being compared (in this case, Sample A). Values $\leq$0.99 correspond to a greater prevalence in the second population being compared (in this case, Sample B, and prevalence is calculated as the inverse of an OR value <1.0). An odds ratio of 1.0 represents identical prevalence between the two samples.

[c] Values of zero strongly artificially deflate OR values, therefore a value of 0.1 is substituted in any occurrence of zero.

The second comparison involves the Middle Moche (Time Period 2) and Late Moche (Time Period 3) eras. This odds ratio comparison found a higher prevalence of cranial modification in Sample A (ÔR = 2.55) (Table 14) but is not statistically significant ($X^2_{1=}$ 0.22).

TABLE 14. Odds ratio analysis: Time Period 2 vs. Time Period 3

Sample A = Middle Moche				Sample B = Late Moche				
Age class[a]	Absent	Present	N	Absent	Present	N	N_T	OR[b]
1	0[c]	0	0.2	5	1	6	2.6	5
2	0	1	1.1	1	6	7	8.1	1.6667
3	0	0	0.2	1	1	2	2.2	1
4	0	1	1.1	2	2	4	5.1	10
5	0	0	0.2	1	4	5	5.2	0.25
6	0	0	0.2	3	3	6	6.2	1

Pathological condition: Cranial Modification
Common odds ratio = 2.55
$\chi^2_{1=}$0.22
Lower 95% confidence limit = 0.08
Upper 95% confidence limit = 78.83

[a] Constructed age classes for this analysis were: age class 1 (0.0-4.9 years), age class 2 (5-14.9 years), age class 3 (15-24.9 years), age class 4 (25-34.9 years), age class 5 (35-44.9 years), and age class 6 (45 years+).

[b] An odds ratio values $\geq$1.01 represent higher prevalence (represented as a direct proportion) in the first population being compared (in this case, Sample A). Values $\leq$0.99 correspond to a greater prevalence in the second population being compared (in this case, Sample B, and prevalence is calculated as the inverse of an OR value <1.0). An odds ratio of 1.0 represents identical prevalence between the two samples.

[c] Values of zero strongly artificially deflate OR values, therefore a value of 0.1 is substituted in any occurrence of zero.

The third comparison was between Late Moche (Time Period 3) and Middle/Late Sicán (Time Period 4) eras. Analysis from this odds ratio test demonstrates prevalence of cranial modification is proportionately 1.11 times higher in Sample B (ÔR = 2.55) (Table 15) and is not statistically significant ($X^2_{1=}$ 0.05).

TABLE 15. Odds ratio analysis: Time Period 3 vs. Time Period 4

	Sample A = Late Moche			Sample B = Middle/Late Sicán				
Age class[a]	Absent	Present	N	Absent	Present	N	N_T	OR[b]
1	5	1	6	8	14	22	28	0.1142
2	1	6	7	17	18	35	42	5.6667
3	1	1	2	7	30	37	39	0.2333
4	2	2	4	27	26	53	57	1.03846
5	1	4	5	20	14	34	39	5.714
6	3	3	6	1	10	11	17	0.1

Pathological condition: Cranial Modification
Common odds ratio = 0.90
$\chi^2_{1=}$0.05
Lower 95% confidence limit = 0.41
Upper 95% confidence limit = 1.98
[a] Constructed age classes for this analysis were: age class 1 (0.0-4.9 years), age class 2 (5-14.9 years), age class 3 (15-24.9 years), age class 4 (25-34.9 years), age class 5 (35-44.9 years), and age class 6 (45 years+).
[b] An odds ratio values $\geq$1.01 represent higher prevalence (represented as a direct proportion) in the first population being compared (in this case, Sample A). Values $\leq$0.99 correspond to a greater prevalence in the second population being compared (in this case, Sample B, and prevalence is calculated as the inverse of an OR value <1.0). An odds ratio of 1.0 represents identical prevalence between the two samples.
[c] Values of zero strongly artificially deflate OR values, therefore a value of 0.1 is substituted in any occurrence of zero.

The fourth comparison to be tested involves the Middle/Late Sicán (Time Period 4) and Chimú (Time Period 5) eras. Analysis from this odds ratio measured higher prevalence of cranial modification in Sample A ($\hat{O}R = 3.27$) (Table 16) and is statistically significant ($X^2_1 = 14.80$).

TABLE 16. Odds ratio analysis: Time Period 4 vs. Time Period 5

Sample A = Middle/Late Sicán				Sample B = Chimú				
Age class[a]	Absent	Present	N	Absent	Present	N	N_T	OR[b]
1	8	14	22	6	3	9	31	3.5
2	17	18	35	8	4	12	47	2.1176471
3	7	30	37	10	0	10.1	47.1	428.57143
4	27	26	53	7	8	15	68	0.8425926
5	20	14	34	11	1	12	46	7.7
6	1	10	11	4	6	10	21	6.6667

Pathological condition: Cranial Modification
Common odds ratio = 3.27
$\chi^2_{1=}$14.80
Lower 95% confidence limit = 1.91
Upper 95% confidence limit = 5.60

[a] Constructed age classes for this analysis were: age class 1 (0.0-4.9 years), age class 2 (5-14.9 years), age class 3 (15-24.9 years), age class 4 (25-34.9 years), age class 5 (35-44.9 years), and age class 6 (45 years+).

[b] An odds ratio values $\geq$1.01 represent higher prevalence (represented as a direct proportion) in the first population being compared (in this case, Sample A). Values $\leq$0.99 correspond to a greater prevalence in the second population being compared (in this case, Sample B, and prevalence is calculated as the inverse of an OR value <1.0). An odds ratio of 1.0 represents identical prevalence between the two samples.

[c] Values of zero strongly artificially deflate OR values, therefore a value of 0.1 is substituted in any occurrence of zero.

The fifth comparison to be tested involves the Chimú (Time Period 5) and Inka (Time Period 6) eras. Analysis from this odds ratio shows prevalence of cranial modification proportionately 67.61 times higher in Sample B ($\hat{O}R = 0.01$) (Table 17) and also is statistically significant ($X^2_1 = 29.43$).

TABLE 17. Odds ratio analysis: Time Period 5 vs. Time Period 6

Sample A = Chimú				Sample B = Inka				
Age class[a]	Absent	Present	N	Absent	Present	N	N_T	OR[b]
1	6	3	9	0	3	3.1	12.1	0.016667
2	8	4	12	0	12	12.1	24.1	0.0041667
3	10	0[c]	10.1	0	4	4.1	14.2	0.00025
4	7	8	15	0	3	3.1	18.1	0.1142857
5	11	1	12	0	1	1.1	13.1	0.0090909
6	4	6	10	0	0	0.2	10.2	1.5

Pathological condition: Cranial Modification
Common odds ratio = 0.03
$\chi^2_{1=}$2.22
Lower 95% confidence limit = 0.00
Upper 95% confidence limit = 12.53
[a] Constructed age classes for this analysis were: age class 1 (0.0-4.9 years), age class 2 (5-14.9 years), age class 3 (15-24.9 years), age class 4 (25-34.9 years), age class 5 (35-44.9 years), and age class 6 (45 years+).
[b] An odds ratio values $\geq$1.01 represent higher prevalence (represented as a direct proportion) in the first population being compared (in this case, Sample A). Values $\leq$0.99 correspond to a greater prevalence in the second population being compared (in this case, Sample B, and prevalence is calculated as the inverse of an OR value <1.0). An odds ratio of 1.0 represents identical prevalence between the two samples.
[c] Values of zero strongly artificially deflate OR values, therefore a value of 0.1 is substituted in any occurrence of zero.

The sixth comparison to be tested involved the Inka (Time Period 5) and Early-to-Mid Colonial (Time Period 6) eras. Analysis from this odds ratio measured higher prevalence of cranial modification in Sample A ($\hat{OR}$ = 352.03) (Table 18) and is statistically significant (X^2_1 = 83.75).

TABLE 18. Odds ratio analysis: Time Period 6 vs. Time Period 7

Sample A = Inka				Sample B = Early-to-Mid Colonial				
Age class[a]	Absent	Present	N	Absent	Present	N	N_T	OR[b]
1	0[c]	3	3.1	98	5	103	106.1	588
2	0	12	12.1	35	8	43	55.1	525
3	0	4	4.1	19	1	20	24.1	760
4	0	3	3.1	35	3	38	41.1	350
5	0	1	1.1	28	1	29	30.1	280
6	0	0	0.2	29	5	34	34.2	5.8

Pathological condition: Cranial Modification
Common odds ratio = 352.03
$\chi^2_{1=}$ 83.75
Lower 95% confidence limit = 12.05
Upper 95% confidence limit = 10166.16
[a] Constructed age classes for this analysis were: age class 1 (0.0-4.9 years), age class 2 (5-14.9 years), age class 3 (15-24.9 years), age class 4 (25-34.9 years), age class 5 (35-44.9 years), and age class 6 (45 years+).
[b] An odds ratio values $\geq$1.01 represent higher prevalence (represented as a direct proportion) in the first population being compared (in this case, Sample A). Values $\leq$0.99 correspond to a greater prevalence in the second population being compared (in this case, Sample B, and prevalence is calculated as the inverse of an OR value <1.0). An odds ratio of 1.0 represents identical prevalence between the two samples.
[c] Values of zero strongly artificially deflate OR values, therefore a value of 0.1 is substituted in any occurrence of zero.

The final comparison to be tested involved the Early-to-Mid Colonial (Time Period 7) and Mid-to-Late Colonial (Time Period 8) eras. Analysis from this odds ratio measured higher prevalence of cranial modification in Sample A ($\hat{OR}$ = 29.73) (Table 19) and is statistically significant ($X^2_{1=}$ 15.97).

TABLE 19. Odds ratio analysis: Time Period 7 vs. Time Period 8

Sample A = Early-to-mid Colonial				Sample B = Mid-to-Late Colonial				
Age class[a]	Absent	Present	N	Absent	Present	N	N_T	OR[b]
1	98	5	103	148	0[c]	148	251.1	75.510204
2	35	8	43	29	0	29.1	72.1	66.285714
3	19	1	20	15	0	15.1	35.1	7.8947368
4	35	3	38	28	0	28.1	66.1	24
5	28	1	29	18	0	18.1	47.1	6.4285714
6	29	5	34	11	0	11.1	45.1	18.965517

Pathological condition: Cranial Modification
Common Odds Ratio = 29.73
$\chi^2_{1=}$ 15.97
Lower 95% confidence limit = 3.40
Upper 95% confidence limit =260.07

[a] Constructed age classes for this analysis were: age class 1 (0.0-4.9 years), age class 2 (5-14.9 years), age class 3 (15-24.9 years), age class 4 (25-34.9 years), age class 5 (35-44.9 years), and age class 6 (45 years+).

[b] An odds ratio values $\geq$1.01 represent higher prevalence (represented as a direct proportion) in the first population being compared (in this case, Sample A). Values $\leq$0.99 correspond to a greater prevalence in the second population being compared (in this case, Sample B, and prevalence is calculated as the inverse of an OR value <1.0). An odds ratio of 1.0 represents identical prevalence between the two samples.

[c] Values of zero strongly artificially deflate OR values, therefore a value of 0.1 is substituted in any occurrence of zero.

CRANIAL MODIFICATION VARIATION BASED ON SOCIAL STATUS

In order to test whether cranial modification was dependent upon social class, a crude prevalence comparison of elite and non-elite individuals was performed. This subsample was drawn principally from a synchronic sample of Middle Sicán-period individuals where the most coherent elite/non-elite samples exist within this entire dataset (see Klaus et al., 2017). Prevalence of head shaping based on social class are reported in Figure 20 and Table 20. An overwhelmingly high frequency (94.3%) of the presence of cranial modification was observed among elite individuals. The presence of cranial modification among non-elite individuals was lower (46.6%).

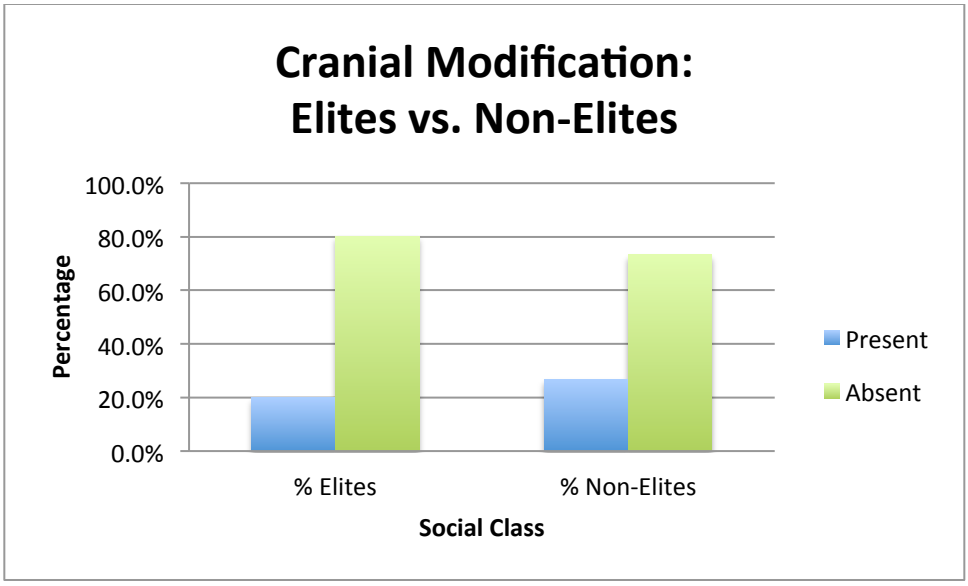

Fig. 20. Prevalence of cranial modification between elites and non-elites.

TABLE 20. Cranial modification prevalence by social class

Cranial Modification Scoring	*N* Individuals	Elites	*N* Non-Elites Individuals	Non-Elites
Present	40	19.90%	109	26.78%
Absent	161	80.10%	298	73.22%

Odds ratio analysis comparing cranial modification in elites versus non-elites (Table 21). measured proportionately 1.08 times higher prevalence of head shaping in Sample B ($\hat{OR} = 0.92$) and is not statistically significant ($X^2_1 = 0.07$).

TABLE 21. Odds ratio analysis by social class

	Sample A = Elites			Sample B = Non-Elites				
Age class[a]	Absent	Present	N	Absent	Present	N	N_T	OR[b]
1	1	0[b]	1.1	12	16	28	29.1	0.075
2	3	2	5	18	22	27	32	0.54545
3	2	18	20	9	14	32	52	5.7857143
4	14	14	28	24	18	32	60	1.33333
5	10	3	13	17	16	19	32	0.31875
6	1	2	3	6	15	17	20	0.8

Pathological condition: Cranial Modification
Common Odds Ratio = 0.92
$\chi^2_{1=}$ 0.07
Lower 95% confidence limit = 0.5533369
Upper 95% confidence limit =1.5353819

[a] Constructed age classes for this analysis were: age class 1 (0.0-4.9 years), age class 2 (5-14.9 years), age class 3 (15-24.9 years), age class 4 (25-34.9 years), age class 5 (35-44.9 years), and age class 6 (45 years+).

[b] An odds ratio values $\geq$1.01 represent higher prevalence (represented as a direct proportion) in the first population being compared (in this case, Sample A). Values $\leq$0.99 correspond to a greater prevalence in the second population being compared (in this case, Sample B, and prevalence is calculated as the inverse of an OR value <1.0). An odds ratio of 1.0 represents identital prevalence between the two samples.

[c] Values of zero strongly artificially deflate OR values, therefore a value of 0.1 is substituted in any occurrence of zero.

CRANIAL MODIFICATION BASED ON SEX

Data detailing sex estimation of the entire sample was supplied as pre-recorded information. Of the 923 individuals who could be scored for cranial modification, estimation of sex could only be performed for 365 individuals, with 191 males and 174 females. Figure 21 and Table 22 revealed prevalence of cranial modification based on sex was greater among females (57%) than males (43%). Unfortunately, odds ratio analysis comparing males and females was not possible due to unavailable data for multiple class groups.

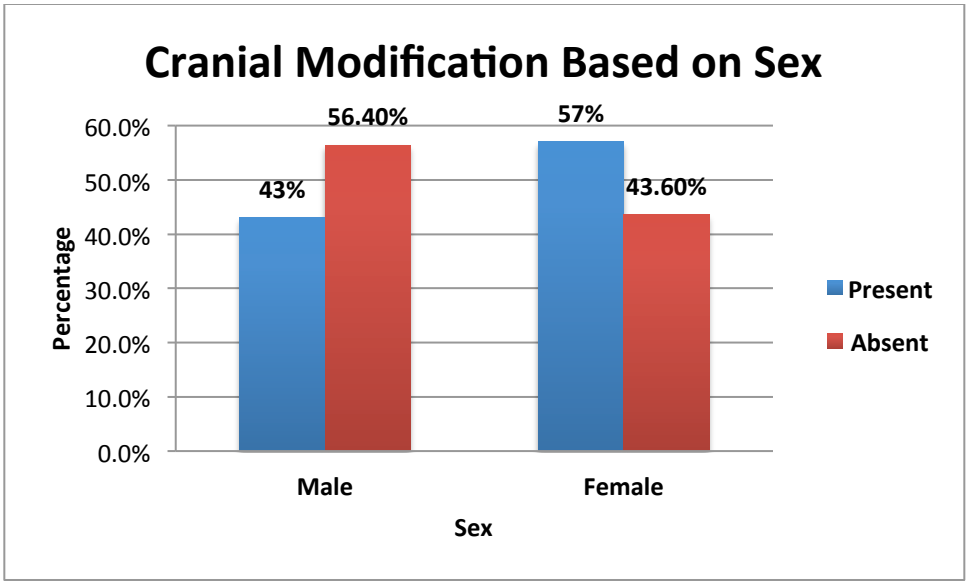

Fig. 21 Prevalence of cranial modification based on sex.

Table 22 Cranial modification prevalence by sex

	Presence		Absence	
Sex	*N*	Percent	*N*	Percent
Male	50	43%	141	56.40%
Female	65	57%	109	43.60%

CRANIAL MODIFICATION SHAPE AND BIAS

Efforts to assess prevalence of specific cranial modification shapes and biases were attempted in this study. However, despite available data, several irregularities in the pre-recorded information proved to be inconsistent and unreliable. For this reason, tests involving different forms of modification in relationship to the hypotheses could not be tested in this study.

CONCLUSION

This chapter presented the quantitative findings from the diachronic and social patterning of cranial modification in the Lambayeque Valley Complex on the north coast of Peru. Specifically, it reported the results relating to the three central hypotheses posited by this thesis. In the next chapter, interpretations of the results are presented in relationship to broader contextual, archaeological, and historic significance associated with head shaping practices in the Andes.

CHAPTER 7

RESULTS

The information presented in the previous chapters of this thesis provided a contextual overview of the Lambayeque Valley Complex with consideration of its environmental, archaeological, ethnohistorical, and bioarchaeological factors spanning three millennia. Preceding this, a literature review of cranial modification and its study since the 19th century highlighted the evolution of its study, from a doctor's hobby to scholarly thematic investigation in bioarchaeology. In this chapter, the tests of the research hypotheses presented in Chapter 1 and the interpretation of the biocultural significance of the results are presented.

Any significant observations drawn from the data, although insightful, are not intended as definitive explanations. Instead, they should be regarded solely as plausible interpretations worthy of consideration within the geographic and archaeological context in which they originated. Careful consideration of cultural context should be exercised in

order to guard against disjunctions between form and meaning, potential homologies, or convergences (Shimada et al., 2004, pp. 397). Moreover, certain aspects of research could not be addressed in this study. For instance, analysis of cranial modification prevalence based on sex was not possible due to an absence of head shaping presence in relationship to sex and within multiple age groups. Additionally, despite available pre-recorded data on cranial shape and bias, multiple inconsistencies in observations suggests further education is needed to improve understanding of modification styles and their documentation. In order to ensure researchers are using reliable techniques, extra training with collections consisting of varying cranial shapes and biases would be beneficial. Just as knowledge and reliability of data are gained when researchers practice sex and age estimation skills, the same occurs when provided more opportunities to work with modified crania. Therefore, the findings offered from this study should not only be considered cautiously to elicit possible meaning but also as a starting point for further study of this topic in the future.

HYPOTHESIS I:
PREVALENCE OF CRANIAL MODIFICATION AND SOCIAL COMPLEXITY

Crude prevalence of cranial modification by time period can be informative to understand possible motivations for head shaping within this specific region of the Andes. Examination of the practice in relationship to the predominant archaeological culture of each time period in the Lambayeque Valley Complex may reveal how important the tradition was regarded and thereby regularly incorporated into daily life. At first glance, evidence of cranial modification from crude prevalence indicates a few

observations worth noting. First, head shaping prevalence found among skeletal remains from the Formative/Cupisnique timeframe reveals this practice existed relatively early in the north coast's history (circa 1600 – 650 BC) and long before the influence of foreign cultures such as the Inka from southern highlands of Peru. This detail is noteworthy because, as mentioned in Chapter 4, Cupisnique culture heavily influenced later societies including the Moche on the level of establishing a number of deeply embedded traditions (Klaus, 2013). Presence of cranial modification was 64.7%, whereas absence was 35.29%, however odds ratio analysis revealed greater prevalence to not be statistically significant ($X^2_1 = 0.002$, $p \leq 0.05$) when compared with the following time period, the Middle Moche. However, it should be noted, the presence of head shaping (100%) from the Middle Moche was relatively small (n=1). While the Middle Moche sample is almost exclusively drawn from the elite tombs of Sipán, most of the skulls were crushed beyond the ability to formally score them. Although an odds ratio test did take into consideration the disparity of the sample sizes between comparisons, these results should be accepted with great caution and not as a definitive finding of any kind.

Transitioning to the Late Moche, the crude prevalence of head shaping was present in more than half the individuals from this era (55.9%; (n=4). This data shows the custom of cranial modification clearly persisted as it continued 1,300 years later after the Formative Cupisnique era. During this timeframe (550 – 750 AD), the Moche civilization reached a pinnacle of social complexity as exhibited from its political, cultural, and religious achievements. From this, a cautionary pattern begins to emerge

and support the theory that the practice of head shaping became more common with social complexity as well as among commoners.

To determine if this trend continued as time evolved, numbers from the Middle/Late Sicán (Time Period 4) were introduced and then compared with the previous Late Moche era (Time Period 3). Crude prevalence measurements were similar to the late Moche, while odds ratio analysis demonstrated that the true prevalence of head shaping was proportionately 1.11 times higher during the Middle/Late Sicán period and also statistically significant in difference. ($X^2_1 = 0.05$, $p \leq 0.05$). This pattern coincided with archaeological evidence of a period increasing in social complexity (local state to regional expansionist state). Advancements in cultural innovation along with strengthened religious ideologies drove new levels of power and wealth within the region, making it more socially dynamic than ever before.

During the Chimú era (Time Period 5), a change in the trend occurs in which the percentage of cranial modification is less common (31.5%) but does not completely disappear. Odds ratio analysis comparing the Middle/Late era with the Chimú time periods indicates greater prevalence of cranial modification occurring during the Middle/Late Sicán ($\hat{O}R = 3.27$) than the Chimú and measuring statistically significant ($X^2_1 = 14.80$, $p \leq 0.05$). As previously mentioned in Chapter 4, the Chimú were an imperial polity that conquered the entire north coast of Peru and established the largest pre-Hispanic coastal state in Andean history (Shimada, 2000). The significance of this achievement is obvious from the scale and complexity of the social and economic functions carried out within compounds located at the capital city of Chan Chan. Without

question, overwhelming evidence supports the idea of social complexity of this society stemming from its vast architectural feats, trade, craft, and agricultural practices. However, the most plausible explanation for this irregularity stems from the lack of information associated with the Chimú in the Lambayeque Valley Complex. Research of the Chimú in this region remains relatively underdeveloped in comparison to other cultures and time periods. Furthermore, the vast size of the settlements and sheer quantity of artifacts waiting to be surveyed and recorded are glaring. This suggests many opportunities for study of topics in bioarchaeology, including cranial modification, are plentiful and await investigation. Therefore, data indicating a decline in head shaping presence during the Chimú era may simply be due to sample size or sample structure, but should not be interpreted as conclusive. Rather, observations of continued cranial modification presence suggest the practice withstood the test of time.

With respects to the Inka era (Time Period 6), analysis of head shaping crude prevalence revealed a resurgence of cranial modification presence (74.2%). A comparison of Chimú and Inka timeframes through odds ratio analysis yielded numbers supporting greater head shaping prevalence during the Inka timeframe ($\hat{O}R = 0.01$), and measured statistically significant in difference ($X^2_1 = 29.43$, $p \leq 0.05$). Once again, archaeological evidence may provide reasons for this outcome. Replacement of the Chimú governors by the Inka did not result in economic, political, or social disruptions but rather, a continuation of societal operations, making its prosperity very appealing for a takeover by the Inka state. Despite vast land seizure, adoption and continuation of Chimú political economic structures remained in place since distant de-centralized, and

indirect forms of Inka rule from the highlands and language barriers made it difficult to exercise complete control (Klaus, 2008). This suggests that the Inka were driven by economic motivations rather than social or cultural imperatives to rule the Chimú indirectly. Continuation of Chimú ideological traditions, based on a highly engrained and local Muchik biological and cultural heritage, were therefore permitted so long as they did not interfere with or prevent the Inka from reaping any political and economic benefits.

The dynamic representation of social complexity dating from the Formative/Cupisnique era to the Inka timeframe within the Lambayeque Valley Complex captures the evolution of north coast living, with many economic, political, cultural, and social innovations revealing the adaptive, resourceful, and resilient strategies adopted in order to thrive. Overall, the trend of cranial modification prevalence appears to coincide with increased growth in social complexity within the region and that the practice established by earlier cultures influenced subsequent groups to maintain its tradition.

Arrival of Spanish colonists changed this dynamic on many levels. Crude prevalence analysis of cranial modification during the Early-Mid-Colonial era (Time Period 7) reveals a major disruption to traditional ways of life. With a sizable number in the sample (n=248), presence of cranial modification was only 8%. Odds ratio analysis comparing the Inka and Early-to-Mid Colonial periods measured prevalence overwhelmingly higher among the Inka ($\hat{O}R = 352.03$) and statistically significant in difference ($X^2_1 = 83.75$, $p \leq 0.05$). The results of this analysis demonstrate how a drastic decline in cranial modification presence aligned with the outlaw of traditional indigenous

practices instituted by Spanish authority and as seen in other settings throughout Latin America (Tiesler and Lozada, 2018, pp. 9). The frequency and extent to which native traditions continued varied depending on the amount of control strongholds had on indigenous communities, with visibility of the body having the most restrictions in the public sphere (Tiesler and Lozada, 2018, pp. 9).

By no surprise, this absolutist posture of Spanish Colonialism appears to have continued during the Mid-to-Late Colonial era based on both crude prevalence and odds ratio data. The percentage of cranial modification presence was 0.04% and absence was 99.6%. Odds ratio analysis comparing the Early-to-Mid Colonial timeframe (Time Period 7) with the Mid-to-Late Colonial era (Time Period 8) indicates a greater presence of prevalence within Time Period 7 ($\hat{O}R = 29.73$) and measured statistically significant in difference. By this time, the Spanish society openly opposed and actively suppressed infant head shaping in New Spain as well as in Peru, along with many other identity-forging indigenous customs (Tiesler, 2014, pp. 249). Furthermore, engagement in any traditional political, economic, social and cultural practices was punishable by law (Tiesler, 2014, pp. 249), thus negatively impacting any opportunities for further social development. The dissolution of indigenous social complexity appears to strongly correspond with the virtual disappearance of head modification evidence from the archaeological records collected in this study. Based on this collective evidence, Hypothesis I is accepted: The practice of head shaping increased over time as a common form of social expression until Spanish Colonial contact suppressed and transformed many traditional, communal ways of indigenous Andean life.

HYPOTHESIS II:
PREVALENCE OF CRAIAL MODIFICATION BY SOCIAL CLASS

To determine if social class had an impact on the prevalence of cranial modification practices in the Lambayeque Valley Complex, assessments of crude prevalence and odds ratio were performed on elite and non-elite individuals. According to Corruccini and Shimada (2002) and Shimada et al., (2005), elites were comprised of the Sicán ethnic group which were also small, patrilocal, and genetically isolated. The effects of their social rank would have resulted in a lack of external gene flow producing a genetically distinct Sicán group from local Muchik subpopulation (Klaus, 2008). Based on the identification of elite members from the quality of grave goods, the majority of the sample scored present (94.3%) for cranial modification. Among non-elite members, absence of head shaping scored higher (53.4%) than presence (46.6%). Although evaluation of this data suggests elites overwhelmingly prioritized this tradition, it also indicates nearly half of the non-elite sample engaged in this tradition as well. Measurements from the odds ratio test demonstrated that the samples to be nearly identical, in which cranial modification was proportionately only 1.08 times more prevalent among non-elites than elites ($\hat{O}R = 0.92$) and this was far from a significant difference ($X^2_1 = 0.07$, $p \leq 0.05$).

From these collective results, a few overarching interpretations can be offered. First, evidence of cranial modification found across social classes indicates it was widespread in the north coast of Peru. Second, due to its ubiquity across all social statuses, this strongly suggests this principle form of body modification was the result of

a common childcare practice associated with cradle boarding. These cradle boards were something along the lines of a combination crib-bassinette (see Verano 1997, Figure 8). It would have generally immobilized the child's head and body. Some cradle boards also likely could be slung over a parent's shoulder and worn like a backpack, making an infant mobile, tied to the movements of adults. As a side effect (whether intended or not), this kind of immobility would have reduced the exposure to some forms of biological/environmental stressors on infants compared to those unrestrained or otherwise not fitted in cradle boards (Klaus, 2008). As a result, one might argue that younger children with greater environmental interaction would be more susceptible to disease vectors (Klaus, 2008). However, since this inference relates closely to Hypothesis III and the lack of identity inscription, further discussion explaining the motivations behind cranial modification in the Lambayeque Valley Complex will be addressed later on in this chapter.

If head shaping had been an exclusive practice, it would not have appeared as an exercised pattern of behavior on non-elite members. Rather, it would have been designated as a special custom reserved solely for specific members of society (e.g., a bounded ethnic group) or those recognized as privileged and influential. Ultimately, the data rejects the notion that head shaping depended on social class. This conclusion is meaningful because, in conjunction with Hypothesis I, a clearer picture for the motivations of cranial modification in the Lambayeque Valley Complex begins to emerge and address Hypothesis III.

HYPOTHESIS III: CRANIAL MODIFICATION AND MEANING THROUGH SOCIAL DIFFERENCE

The results relating to Hypotheses I and II assessed prevalence of cranial modification within specific time periods, over time, and based on social class. Hypothesis III specifically seeks to address whether head shaping was practiced to intentionally inscribe markers of identity and convey social difference. In other words, what did it actually mean to those people who had culturally-modified head shapes? To test this hypothesis, a preliminary overview of this theory is provided in order to explain how it has been applied to data sets from other parts of the Andes.

One of the best examples involving the expression of social identity from cranial modification practices comes from Blom's research of the Tiwanaku society in the south-central Andes (2005). Using ethnohistorical and osteological data, she drew connections between known head shape variants and social groups who chose to distinguish their group affiliation. The study focused on style of head shape rather than absence or presence to improve understanding of cranial modification of the diverse populations who met at the capital site of Tiwanaku (Blom, 2005). Based on investigations of head wrapping on Tiwanaku children, over 80 percent indicated evidence of cranial modification and without correlation linked to sex, class or religious status (Blom and Couture, 2018). The regional studies of the Tiwanaku polity performed by Blom (2005) indicated ethnic or community/regional groups were differentiated by different cranial modification styles. For instance, skeletal remains from Tiwanaku and lowland coastal

valley sites predominately exhibited tabular oblique shapes (Buikstra, 1995; Howshower et al., 1995; Torres-Rouff, 2002, 2003), while annular forms were more common among individuals from the Lake Katari Valley, just adjacent to the Tiwanaku Valley in the Titicaca Basin (Blom and Couture, 2018).

Blom's studies of head shaping based on group identity at Tiwanaku are reflected in other regions and times in the Andes. Velasco's (2018) study of cranial modification as a correlate of embodied identity explored how the Inka formed political solidarity of diverse peoples into their empire in the late pre-Hispanic Colca Valley. Rather than create a more encompassing identity to homogenize experiences for all peoples, he contends head shaping intersected with other forms of collective identity and likely contributed to social inequality prior to Inka imperial expansion (Velasco, 2018).

The findings by Blom and Knudson (2014) contributed theoretical background on social constructs of Andean childhood from relevant ethnographic and ethnohistorical records, offering highly valuable interpretation of cranial modification by other groups in the Andes. This includes detailed narratives of children's activities associated with various age groups according to Quechua-speaking Inka and Aymara-speaking communities (e.g., de Castro and de Otega Morejón [1558] 1936, pp. 238; de Santillán [1563] 1879, pp. 19-21; Guaman Poma de Ayala [1615] 1936, pp. 193-234) as well as information detailing social age categories and gender identities in the Andes (e.g., Allen, 2002; Bolin, 2006; Canessa, 2000; Harris, 1980). A common Andean theme associated with personhood involved the transformation of pre-social, untamed, wild beings (i.e., fetuses or babies) into social persons (Arnold and Hastorf, 2008, pp. 52; Canessa, 2000;

Graham 1999; Greenway, 1998; Harris, 1980, pp. 75; Klaus, 2017). Special rituals performed to reinforce the development of the social person provided children with a strong kin network under the guise of adult supervision (Blom and Couture, 2018, pp. 206). This specifically included the practice of head modification. The perception that a child's spirit was more susceptible to threats from physical and supernatural forces served as a primary reason for swaddling (Sillar, 1994, pp. 50). Containment served as an ideal method to protect children from supernatural and physical elements (Graham, 1997; Leonard, 1991) including cold temperatures, while also providing convenience for nursing mothers as they continued their engagement in everyday social and economic interactions (Allen, 2002, pp. 155). The importance of the head in the establishment of personhood meant the practice of wrapping and molding children's heads would transition fetuses and infants (*wawa*) through a liminal state and into social persons (Blom and Couture, 2018, pp. 205). Upon reaching full transformation as human boys and girls, children would then ultimately acquire their social identities (Blom and Couture, 2018, pp. 207) but as stronger individuals with well-integrated life force (Graham, 1997, pp. 1703).

Aside from Blom and colleagues, alternative interpretive meanings of cranial modification from the southern Central Andes draw on archaeological, historical, and ethnographic data to create a nexus between personhood, place, language, and social differentiation. Mannheim et al. (2018) applied a typological framework of ontology in order to compare and understand the meaning of cranial modification from two different case studies–the Inka at colonial Collaguas and another dating from the Formative Cuzco.

In general, Inka principles emphasized social differentiation based on bundling locality, speech, dress, and state-organized circulation of labor (Pachacuti Yamqui, ca. 1615). These principles played out differently depending on locality primarily because of linguistic and ecological differences affecting social organization and permanent exchange relationships (Mannheim et al., 2018, pp. 225). While Mannheim et al. acknowledged not all social differentiations were created equally by the Inka, uniform evidence of head binding found on individuals from Collaguas suggests standardization was the goal and therefore played a central role in personhood (Mannheim et al. 2018). In contrast, archaeological evidence from Formative Cuzco indicated an absence of economic, political, or ecological distinctions based on locality. Lack of continuity in head shapes thus suggested continuum of shapes did not lend itself to indexing locality (Mannheim et al., 2018, pp. 228). The results of this comparative study are important because they highlight the crucial role of context in order to address questions of agency associated with various pre-Hispanic Andean civilizations and their motivations for head shaping. According to Mannheim et al. (2018), a single universal method of childcare practiced during the Formative period in Cuzco resulted in a variety of non-standardized head shapes that could not be used to categorize cultural or linguistic differences by archaeologists. Therefore, if evidence of arbitrary head shape patterning found within the southern Andes is possible, it is also plausible for the absence of intentional inscription of ethnic identity to occur in other parts of the Andes, including places such as the north coast of Peru.

In light of the theoretical observations just presented, the practice of cranial modification in the Lambayeque Valley Complex was likely absent of any specific, intentional meaning and unrelated to inscription of group or ethnic identity. Acceptance of Hypothesis III is fundamentally based on four primary observations. The first observation focuses on the lack of ethnohistorical and ethnographic records. Studies of head modification in other parts of Peru were heavily aided by documentation yielding narrative explanations for the tradition. However, the absence of written records in the north coast of Peru makes bioarchaeological evidence the essential basis of this study. The result of this vital yet exclusive evidence leads to the second reason for accepting Hypothesis III, as already shown by both Hypotheses I and II. Interpretations drawn from the test of Hypothesis I demonstrate that head shaping became more common as cultures in the region evolved and became more dynamic. Both results from crude prevalence and multiple odds ratio tests support how widespread the practice was within individual time periods and spanning multiple timeframes. The correlation between head shaping and societal complexity reinforces the positive relationship between these two factors. The third reason stems from the test of Hypothesis II and confirms head shaping was not exclusively designated for select individuals, but rather, it was practiced across social classes as indicated by the nearly equivalent presence of cranial modification. Rituals and traditions of special significance would not be exercised on commoners and data from this study supports that head shaping did not constitute an exclusive custom strictly intended for chosen members of society. This collectively supports and leads to

the fourth and final reason for why cranial modification was not a form of identity inscription in the north coast of Peru: the *lo andino* concept.

Throughout the last few centuries, the study of pre-Hispanic cultures in the Andes has become either implicitly or explicitly embraced the *lo andino* concept. This holds that there is one overarching normative Andean essence, pattern of behavior, symbolic system and set of perceptions associated with all of its cultures (Klaus, 2008). As the product of ethnohistoric writing by Spanish Colonists emphasized an Inka-centric portrayal of Peruvian history, the *lo andino* assumption reduced Andean culture to a single group by homogenizing three major cultural, linguistic, and ecological zones including the central and north coasts, the north and central highlands, and the south-central Andes (Stanish, 2005, pp. 230-231). One major problem associated with the adoption of the *lo andino* concept involves the simplification and reduction of different cultures within the Andes throughout space and time. It overlooks critical contextual evidence used to identify nuanced differences in cultural traits, customs, and beliefs by emphasizing patterns of similarity rather than heterogeneity. Indeed, Andean cultures did many things differently. Another problem associated with the *lo andino* concept involves the assumption that even the Inka-centric narrative is accurate and based on factual evidence. Since Spanish Colonists effectively "wrote" history as victors in the region, their accounts were fashioned with highly biased and ethnocentric descriptions of indigenous peoples and their lifestyles. Therefore, to draw conclusions about Andean cultures using the *lo andino* conceptual approach is highly flawed and ill suited for objective scholarly research.

In the case of the Lambayeque Valley Complex, Inka imperial expansion into the north coast did not involve the same standard of social principles used in the south-central Andes. Rather, it entailed rule that was fundamentally local and pluralistic. Archaeological evidence summarized in Chapter 4 outlined how the fall and rise of distinct groups often influenced subsequent cultures who rose to prominence, while outside groups such as the Inka, encouraged continuation of local practices so as to not create interruptions to economic prosperity. Unlike Blom (2005), Mannheim et al. (2018), and Velasco (2018), who demonstrated that communities of the lower Andes used cranial modification as ethnic identity markers, the lack of uniformity in intentional cranial shape within this study supports the notion that rule varied considerably and did not permeate all facets of daily life. Furthermore, it demonstrates how investigations of cranial modification in general can produce insights about ancient cultures other than those strictly associated with the crafting of identity, such as childcare. A secondary study on the same sample and focusing on cranial modification styles would certainly expand the depth of knowledge about the various unique Andean cultures transcending time on the north coast of Peru. In particular, the application of high-resolution 3D imaging as a morphometric method could provide an even broader range of variation both within and between traditional cranial shapes as well as populaces (Kuzminsky et al., 2016). But extension of the conclusions about cranial modification by Blom and colleagues to this specific study would only espouse the fallacy and disregard the necessity for important contextual, postprocessual evidence to aid in the understanding of highly diverse communities known to this region.

CONCLUSION

In sum, the primary factor driving for cranial modification practices on the north coast appears to be the result(s) of behaviors associated with caring for children. Its prevalence among diverse cultures and across various time periods, and across social class underscores its ubiquity. Other ideals of the physical body introduced and enforced by Spanish colonists challenged and eventually eradicated the physical consequences of this form of childcare as a result of their hegemonic practices. However, because of bioarchaeological approaches and methods used in this study, investigations of head shaping practices in the Lambayeque region that have been long overdue, have been able to elucidate the broader patterns, history, and meanings of a very long-lived form of human behavior in the Andean past.

CHAPTER 8

SUMMARY AND CONCLUSION

The work in this investigation involves a bioarchaeological examination of cranial modification in the Lambayeque Valley Complex of Peru. Like many other regions of Latin America, in particular the Andes, several generations of pre-Hispanic cultures engaged in this permanent form of body alteration. Manipulation of infant crania by caretakers required extensive time and care during this transformative process, revealing intentionality behind its practice. For some cultural groups, head shaping stemmed from a need to assign meaning associated with ethnic identity, while others actively swaddled and protected young children from vulnerabilities due to perceived harmful forces and/or natural elements. Regardless, the motivation for head shape transformation has not always resulted in intentional or uniform outcomes. For this reason, the interpretation of human behaviors behind the alteration of cranial shape has provided deeper understanding of ideologies and traditions from ancient contexts. In certain circumstances, ethnohistorical and ethnographic documentation has aided in deciphering highly complex meaning associated with this tradition. However, the absence of such narratives, as in the case of the Lambayeque region, warrants the use of physical methods to holistically decipher human reasoning from the past. For this reason, the application of bioarchaeological techniques to investigate archaeological evidence of modified crania

within Latin America makes it a highly dependable and accurate method. Initiated and led by Latin American scholars, the evaluation and interpretation of diversity in head shape produced unprecedented understanding of indigenous ideologies and cultural practices. In pursuit of broadening this understanding, this research revealed some of the factors responsible for cranial modification prevalence in the Lambayeque Valley Complex, including social complexity, class, and difference.

The samples used in this study consisted of individuals discovered at several sites from the Lambayeque Valley Complex, spanning three millennia, and representative of various social statuses. Archaeological evidence reveals peoples of this region were highly adaptive to drastic environmental conditions that definitively played a major role in their political, economic, social, and religious activities. The establishment of sophisticated urban dwellings, irrigation systems, ceremonial centers, and trade routes, represents a long legacy of complex human achievement within this area. However, continuation of traditional systems of life came to an end upon Spanish colonial contact and later conquest. Institution of strict hierarchal social and economic structures resulted in the demise of vast indigenous populations, leaving survivors to endure significant marginalization, while exclusively benefiting the Spanish Crown.

In addition to following standards of sex and age estimation, the sample consisting of 1,691 individuals, was scored for cranial modification. Unilateral and odds ratio analyses involved 923 individuals from eight different time periods and represented members of both elite and non-elite social classes. Results from both unilateral and odds ratio comparisons found a positive relationship between head shaping practices and social

complexity. As societies became more advanced in their development, the prevalence of cranial modification became more ubiquitous. The emergence of Spanish colonial presence changed this pattern, initially with a drastic decline in observations of head shaping, followed by near total disappearance of the practice altogether. This trend corresponded with Spanish ethnohistorical documentation outlining the denunciation and prohibition of the practice within New Spain.

Additional analysis revealed the tradition of cranial shaping was not dependent upon social class, as a comparison of elite and non-elite individuals revealed presence and absence of cranial modification were nearly identical. These results further indicated that the common custom of head shaping was more likely the outcome of childcare practices rather than ritualized traditions designated for select members of society. The combination of these findings supports the notion that cultures of the north coast, although familiar with influences from the south-central Andes, were not prone to the same ideological belief systems. Unlike cultural groups who intentionally practiced cranial modification to express specific ethnic affiliations, societies of the Lambayeque Valley Complex were highly distinctive in nature from the traditionally perceived cultures of the lower Andes. The purpose of cranial modification was absent of meaning, signifying that a single interpretation of Andean culture, better known as the *lo andino* concept, is both dismissive and inaccurate when applied broadly.

While the research presented in this thesis is solely a preliminary investigation of cranial modification in the Lambayeque Valley Complex, it also serves as an invitation to consider future opportunities for bioarchaeological research. Bioarchaeologists are

uniquely positioned to address a variety of other themes, such as the role of sex in determining variation in head shaping practices. Although initial tests of cranial modification from crude prevalence alone revealed higher levels of presence among women than men in the Lambayeque Valley region, are they statistically significant? If so, why? Deeper analysis worthy of consideration also includes a focus on left versus right bias in head shape. Collection of data related to bias may provide improved interpretation of specific cranial modification techniques by practitioners from the north coast and how these differences based on cultures and time period may then be compared with other regions of the Andes. Further research could also explain themes related to the indigenous body such as in Weismantel's (2015) study of the Moche. According to her interpretations, the Moche believed energies could escape and be recycled, in which an individual's head transmitted vitality to the community. Subsequent investigations involving the same sample could address themes of embodiment theory as well as expand insight into the overall beliefs associated with personhood. Therefore, it becomes apparent how additional research is critical, if for no other reason, to avoid drawing conclusions that lack important contextual details.

In conclusion, the evidence from this study finds that unique cultural differences existed among various Andean cultures and throughout time. The practice of head shaping was not representative of ethnic markers, nor did it involve highly engrained meaning associated with identity. Rather, this common practice was likely the result of cradle boarding, emphasizing the importance for context in order to accurately interpret and document human behaviors of the past.

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