TRAUMA FRACTURES AND THE BRUTALITY OF SPORT:

EXPLORING EVIDENCE OF GAMING

IN THE MISSISSIPPIAN SOUTHEAST

by

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ABSTRACT

This research speaks to the relationship between warfare and gaming as it pertains to the skeletal record. Here, gaming refers to the Native American stickball game that was the foundation for modern-day lacrosse. The Mississippian skeletal assemblages from Moundville and Koger's Island have different frequency rates of fractures. This research examines these inter-site frequencies by focusing on the relationship between site size and warfare and gaming. The protection and ample gaming space that a larger site provides suggests that individuals at these sites might have spent less time defending themselves and more time gaming. Individuals at smaller, less protected sites would have been more vulnerable to attacks and probably spent more time in battle. If this is true, Moundville, a larger site, would have a high frequency of trauma related to gaming in comparison to Koger's Island, a smaller site, which would have a high frequency of trauma related to warfare. Fractures from each site were examined and assigned a possible cause. Additional antemortem and perimortem factors were also considered when determining whether trauma was gaming or warfare related. The results indicate that while Moundville did present with a higher frequency of fractures related to warfare, there was no statistical difference between the two sites in regard to fracture location and type. Future research will incorporate multiple lines of evidence, including the stories and radiographs of modern Native American ballplayers, to understand even more clearly the risks involved in playing the ancient game.

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CHAPTER 1

INTRODUCTION

Mississippian Warfare and Fortification

The Mississippian period is said to extend chronologically from A.D. 1000 to the mid-1500s when contact with Europeans was recurrent albeit sporadic (Anderson and Sassaman, 2012:152). This period, describing the prehistoric and protohistoric Southeast, is typified by hereditary chiefs, ascribed status, social hierarchy, maize agriculture, and shared religious cults and iconography (Scarry 1996:13). The Mississippian archaeological record is rife with evidence of warfare including skeletal trauma associated with weaponry, fortifications such as moats and palisades, iconography illustrating trophy taking, and early historic accounts detailing intra- and inter-group violence (Anderson and Sassaman, 2012:160). During the Mississippian period, warfare and inter-societal violence was possibly caused and exacerbated by the race for political power and prestige. Both a product and a tool of this power struggle, warfare played a critical part in Mississippian emergence and expansion.

Traditionally defined chiefdoms and states, being large and characterized by a high degree of complexity and organization, are better positioned to protect themselves in comparison to smaller and less complex societies (Anderson and Sassaman, 2012:159). For example, continuous and heavy warfare may have been the primary motivation for smaller dispersed populations to coalesce into larger villages thereby creating a buffer zone between them and

neighboring villages (Dye, 2006). The Mississippian style of fighting was based around raids and ambushes, both small- and large-scale, carried out on hunting parties and fortified settlements; these attacks, being extremely quick and violent, were not a part of conquest warfare but meant to assert power over one's competitors by being able to affect their comfort and livelihood, sometimes eliminating it completely (Steinen, 1992).

While newly formed palisades functioned to protect recently established wealth and growing populations in the Mississippian period, these fortifications first and foremost served as a physical manifestation of elite power (Dye, 2006; Milner, 1999). These fortifications were only erected to protect the civic centers and frontier villages would have palisades for protection, whereas many farmsteads would not (Steinen, 1992). Here there is evidence for the differential treatment of individual groups along the social hierarchy. It would have been necessary for the hierarchical social structure of chief, noble, and commoner ranks to be reinforced for the chiefdom is to survive. Reinforcement is not one action, but a continuous stream of actions that are guided by strategy (Dye, 2006). One such strategy was violence. Mississippian warfare can therefore be seen as a chess match, a long-term game culminating in a loss, stalemate, or checkmate of a chief.

The problem of distinguishing between injuries caused by warfare and those caused by gaming is not an easy task. For instance, palisades are not necessarily evidence of increase violence but certainly illustrate an increase in fear of violence. Defensive architecture and settlement patterns may strongly suggest the presence of warfare however, the only direct evidence of gaming and warfare are the palpable osteological effects (Tung, 2007). Still, the archaeological evidence is invaluable in reconstructing the events leading to the injury as evidenced by the bone. The archaeology, iconography, and ethnohistory of the Mississippian

period indicate that war clubs were popular weapons during this time (Table 1.1). Injuries to the head and lower arm indicate that such a weapon was likely used (Bridges et al., 2000:59).

Table 1.1 Weapons Associated with the Mississippian Period and Culture (Dye, 2006:131)

Mississippian Period Weapons	Weapons as Pretige Items (made from copper, exotic stone, and copper-covered wood)
War Clubs (Sticks, Staffs, Swords, Hatchets)	Clubs
Flint Knives	Bifaces
Greenstone Celts	Maces
Bow and Arrow	Axes
	Celts
	Knives
	Arrow Points

Gaming as Precursor to Warfare

With violence so prevalent, gaming likely served as a training activity and precursor to warfare. But, while there is a clear understanding of the link between warfare and gaming among the well-documented Cherokee, this relationship in other Native American populations is relatively unclear. Many groups of the Southeast participated in a stickball game similar to lacrosse including the Cherokee**,** Choctaw, Muskogee, and Seminole (Vennum, 1994).

Warfare and gaming were often closely linked by both language and ritual. For example, the Cherokee name for lacrosse is *a-ne-tsó* or *na-wah'uwsdi'*, which translates to "little war" (Vennum, 1994:214). The word for lacrosse in many Algonquian languages contains a morpheme meaning “to hit”: *ba-ga’a-to-we* in Objibwe, *pe-ki’twe-win* in Pottawatomie, *pa:ka-ha-towe:wa* in Fox (Mesquakie), *pa-ka-ha-to-wan* in Plains Cree, *pa-ka-to-win* in Nippising, and *pa-ki-ta* in Kaskasia Illinois (Vennum, 2007:3). Oral histories with a focus on gaming testify to the institution’s importance in the lives of many Native Americans prior to contact and well

before the Jesuits in Huronia coined the term lacrosse in the early 17th century (Vennum, 2007). These legends inform the audience how to act "properly," as illustrated by the actions of mythical heroes, as well as teach the youth about the world around them (Vennum, 2007). The keepers of these oral legends, or tribal histories, are the tribes' "medicine men" (Vennum, 2007). In gaming, these revered and feared conjurers served as the team's athletic trainer and spiritual advisor and were thought not only powerful enough to prevent injury but bestow it on players of the opposite team (Vennum, 2007).

Based on historical accounts, Native American lacrosse was played on a field considerably larger than modern fields. There were no strict regulations to determine the distance between the two goals. Instead, the number of players participating helped determine the length of the field which one Miami Indian argued was a mile or two long; in most cases there were no marked sidelines. Fields were often constructed outside the palisade walls and next to a body of water where there was room enough to play and afterwards ritually cleanse oneself after "battle" (Vennum, 1994). On observing the preparations for a Choctaw ball game, George Catlin (1844:126) wrote

> During the afternoon, we loitered about amongst the different tents and shantees of the two encampments, and afterwards, at sundown, witnessed the ceremony of measuring out the ground, and erecting the "byes" or goals which were to guide the play. Each party had their goal made with two upright posts, about 25 feet high and six feet apart, set firm in the ground, with a pole across at the top. These goals were about forty or fifty rods apart; and at a point just half way between, was another small stake, driven down, where the ball was to be thrown up at the firing of a gun, to be struggled for by the players.

Catlin goes on to characterize the game as a dusty frenzy, with long periods of time struggling to find the ball on the ground. Intermittently, the ball would be captured by a player and tossed into the air down field (Figure 1.1). Catlin's illustrations reinforce the notion that, in the original native game, no safety equipment was used.

Figure 1.1 *Choctaw ball game depicting action when the ball is in the air*. George Catlin, 1844: Plate 225

Based on the sticks and balls used in the late 1800s and early 1900s, Vennum (2007) divides Native American lacrosse into three different regional categories: northeastern, Great Lakes, and southeastern. The defining characteristic of the southeastern style is the use of two sticks instead of one (Vennum, 2007). These sticks do for the arms what stilts do for the legs: they act more as extensions of the body than as tools themselves. Southeastern sticks are naturally lighter and more fragile than their Great Lakes counterparts because each stick is wielded by only one arm. These sticks were also minimally strung (Figure 1.2).

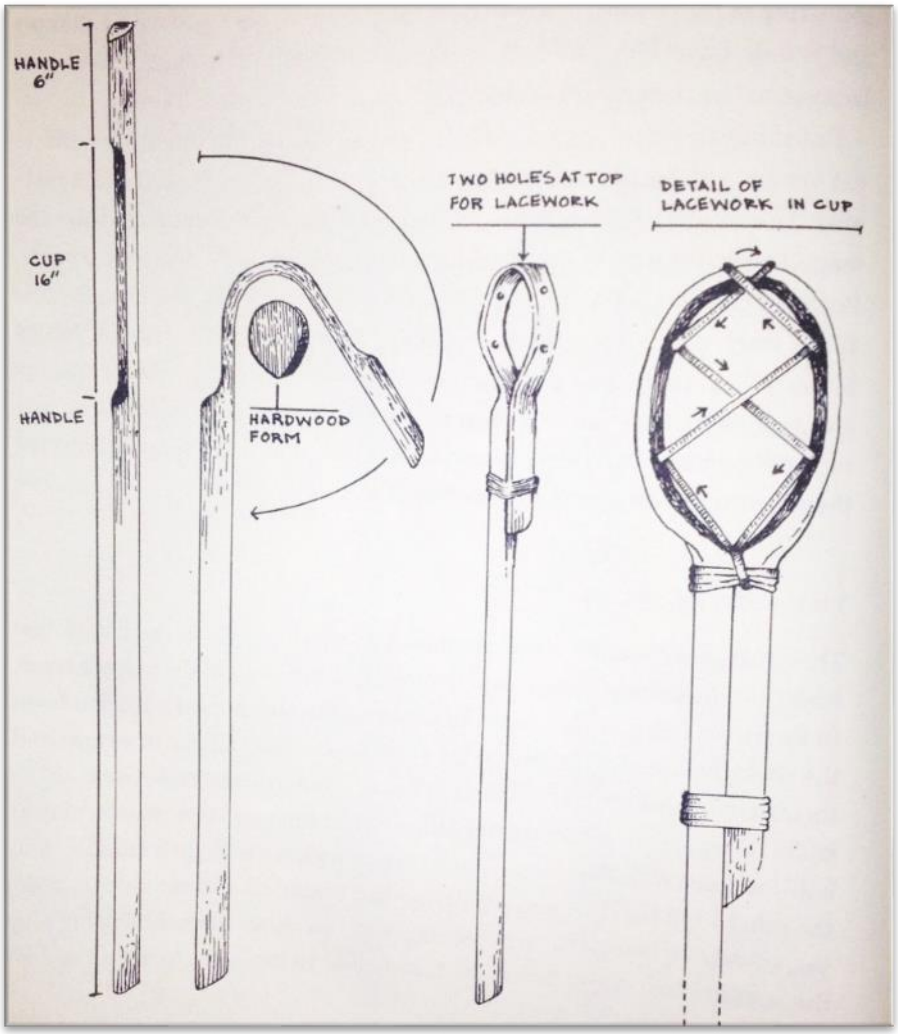

Figure 1.2 The Southeastern Stick as Drawn by Daphne Shuttleworth (Vennum 2007:26)

Vennum (2007) describes the techniques of historic southeastern play. The southeastern ball was traditionally small, light and made of animal skin or bark. It is, therefore, not difficult to see why the ball was on the ground during much of a southeastern ballgame. Ball visibility was low, allowing misdirection and trickery to figure largely into game tactics. Feigning possession of the ball, one player will take off away from the scuffle in the hopes of drawing defenders away from the real ball carrier. To pick the ball off the ground, a southeastern ballplayer relies on a pincer maneuver. The player secures the ball in-between the webbing of the two sticks by crossing his wrists and running with the sticks in the upward position in front of his chest. In this

style, there is no passing in terms of intention and accuracy, though a ball may be gotten rid of using an overhead throw if the ball carrier is under pressure and in danger of losing possession. In viewing a Creek ballgame in 1829, Captain Basil Hall described the chase of a player free from the scrum:

> At length, an Indian more expert than the others, continued to nip the ball between the ends of his two sticks, and, having managed to fork it out, ran off with it like a deer, with his arms raised over his head, pursued by the whole party engaged in the first struggle. The unfortunate youth was, of course, intercepted in his progress twenty different times by his antagonists, who shot like hawks across his flight from all parts of the field to knock the prize out of his grasp, or to trip him up—in short, by any means to prevent his throwing it through [the goal] (Vennum, 2007:29).

The southeastern style of lacrosse is no exception to the rule. These native games were very physical; it was a contact sport. On joining a practice session of the Eastern Cherokee, anthropologist Raymond Fogelson found out the hard way how much endurance it takes to play a game largely made up of high-intensity close-hold play peppered with long-winded sprints (Vennum, 2007).

Modern Analogs for Mississippian Lacrosse

Information on modern men's lacrosse injuries provide a good starting point for distinguishing between trauma fractures caused by war and those caused by gaming. Generally speaking, injuries that occur above the waist tend to be caused by a direct force from an opponent, stick, or ball. Lower body injuries, on the other hand, usually occur in the absence of a direct force and are the result of pivoting or twisting (Bach and McColloch, 2007). However, modern lacrosse is not a perfect parallel case. Many of the more physical maneuvers permitted in past play are now considered illegal in modern day lacrosse such as tackling, tripping, charging,

ramming, slashing, and striking with the stick. Some past injuries were even the result of more deliberate acts fueled by hurt feelings or personal grudges and led to all-out brawls between teams (Vennum, 1994).

Both US Lacrosse and the NCAA require each player to wear a circumferential helmet, full facemask, mouth guard, four-point chin strap, non-cantilevered shoulder pads, arm pads, and padded gloves (Bach and McColloch, 2007). It is probable that these areas, padded and protected today, had a high frequency of injuries in the past, making it important to note the absence of injuries likely prevented by the invention of new rules and regulatory safety equipment. These protected locations are just as important to the study of prehistoric gaming as the locations of commonly occurring modern lacrosse injuries.

Sometimes, even new equipment standards are not enough to prevent injury. Silloway et al. (1985) found that clavicular fractures and acromioclavicular joint dislocations were common injuries in male high school lacrosse players in the Charlottesville area of Virginia despite the protective equipment donned. They noted that these injuries occurred in attacking players when they were checked by defensive players who were trying to stop the offensive rush. Of the four case studies which occurred in a 14 month period, three involved midclavicular fractures (Silloway et al., 1985).

CHAPTER 2

BACKGROUND

Site Background

This research examines what the skeletal record can tell us about the relationship between site size and warfare or gaming. Specifically, the emergence of a fracturing pattern will help clarify the contexts in which violence asserts itself in Mississippian societies. Located in west-central Alabama, Moundville (1TU500) is a large Mississippian site with ample gaming area next to the Black Warrior River (Figure 2.1). Initial excavations were completed by C.B. Moore in 1905 and 1906, but the location for a large majority of these burials is not known (Bridges et al., 2000). Further excavations from 1932 to 1941 yielded the collections from which this research sampled. It is important to note that this collection is biased by poor preservation and judgements of the "interestingness" of a burial in regard to whether it should be excavated and whether it should stay in the collections (Bridges et al., 2000).

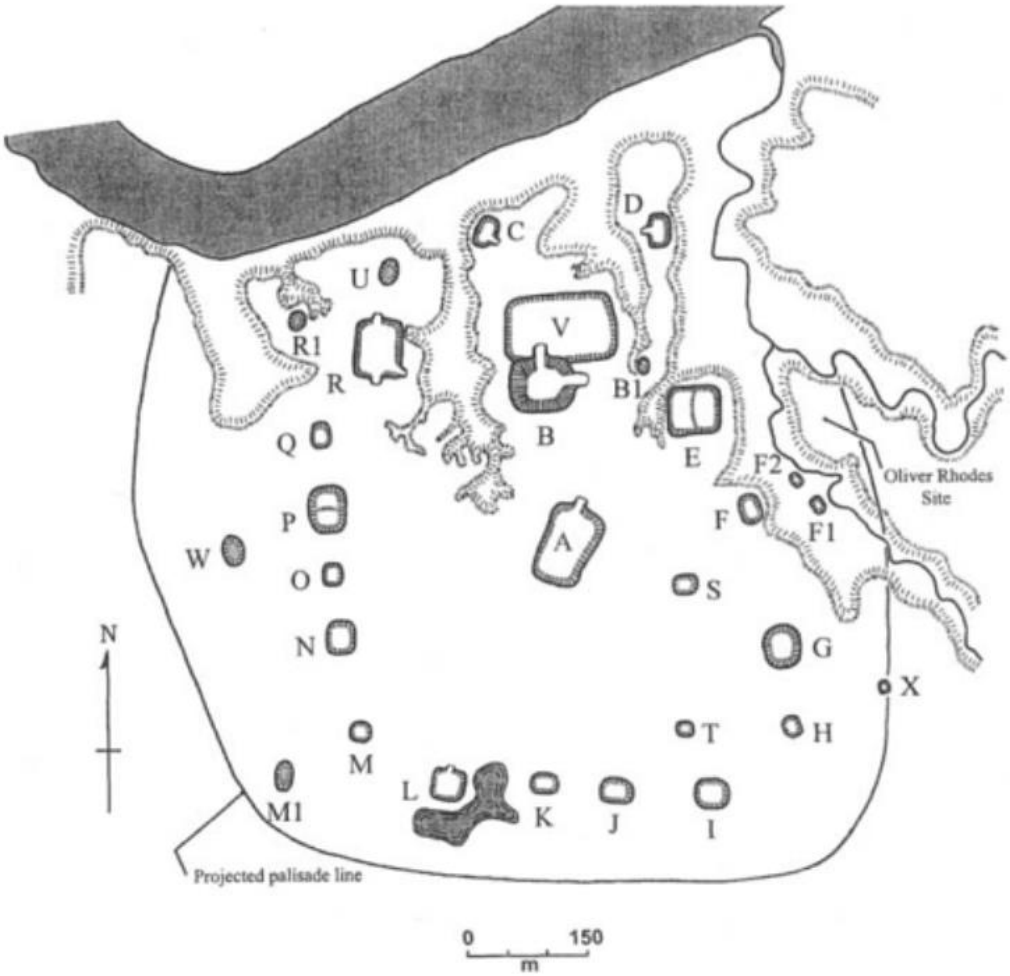

Figure 2.1 Map of Moundville (Knight and Steponaitis, 1998: Figure 1.1)

Moundville is also a site largely devoid of direct evidence of warfare (Bridges et al., 2000). Moundville and other similarly sized sites had palisades that were 10 feet high, a substantial fortification able to withstand large scale attacks (Steinen, 1992). The first palisade at Moundville was built around A.D. 1200 and endured roughly six reconstructions over the course of a century (Knight and Steponaitis, 1998). This palisade system was made of curtain walls connected by bastions at every 35 to 40 meters, with each 4 meter wide bastion projecting out from the curtain wall for 7 meters (Vogel and Allan, 1985:63). It was previously thought that Moundville does not have any confirmed cases of death by violence, a statistic typifying the

protective nature of large and well-defended sites during this time (Bridges et al., 2000:56). Recent research has augmented this reality with the discovery of an individual, burial 2548, a 20-30 year old female showing evidence of scalping (DeVore, personal communication). Previous comparative research still holds that mortality due to violence is variable from site to site during the Mississippian period, as are the frequencies of types of injuries observed (Bridges et al., 2000).

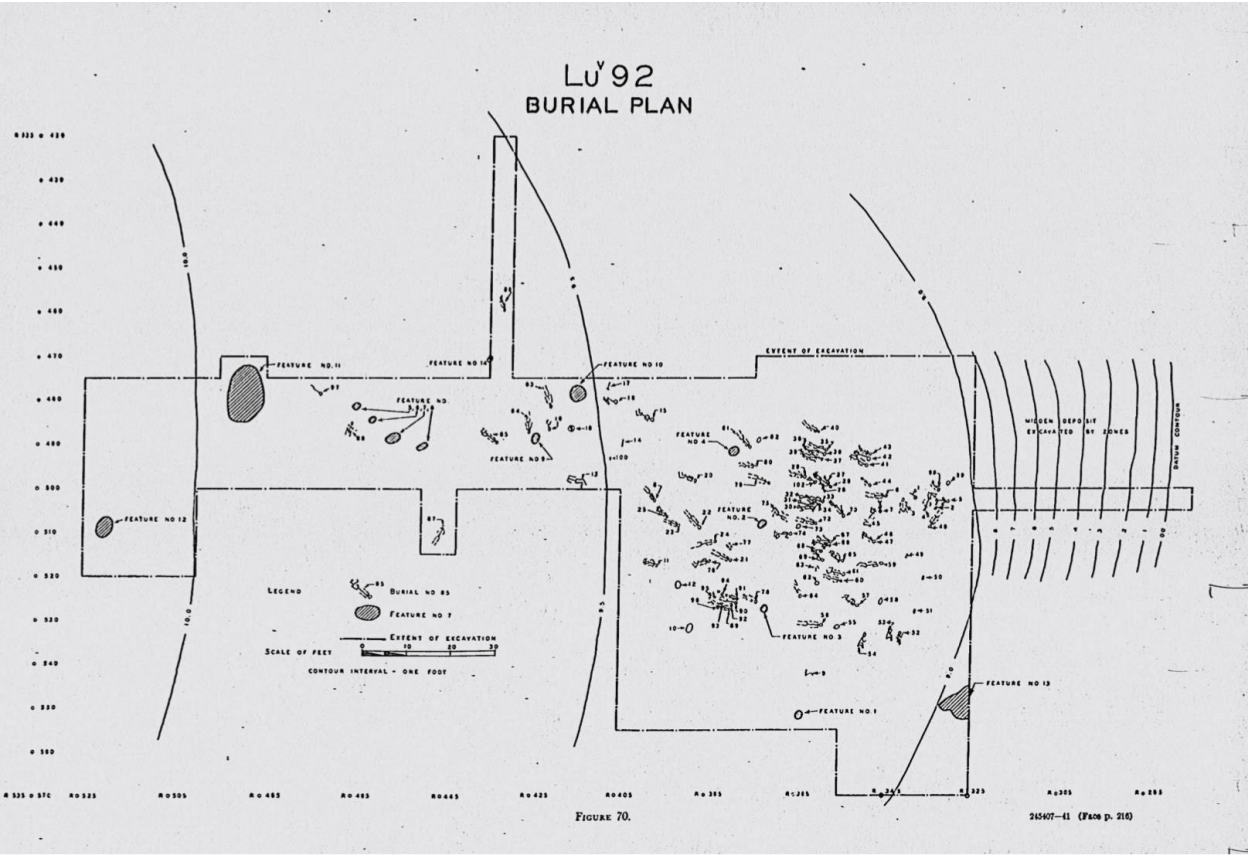

Figure 2.2 Map of the Cemetery at Koger's Island (Webb and DeJarnette, 1942:216)

The second site of this research is Koger's Island (1Lu92), a village and cemetery site located in Northwestern Alabama on the Tennessee River's eastern bank (Figure 2.2). Only when the water levels are high is the site completely cut off from the mainland (Webb and DeJarnette, 1942). The cemetery was excavated in the 1930s by the WPA in anticipation of the construction

of the Pickwick Reservoir. Although there was a midden on site, it was not excavated and that information is now lost. Therefore, when interpreting Koger's Island an emphasis has been placed on the skeletal remains and burial goods (Bridges et al., 2000). A mid-sized Mississippian site, Koger's Island presents with high mortality mainly due to upper-body and cranial trauma fractures thought to be the work of hand-to-hand combat with war clubs rather than bow-and-arrow technology (Dye, 2006; Bridges et al., 2000). In general, the cause of violent mortalities are a reflection of site size and defensibility; small Mississippian sites have higher mortality rates attributed to bow and arrow technology in comparison to mid-sized Mississippian sites which have higher mortality rates due to hand-to-hand combat techniques (Bridges et al., 2000). Koger's Island's location was its main line of defense and, much like Moundville's palisades, served to protect its residents from attacks using bow and arrow technology (Bridges et al., 2000) Still, warfare was a constant in the lives of mid-sized Mississippian societies in the Pickwick Basin along the Tennessee River Bridges (Bridges, 1996). This point is never more salient than at Koger's Island where 20% of the individuals recovered (22 out of 108 total) were found in four mass graves, many presenting with evidence of scalping (Bridges et al., 2000).

Research Goals

To restate, it was proposed that subjects at larger sites spent less time fighting and more time playing war-like games due to the presence of palisades and the space necessary to house a ball field. In gaming, through physical maneuvering and infliction of injury, the object is to slow down your opponents, not kill them. Based on this assumption, it was predicted that, in comparison to the smaller Kroger's Island, the Mississippian skeletal record at Moundville will contain a lower percentage of fractures overall with a higher percentage of those fractures

remodeled. However, fractures can occur in warfare without being accompanied by death and this was often the case in prehistoric Alabama beginning in the Middle Archaic period (Bridges et al., 2000). It is also possible, albeit uncommon, for a player to die during a ballgame. The potential deadliness of gaming is apparent in notes taken by W.O. Tuggle in the late 1800s indicating that four Creek players had died from a single match, a match so tenacious that the rest of the players needed at least a month to recover from the injuries they sustained (Tuggle, 1973). These injuries were likely fractures, considering the time it took players to heal. Due to the inability to use immediate mortality to completely separate warfare and gaming injuries, this research will use the location and type of traumatic fracture to infer causation. Violence-related mortality can be inferred through the presence of embedded points in unhealed bone, unhealed perimortem fractures, partially healed scalping cut marks, and internment in mass graves (Bridges et al., 2000). Researchers who opt for a more forensic view of the bioarchaeological record have suggested ways in which "homicide" cases can be unearthed archaeologically (Spencer, 2012). Likewise, this research holds the perspective that intent can be gleaned from fracture evidence and will utilize corroborating evidence to understand the nature of each fracture (Table 2.1).

Table 2.1 Hierarchy of Variables and Their Determined Association with Warfare or Gaming

Level of Importance in Classification	Variable	Associated with Warfare	Associated with Gaming
Primary	Location	Head and Lower Arm	Clavicle and Lower Leg
Secondary	Type	Oblique fracture to the distal ulna (Parry Fracture)	Transverse fracture of the spinous process (Clay Shoveler's Fracture), Transverse fracture of the hook of the hamate*
Teritiary	Sex		Male
	Age		Adolescent, Young Adult, Middle Adult
	Burial Association	Burried with Multiple People	
	Fracture Count	Multiple Fractures	
	Presence of Remodeling	No	
	Evidence of Scalping	Yes	
	Evidence of Dismemberment	Yes	
	Embedded Points	Yes	

CHAPTER 3

MATERIALS AND METHODS

The initial description of the Koger's Island burials was completed by Webb and DeJarnette (1942). More in depth analysis was undertaken by Patricia Bridges from the late 1980s to the early 1990s (Bridges, 1996). For these most recent records, age and sex were determined using standard methods (Buikstra and Ubelaker, 1994). The initial analysis of the Moundville burials were examined by Mary Lucas Powell (1988) and have since been looked at and reanalyzed by many University of Alabama students and researchers in osteology lab. Likewise, age and sex for these most recent records were determined Powell and students using standard methods (Buikstra and Ubelaker, 1994). During the analysis stage of this research, an inventory of all the remains housed in the Osteology Laboratory was being completed by the University of Alabama Office of Archaeological Research (OAR) with help from undergraduate and graduate students at the University of Alabama. Where possible, I included this new data in with my analysis.

Out of 108 total burials at Koger's Island, 47 presented with traumatic fractures. All 47 of these burials were examined for location, type, and cause. At Moundville, 124 out of roughly 1500 Mississippian burials available for study exhibited traumatic fractures. Due to time constraints, this research opted to have comparable sample sizes in terms of skeletal remains. Therefore, 50 of the 124 Moundville subjects presenting with fractures were randomly selected using a random number chart (Drennan, 2010).

Archaeological site (Moundville, Koger's Island) was the independent nominal variable in this research and, one site being large and the other small, served as a proxy to mark the presence or absence of palisades and ball fields. Trauma fractures from each site were examined and assigned a possible cause (warfare, gaming, warfare/gaming, or unknown) based primarily on fracture location. The "unknown" category was used for fractures that were more attributable to accidents, whether that be a stubbed toe or a fall from a high place. The body was mainly subdivided by bone with a few exceptions: cervical, thoracic, lumbar, and sacral vertebra as well as ribs were not broken down by number. These categories were collapsed into larger body regions during statistical analysis. Due to the deterioration of these remains, it is often difficult to determine the exact order of the bones in these areas. It was determined that a lack of specificity in these areas was acceptable. When possible, the specific rib or vertebrae number was noted.

Specific locations were coded for cause. The head and lower arm would have borne the brunt of assaults indicative of warfare due to the lethal force of skull fractures and the defensive posturing of parry fractures (Figure 3.1). The ribs, upper arm, metacarpals, and upper leg regions were areas that would show wear and tear from both war and gaming. The clavicle and lower leg would have collected types of injuries considered indicative of gaming due to upending, checking, and slashing movements in lacrosse (Figure 3.2).

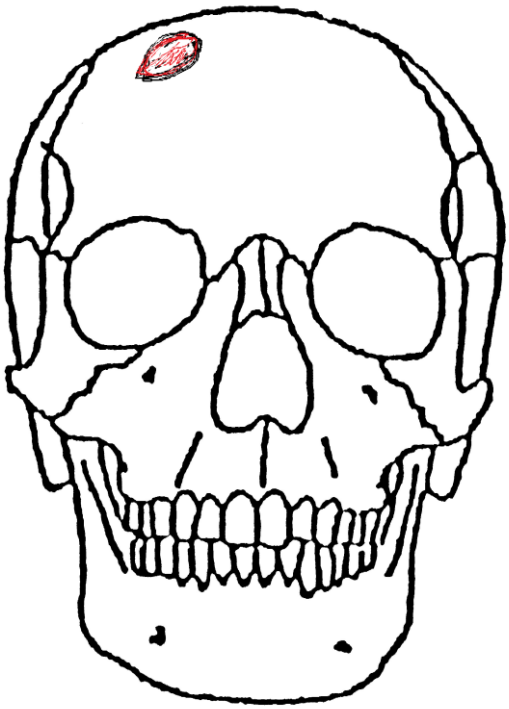

Figure 3.1 Fracture of the Frontal Bone of Sk 94 from Koger's Island, Typical Injury of Warfare

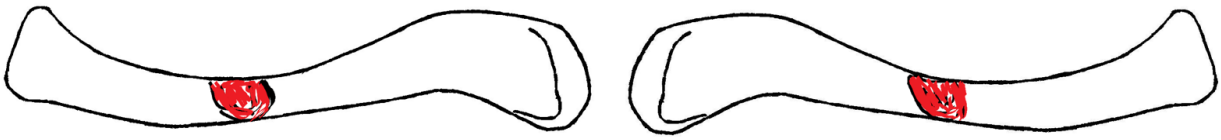

Figure 3.2 Fractures of the Left and Right Clavicle (in Superior View) of Sk 16 from Koger's Island, Typical Injury of Gaming

Secondarily, fracture type was assessed macroscopically using a combination of sources. Rockwood et al.'s (1991) guide to fracture type by mechanism (tapping, crushing, penetrating, traction/tension, angulation, rotational, compression, and combination) was found to be useful. These categories have been reinforced in subsequent research, including Lovell's (1997) review of trauma analysis in anthropological contexts. Galloway (1999) was used to understand how different types of fractures manifest in specific areas of the body. The fracture type categories used included: transverse, oblique, short oblique, spiral, butterfly, crush, depression,

compression, chip, hairline, and unknown. The identification of fracture type naturally leads to an understanding of the mechanism involved which thus allows for a ruling to be made on the injury's cause (Lovell, 1997).

After initial assessment of fracture cause based on location and type, the final determination rested with a more holistic approach to skeletal trauma. Tertiary factors including sex, age range, burial association, number of fractures, and the presence or absence of bone remodeling, scalping, dismemberment, or embedded points weighted the initial determination of cause. These tertiary factors are important when deciding the nature of a fracture because they place the fracture in the correct context. Ultimately, when doing skeletal analysis we are looking at an individual, a body. This point is particularly salient considering the coordinated movement needed in warfare and gaming.

To assess the statistical significance of the differences in fracture patterns presented at each site, chi-square tests were run on the primary and secondary variables as well as the resulting determination of cause. The p-value adhered to in this research was .10 due to a small sample size.

CHAPTER 4

RESULTS

The skeletal sample for this study was selected from two Mississippian sites: Koger's Island (1LU92) and Moundville (MSM). Fractures for (N_1=97) individuals were examined, of which 47 were from Koger's Island with the remaining 50 from Moundville. Overall, (N_2=158) fractures were examined from these two sites, 92 from Koger's Island and 66 from Moundville. See Appendix for complete results.

Primary Variable

A majority of the fractures studied were rib fractures, 17.7% (n=28), followed by tibial and fibular fractures, each 10.1% (n=16), and ulnar fractures, 9.5% (n=15). Less common were radial fractures, 5.1% (n=8), clavicular and femoral fractures, each 4.4% (n=7), humeral fractures, 3.9% (n=6), and fractures of the frontal, parietal, and metatarsal 5, each 3.2% (n=5). The remaining fractures occur throughout the body with a frequency less than or equal to 3.

When combining fractures from both sites, you can see that rib fractures dominate the sample. There are also high frequencies of upper and lower extremity fractures. To run a chi-square, the variable fracture location was first collapsed into the following categories: head, torso, arms, legs, and hand/foot. There was no difference for location of fractures between the two sites (p=.359). The variable of location was secondarily collapsed into these different

categories: head, torso, upper extremities, and lower extremities. The results were similar (p=.268).

Secondary Variable

The most frequent fracture types were crush and transverse, at 15.8 % (n=25) and 14.6% (n=23) respectively. Short oblique, depression, and oblique fractures were also common at 10.8% (n=17), 10.1% (n=16), and 8.9% (n=14) in that order. Compression, spiral, hairline, chip, and butterfly fractures were less common with a frequency of 5 or lower. Fractures of unknown type made up 31.6% (n=50) of the total population.

When looking at the overall frequency of determinable fracture types, crush and transverse fractures were most common, closely followed by short oblique and oblique fractures. When site differences were analyzed for type of fracture the p-value was .821. This was only in regard to transverse, oblique, short oblique, crush, and depression fractures. Spiral, butterfly, compression, chip, hairline, and unknown fractures were not taken into account because they all had a cell count of less than 5.

Tertiary Variables and Contributing Details

Overall, males made up a slight majority of the population at 41.2% (n=40), followed closely by females at 38.1% (n=37). The remaining 20.6% (n=20) of the population was of indeterminate sex. For Koger's Island, 51.0% (n=24) of the sample population was male, 44.7% (n=21) was female, and 4.3% (n=2) was of indeterminate sex. In comparison, the sample population at Moundville was 32.0% (n=16) male, 32.0% (n=16) female, and 36.0% (n=18) indeterminate.

In regard to age group, the total population was 2.1% (n=2) child, 7.2% (n=7) adolescent, 38.1% (n=37) young adult, 36.1% (n=35) middle adult, 5.2% (n=5) old adult, and 11.3% (n=11) unspecified adult. For Koger's Island, 4.3% (n=2) of the sample population was child, 2.1% (n=1) adolescent, 48.9% (n=23) was young adult, 36.2% (n=17) middle adult, 6.4% (n=3) old adult, and 0% (n=0) unspecified adult. The sample population at Moundville was 0.0% (n=0) child, 12.0% (6) adolescent, 28.0% (n=14) young adult, 34.0% (n=17) middle adult, 4.0% (n=2) old adult, and 22.0% (n=11) unspecified adult.

Of the total population, 78.4% (n=76) of individuals were not associated with another burial, 17.5% (n=17) of individuals were associated with burials also exhibiting traumatic fractures, and 4.1% (n=4) of individuals were associated with burials not exhibiting traumatic fractures. Most of the individuals with associated fracture or fracture-free burials were found in the Koger's Island sample. Of the Koger's Island individuals examined, 57.5% (n=27) had no associated burials, 34.0% (n=16) were associated with fracture burials, and 8.5% (n=4) were associated with fracture-free burials. Of the Moundville individuals examined, 98.0% (n=49) had no associated burials, leaving only 2.0% (n=1) that were associated with fracture burials.

At 70.1% (n=68), a majority of the total population had a total fracture count of 1. Individuals presenting with 2 fractures at 9.3% (n=9), individuals presenting with 3 fractures at 13.4% (n=13), individuals presenting with 4 fractures at 5.2% (n=5), individuals presenting with 5 fractures 1.0% (n=1), and individuals presenting with 8 fractures at 1.0% (n=1) round out the sample. Koger's Island had a higher frequency of individuals with multiple fractures than the total population. For this sample, individuals with 1 fracture made up 55.3% (n=26), individuals with 3 fractures made up 17.0% (n=8), individuals with 2 fractures made up 14.9% (n=7), individuals with 4 fractures made up 10.6% (n=5), and individuals with 8 fractures made up

2.1% (n=1). At 84.0% (n=42), Moundville had a very high frequency of individuals with only 1 fracture. Only 4.0% (n=2), 10.0% (n=5), and 2.0% (n=1) of Moundville individuals had 2, 3, and 5 fractures respectively.

Only 8.2% (n=8) of the total population showed evidence of scalping. Most of these scalped individuals came from the Koger's Island sample, which was 14.9% (n=7) scalping cases, in comparison to the Moundville sample was made up of 2.0% (n=1) scalping cases. Similarly, 4.1% (n=4) of the total population exhibited evidence of dismemberment. All of these cases came from the Koger's Island sample, which presented with 8.5% (n=4) dismembered individuals.

At 96.8% (n=152), most fractures examined showed signs of remodeling. Fractures did not strongly favor either side of the body with 43.0% (n=68) of fractures located on the left side of the body and 41.1% (n=65) of fractures located on the right side of the body. Only 5.7% (n=9) of fractures were located on the axial column, leaving 10.1% (n=16) located on an unknown side.

Possible Cause of Fracture

Warfare was the most prevalent cause attributed to fractures with 50% (n=79). Fractures caused by either warfare or gaming made up 28.5% (n=45) of the total population (N=158). Gaming was the cause of relatively few fractures at 12.7% (n=20). A small percentage of fractures could not be determined for cause at 8.9% (n=14). At Koger's Island, 53.3% (n=49) of fractures were caused strictly by warfare, 30% (n=28) by gaming or warfare, and only 6.5% (n=6) strictly by gaming. The corresponding percentages for Moundville were 45.5% (n=30) warfare, 21.2% (n=14) gaming or warfare, and 25.8% (n=17) gaming. Therefore, there was a difference observed between the two sites in terms of possible cause (p=.057) (Table 4.1).

Table 4.1 Frequency of Trauma Fractures Related to Gaming at Moundville and Koger's Island (p=.057)

	Warfare	Warfare or Gaming	Gaming	Undeterminable
Koger's Island	53.3 %	30 %	6.5 %	10.2 %
Moundville	45.5 %	21.2 %	25.8 %	7.5 %
Overall	50 %	28.5 %	12.7 %	8.9 %

CHAPTER 5

DISCUSSION

The chi-square analysis for cause of fracture confirming the hypothesis: Moundville has a higher frequency of trauma fractures related to gaming than Koger's Island and Koger's Island has a higher frequency of trauma fractures related to warfare than Moundville. However, the two chi-squares for fracture location and fracture type returned a high p-value indicating that, in terms of these two variables, the inter-site differences are insignificant. These results suggest that the primary and secondary variables chosen to determine a fracture's cause might not be precise indicators but accurate ones. As stated by White and Folkens (2005:360), "accuracy is the degree to which an estimate conforms to reality. Precision is the degree with which an estimate is made." Fracture location and type are broad indicators of fracture cause, with refinement coming from tertiary variables. Still, it would not be wise to judge the usefulness of these variables just yet. The categories for both fracture location and fracture type are initially very large. However, it was necessary to collapse these categories multiple times to run a chi square test. In doing so, the inter-site variation of these variables might have been lost. For instance, a fracture of the metacarpal is vastly different from a fracture of the humerus and yet, for a chi-square, these injuries would have been lumped under the umbrella term upper extremity. With warfare and gaming already so inextricably linked in the skeletal record, we need to keep as much of the minute detail as we can if we hope to discern a difference between their effects. For this reason, research of this nature would greatly benefit from a much larger sample size.

Initially, in examining the skeletal record for evidence of gaming, it was believed that the essential question was one of intent. If gaming was a precursor to warfare, what separated them was the intent behind the violence. In going to war, the object was to kill; in playing a game, the object was to injure or at the very least impede. For this reason, it was hoped that the evidence of remodeling would be a large factor in determining whether a traumatic injury occurred through gaming or warfare. If a fracture showed no signs of remodeling, then it happened around the time of death and is likely evidence of an attack. However, only 3.8 % of the total number of fractures examined showed no signs of remodeling. This could have three implications: 1) that warfare was not as deadly as previously thought, 2) most deaths in warfare did not involve trauma fractures, or 3) there was less incidence of warfare during the Mississippian period than previously thought. With the first option seeming most probable, signs of remodeling were moved to tertiary importance during analysis.

Furthermore, Moundville might have been a problematic site for this study. Looking at midden deposits over time, specifically the number of sherds, the size of Moundville's resident population can be inferred. It seems that Moundville's resident population was highest around AD 1050 and AD 1300. Afterwards, the population declined. However, it was during this time that burials increase. It is now believed that from AD 1300 to AD 1550 Moundville was home mostly to elites and served as a ritual site where those from regional settlements would bring their dead for burial (Knight and Steponaitas, 1998). Powell did a diachronic study of the health of those buried at Moundville in 1998 and showed that, whatever the reason for population dispersion after phase I, moving from the center to the outstretches of the Black Warrior Valley produced a positive change in health (Powell, 1998). There was less evidence of dietary stress, overcrowding, and social trauma in the later burials. Perhaps, despite these ubiquities,

Moundville is the perfect foil for smaller Mississippian sites. If Moundville's influence was strong enough to cast protection over these hinterlands, we would expect less traumatic fractures from warfare. Also, in considering Moundville a regional ritual site, then it would not be a stretch to assume that it was also a site for gaming which has a strong ritual component. In the future, this research will be expanded to include remains from Mississippian sites of various sizes throughout the Southeast. It will be important to see if there are differential frequencies of traumatic fractures at sites of different sizes and fortifications and if these disparities can be explained by the varying degrees of gaming and warfare taking place at each site.

The methods here form the basis of a new classification system, one which, although useful, has its flaws. For example, Koger's Island burial 101 A exhibited at least eight different traumatic fractures. Three out of the eight fractures occurred in what are considered gaming locations. The initial determination of cause for these three fractures was gaming. However, burial 101 A is a female with evidence of scalping and dismemberment. This tertiary evidence suggests that this woman was caught in very serious intra- or inter-site violence. One leading theory is that the deaths of both her and her child were due to corporate punishment for adulterous acts (DeVore and Jacobi, personal communication). The final cause was recorded as warfare/gaming. While the intent behind each of these three injuries was skewed toward warfare, the possibility of these injuries being gaming related was not ruled out completely.

This example typifies the conservative nature of this system which allows for whole body interpretation (sex, scalping, and dismemberment) without discounting fracture specific analysis (fracture location and fracture type). Still, extreme cases like burial 101 A might be misidentified because the system, as it stands, does not take into account the strength of multiple tertiary variables. If only one of these three tertiary variables were present, the initial determination of

cause would have been skewed in category toward warfare. One solution would be to move one category towards warfare for every tertiary factor present. Perhaps, the category of cause could be expanded to act more like a spectrum would allow for more fine tuning by variables such as sex, scalping, and dismemberment.

Perhaps the most important revision this classification system could receive is a more nuanced understanding of the injuries involved in gaming and warfare. The task of interpretation is made easier when there are artifacts associated with the cause of such aberrations. Access to war clubs and gaming sticks housed in museums and private collections could contribute to identifying the cause of unhealed, and possibly partially healed, depression fractures if permission to take molds of the places of contact could be acquired. This research did measure the length and width of depression fractures but there was not a large enough sample size to see if measurements of this sort would prove insightful. Still, very little material remains of gaming equipment and apparel have preserved (Vennum, 2007). Gaming sticks were made of hickory or ash wood and webbed with rawhide, while balls were made of rawhide, wood, or baked clay (Vennum, 2007). Most of these artifacts have long since deteriorated and decomposed. The archaeological evidence of for southeastern weaponry is equally unclear. Bridges (1998) suggests that this opacity might be due the quickness with which bows and war clubs were replaced by new technologies such as guns and tomahawks after contact with Europeans. Studies involving the morphology of antemortem and perimortem cranial injuries could prove paramount to the description of weaponry and lead to a more comprehensive understanding of violence and warfare (Bridges, 1998). Informed by historic records, Bridges (1998) proposes that a hafted ground stone axe might have produced two of the healed cranial fractures discovered at Koger's

Island and that a third injury, an unhealed cranial fracture with unique morphology, was possibly the work of a bone or stone studded club.

Some sticks do show up from time to time in antique shops; it is even rumored that Roy Simmons Jr., former coach of the Syracuse men's lacrosse team, has built up quite a collection of antique Iroquois sticks by sifting through garage sales (Vennum, 2007). Even these few surviving sticks bring up questions of continuity and standardization. As it stands, the first stick illustration and the oldest museum pieces only date back to 1790 and the 1820s respectively (Vennum, 2007). While the game was conceivably played for centuries before contact, once Europeans arrived the game would never be the same. The newcomers appropriated the basic principles of the game, renaming it lacrosse. Native Americans, on the other hand, utilized European technology in playing the game as they always had (Vennum, 2007:9). For example, Native Americans began using metal nails and a steel-plated fulcrum to form sticks (Vennum, 2007). While these changes do not call into question the *authenticity* of post-contact sticks, they do serve as a reminder that even the oldest antique sticks are at least subtly different than pre-contact sticks. In regard to standardization, the Native American stick, much like the war club, was subject to personal taste in decoration (Vennum, 2007). Sticks were also customized for preference and performance. It is unknown to what degree this variation in decoration and, to a smaller degree, form would play in any depression fractures left on opposing players. An interesting area of research would be to test the standardization of shaft morphology of antique lacrosse sticks. If these sticks have relatively standard morphologies, then perhaps the pre-contact sticks were equally standardized. This is, however, unlikely. Historically speaking, the making of a gaming stick was a general skill wherein a player would use the proportions of his

body to make a stick that meets his physical needs (Vennum, 2007). It was also not uncommon for length to vary in association with the player's preference or position (Vennum, 2007).

Some have looked to oral histories to shed light on gaming. Vennum (2007) analyzes thirteen gaming legends and places them in seven different places on a map roughly corresponding to reservations (Figure 5.1). These legends were recorded in the late 1800s and early 1900s, a time when Native American culture was largely federally circumscribed to reservations. It may be clear that the baseline of such narratives is entrenched in pre-contact ideology, but the details have been shaped over time through contact with Western culture (Vennum, 2007). It should also be noted that these legends were recorded by anthropologists and folklorists who often made use of a translator (Vennum, 2007). The subsequent legend is a product of at least three interpretations: the storyteller, the translator, and the recorder. Ultimately, while the proliferation of these gaming narratives attest to the importance of this institution in the ritual lives of these cultures they can also have deleterious implications for understanding the actual techniques employed in a ballgame.

Figure 5.1 Map Illustrating the Places Where Lacrosse Legends Were Translated or Written Down in the Late 1800s and Early 1900s. Map by Bill Nelson, After a Map Drafted by Lewis T. Moran (Vennum 2007:14)

For example, the vignette about rabbit-leg potion mentioned above is part of a larger collection of legends Vennum (2007:20) dubs "animals as star players." In one such legend titled "The Cherokee Ball Play," which was originally recorded and published by James Mooney in 1890, describes a game where the animals play against the birds (Vennum, 2007; Mooney, 1890). The legend uses the common attributes of each animal and bird to indicate what skills would be valued in a ball game (Vennum, 2007). The deer's main attribute is speed. The terrapin can take hits from opponents' sticks with ease and bulldoze his way to glory. The birds, on the other hand, have quick reflexes and the ability to fly, which allows them to evade their opponents and avoid hazardous play. The teams seem evenly matched until the flying squirrel and bat join the birds. These two animals emerged as star players through their ability to keep the ball in the air and away from the animals on the ground. Versions of this legend are told throughout the Southeast which suggests that the key to victory in this region's version of the ballgame is skillful airplay. However, this is unlikely because early ethnohistoric records and illustrations such as those by George Catlin indicate that the southeastern game was played with two sticks and that the ball was on the ground a majority of the time (Vennum, 2007).

Modern-day lacrosse gave this research a starting point for comparison. It was chosen for the ways in which it is different from the original Native American game. This preliminary comparison was expedient. Clear rules and strictly defined safety equipment are most likely a direct result of the need to prevent injury. However, modern day lacrosse is not the best analog available. There are some today that still play the old game by rules handed down from generation to generation. This is particularly salient for those of the Southeast. This two-stick style is the only native lacrosse version with some semblance of continuity. Today, the game is played in Oklahoma, due to federal relocation in the 1830s, and throughout the Southeast by the

Cherokee in North Carolina and the Choctaw in Mississippi (Vennum, 2007). This research will be expanded to include ethnographic methods and participant observation to understand the mechanics behind injuries associated with the old game. The future of this research rests on creating a network of modern ballplayers. Through the stories they tell and possibly the x-rays they share, a clearer understanding of the biological implications of gaming within Native American culture will be gained.

A potential product of this continued research is a database of gaming injuries. Two possible examples of specific gaming related fractures were found in this investigation: the fracture of the hook of the hamate and the fracture of the spinous process of a vertebra (Figures 5.2 and 5.3). This particular hamate fracture is a known sports injury that occurs when an individual falls on a wrist in dorsiflexion (Galloway, 1999:151). The few spinous process fractures found in this research could be what's known as a clay shoveler's fracture. This fracture was named for the injury that occurs when clay sticks to the shovel blade (Galloway, 1999:94). A similar scooping and throwing movement occurs in lacrosse and the unforeseen pressure of an opponent's stick could pose the same amount of injury-producing force as stuck clay. Such fractures might be more common in skeletal remains from the Great Lakes or northeastern regions where the style of the stick allows players to more easily "shovel" or "scoop" the ball (Vennum, 2007:28). Ultimately, it will take multiple lines of evidence to get into the minds of people of the past and understand the intent behind each fracture.

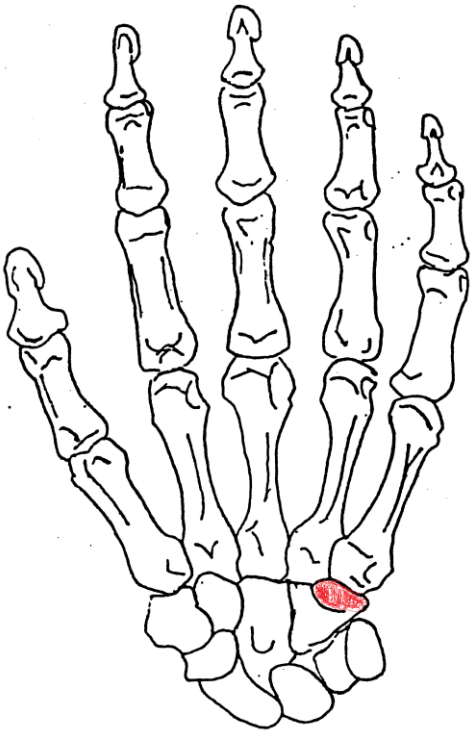

Figure 5.2 Fracture of the Hook of the Hamate of Koger's Island Sk 15

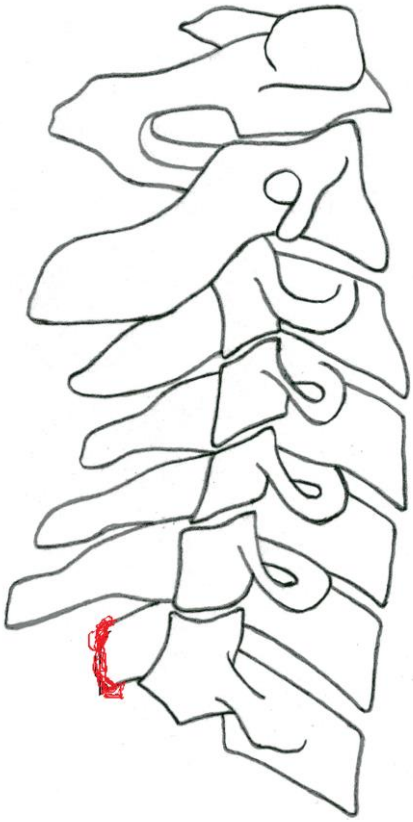

Figure 5.3 Fracture of the Spinous Process of the C-7 of Koger's Island Sk 66

CHAPTER 6

CONCLUSION

This research examined two Mississippian sites of different sizes. Moundville's large size afforded its constituents protection via extensive palisades and ample room to play the popular Mississippian stickball game. Koger's Island small size did not allow for the complex organization or manpower needed to build strong palisades, thereby relying on its island location as protection from inter-site violence. It was therefore proposed that Moundville would have a higher frequency of traumatic fractures related to gaming in comparison to Koger's Island, which would have a higher frequency of traumatic fractures related to warfare. The cause of traumatic fractures was inferred using a new classification system based on primary (location), secondary (type), and tertiary variables (sex, age, burial association, total fracture count, presence of remodeling, evidence of scalping, evidence of dismemberment, and embedded points) which were coded for cause using data from modern-day lacrosse. On their own, these variables do not speak to the intent behind a fracture. Together, however, they reconstruct the events and mechanisms that result in fractures.

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APPENDIX

Table A.1 Koger's Island Examined Fractures

Burial	Sex	Age	Burial Association	Fracture Count	Evidence of Scalping	Evidence of Dismemberment	Embedded Points	Fracture Location(s)	Fracture Type(s)	Presence of Remodeling	Possible Cause
Sk 5	F	Young Adult		1				R Rib	Transverse	Yes	Warfare
Sk 6	M	Young Adult		3				R Clavicle	Crush	Yes	Gaming
								L Metatarsal 3	Unknown	Yes	Unknown
								L Metatarsal 4	Unknown	Yes	Unknown
Sk 13	M	Young Adult		3		Yes		R Rib	Transverse	Yes	Warfare
								R Fibula	Oblique	Yes	Warfare/Gaming
								L Femur	Oblique	Yes	Warfare
Sk 14	F	Young Adult	Sk 14A, 14B, 14C, & unattributable	2				R Metatarsal 3	Unknown	Yes	Unknown
								L Talus	Compression	Yes	Unknown
Sk 15	M	Middle Adult		1				L Hamate	Transverse	Yes	Gaming
Sk 16	F	Middle Adult		4				R Clavicle	Transverse	Yes	Warfare/Gaming
								L Clavicle	Transverse	Yes	Warfare/Gaming
								L Fibula	Oblique	Yes	Warfare/Gaming
								R Tibia	Transverse	Yes	Warfare/Gaming
Sk 20	M	Young Adult		1				R Fibula	Crush	Yes	Gaming
Sk 21	M	Young Adult		1				R Metacarpal 5	Short Oblique	Yes	Warfare/Gaming
Sk 24	F	Young Adult		2				R Frontal	Depression	Yes	Warfare
								L Fibula	Hairline	Yes	Warfare/Gaming
Sk 31	M	Middle Adult	Sk 36, 37, 38, 39	1	Yes			Rib	Crush	Yes	Warfare
Sk 36	M	Young Adult	Sk 31, 37, 38, 39	1	Yes			R Ulna	Oblique	Yes	Warfare
Sk 37	F	Old Adult	Sk 31, 36, 38, 39	1	Yes			Rib	Transverse	Yes	Warfare
Sk 31	M	Middle Adult	Sk 31, 36, 37, 39	1	Yes			L Clavicle	Transverse	Yes	Warfare/Gaming
Sk 39	M	Middle Adult	Sk 31, 36, 37, 38	2	Yes			Proximal Phalanges	Compression	No	Warfare
								Intermediate Phalanges	Compression	No	Warfare
Sk 40B	M	Young Adult		1		Yes		L Metatarsal 5	Crush	Yes	Warfare
Sk 41	M	Middle Adult	Sk 42, 43	1				R Rib (8,9, or 10)	Short Oblique	Yes	Warfare
Sk 42	F	Young Adult	Sk 41, 43	2				R Rib (7 or 8)	Short Oblique	Yes	Warfare
								R Metacarpal 1	Transverse	Yes	Warfare
Sk 43	F	Middle Adult	Sk 41, 42, 43	4				L Tibia	Crush	Yes	Warfare/Gaming
								L Calcaneus	Crush	Yes	Warfare/Gaming
								L Talus	Crush	Yes	Warfare/Gaming
								L Navicular	Crush	Yes	Warfare/Gaming
Sk 45	F	Old Adult		3				R Parietal	Depression	Yes	Warfare
								L Ulna	Unknown	Yes	Warfare
								L Radius	Unknown	Yes	Warfare
Sk 46	F	Middle Adult	Sk 47	1				L Humerus	Unknown	Yes	Warfare
Sk 47	F	Middle Adult	Sk 46	2				L Ulna	Short Oblique	No	Warfare
								Lumbar	Compression	Yes	Unknown
Sk 53	M	Young Adult		1				L Femur	Crush	Yes	Warfare
Sk 57	F	Young Adult		2				R Rib	Transverse	Yes	Warfare
								L Parietal	Depression	Yes	Warfare
Sk 59	M	Young Adult		2				R Metatarsal 5	Unknown	Yes	Warfare/Gaming
								L Humerus	Unknown	Yes	Warfare/Gaming
Sk 60	M	Middle Adult	Sk 61	4				R Humerus	Oblique	Yes	Warfare
								L Rib	Transverse	Yes	Warfare
								Rib	Short Oblique	Yes	Warfare
								Rib	Unknown	Yes	Warfare
Sk 66	M	Young Adult		4				R Parietal	Depression	Yes	Warfare
								R Tibia	Oblique	Yes	Unknown
								L Fibula	Unknown	Yes	Unknown
								Cervical 7th	Unknown	Yes	Warfare/Gaming
Sk 67	F	Young Adult		1				L Ulna	Short Oblique	Yes	Warfare
Sk 69	UNK	Child		1				Metacarpal or Metatarsal	Unknown	Yes	Unknown
Sk 70	M	Young Adult		1				R Rib 2	Transverse	Yes	Warfare/Gaming
Sk 72	F	Adolescent		1	Yes			L Ulna	Unknown	Yes	Warfare
Sk 73	F	Middle Adult		1				R Radius	Depression	Yes	Warfare
Sk 75	M	Middle Adult		4		Yes		R Clavicle	Oblique	Yes	Warfare/Gaming
								L Fibula	Crush	Yes	Warfare/Gaming
								Rib	Transverse	Yes	Warfare
								L Metatarsal 5	Compression	Yes	Unknown
Sk 78	F	Young Adult		3				L Rib	Depression	Yes	Warfare
								R Rib	Unknown	Yes	Warfare
								R Tibia	Unknown	Yes	Warfare/Gaming
Sk 79	M	Young Adult		3				R Rib	Crush	Yes	Warfare/Gaming
								Thoracic 1st	Transverse	Yes	Gaming
								L Fibula	Spiral	Yes	Gaming
Sk 81	F	Young Adult		3				R Fibula	Unknown	Yes	Warfare/Gaming
								L Ulna	Short Oblique	Yes	Warfare
								L Tibia	Unknown	Yes	Warfare/Gaming
Sk 83	F	Young Adult		1				Sacrum	Unknown	Yes	Unknown
Sk 84A	M	Middle Adult		1				L Metatarsal 2	Crush	Yes	Warfare/Gaming
Sk 85	M	Young Adult		3				L Pubis	Unknown	Yes	Warfare/Gaming
								L Ilium	Depression	Yes	Warfare
								L Radius	Unknown	Yes	Warfare
Sk 87	F	Middle Adult		1				R Radius	Unknown	Yes	Warfare
Sk 89	F	Young Adult	Sk 90, 91, 92, 93, 94	1				R Fibula	Spiral	Yes	Unknown
Sk 90	M	Young Adult	Sk 89, 91, 92, 93, 94	1				R Middle Phallanx	Short Oblique	Yes	Warfare
Sk 91	F	Middle Adult	Sk 89, 90, 92, 93, 94	1				L Rib	Unknown	Yes	Warfare
Sk 92	M	Young Adult	Sk 89, 90, 91, 93, 94	1				L Rib	Depression	Yes	Warfare
Sk 93	M	Young Adult	Sk 89, 90, 91, 92, 94	3				R Ulna	Short Oblique	Yes	Warfare
								L Tibia	Crush	Yes	Warfare
								R Metatarsal 4	Unknown	Yes	Warfare
Sk 94	M	Middle Adult	Sk 89, 90, 91, 92, 93	1				Frontal	Depression	Yes	Warfare
Sk 100B	UNK	Child	SK 100, 100A	1				Unknown, Radius or Humerus	Crush	No	Warfare
Sk 101	F	Young Adult	Sk 26, 27, 28, 101B	8	Yes	Yes		R Clavicle	Transverse	Yes	Warfare/Gaming
								R Tibia	Unknown	Yes	Warfare/Gaming
								R Fibula	Unknown	Yes	Warfare/Gaming
								L Zygomatic	Depression	Yes	Warfare
								Frontal	Depression	Yes	Warfare
								L Humerus	Unknown	Yes	Warfare
								R Rib	Short Oblique	Yes	Warfare
								R Rib 2	Unknown	Yes	Warfare

Table A.2 Moundville Examined Fractures

Burial	Sex	Age	Burial Association	Fracture Count	Evidence of Scalping	Evidence of Dismemberment	Embedded Points	Fracture Location(s)	Fracture Type(s)	Presence of Remodeling	Possible Cause
Sk 2592	M	Young Adult	Sk 2588, 2589, 2590, 2591, 2592, 2593	3				R Metacarpal 3	Transverse	Yes	Warfare
								R Metacarpal 4	Transverse	Yes	Warfare
								R Phalange	Spiral	Yes	Warfare
Sk 1909	UNK	Middle Adult		1				L Distal Phalange for MT1	Chip	Yes	Warfare/Gaming
Sk 2589	M	Middle Adult		1				R Radius	Butterfly	Yes	Unknown
Sk 1750	M	Young Adult		1				R Fibula	Crush	Yes	Gaming
Sk 1737	M	Young Adult		1				R Navicular	Crush	Yes	Gaming
Sk 2317	M	Middle Adult		1				L Ilium	Unknown	Yes	Warfare
Sk 1610	UNK	Adolescent		1				R Fibula	Crush	Yes	Gaming
Sk 1015	M	Middle Adult		1				L Tibia	Unknown	Yes	Gaming
Sk 2613	UNK	Adolescent		1				L Tibia	Unknown	Yes	Gaming
Sk 2856	M	Middle Adult		1				Rib	Transverse	Yes	Unknown
Sk 1654	UNK	Adolescent		1				R Radius	Unknown	Yes	Unknown
Sk 1759	M	Young Adult		3				R Clavicle	Depression	Yes	Warfare/Gaming
								L Parietal	Depression	Yes	Warfare
								Rib	Transverse	Yes	Warfare/Gaming
Sk 2907	UNK	Adult		1				L Fibula	Depression	Yes	Gaming
Sk 2167	M	Middle Adult		1				Rib	Short Oblique	Yes	Warfare/Gaming
Sk 1205	UNK	Adult		1				R Metatarsal 5	Unknown	Yes	Unknown
Sk 1740	F	Middle Adult		1				Frontal	Crush	No	Warfare
Sk 2872	F	Young Adult		1				L Humerus	Spiral	Yes	Warfare
Sk 1347	UNK	Old Adult		1				L Tibia	Unknown	Yes	Gaming
Sk 2430	F	Middle Adult		1				R Fibula	Unknown	Yes	Warfare/Gaming
Sk 1572	UNK	Adult		3				R Medial Cuneiform	Crush	Yes	Warfare/Gaming
								R Metatarsal 3	Crush	Yes	Warfare/Gaming
								R Metatarsal 2	Crush	Yes	Warfare/Gaming
Sk 3084	UNK	Adult		1				R Femur	Hairline	Yes	Warfare/Gaming
Sk 1901	M	Middle Adult		1				R Ulna	Oblique	Yes	Warfare
Sk 2282	UNK	Young Adult		1				L Ulna	Oblique	Yes	Warfare
Sk 2679	UNK	Adolescent		1				L Tibia	Unknown	Yes	Gaming
Sk 1737A	F	Adult		5				L Femur	Unknown	Yes	Warfare
								L Tibia	Unknown	Yes	Warfare/Gaming
								L Fibula	Short Oblique	Yes	Warfare/Gaming
								R Fibula	Short Oblique	Yes	Warfare/Gaming
								R Femur	Unknown	Yes	Warfare
Sk 2975	F	Middle Adult		1				R Humerus	Oblique	Yes	Unknown
Sk 1589	F	Adult		1				Temporal	Short Oblique	Yes	Warfare
Sk 1553	UNK	Young Adult		1				R Tibia	Unknown	Yes	Gaming
Sk 2297	UNK	Adult		1				L Ulna	Oblique	Yes	Warfare
Sk 2211A	F	Middle Adult		1				Rib	Transverse	Yes	Warfare
Sk 2912	UNK	Middle Adult		1				L Tibia	Unknown	Yes	Gaming
Sk 3049	M	Young Adult		1				R Ulna	Crush	Yes	Warfare
Sk 2862	M	Old Adult		2				R Tibia	Unknown	Yes	Gaming
								R Metacarpal 5	Crush	Yes	Gaming
Sk 1161	M	Middle Adult		1				R Ulna	Oblique	Yes	Warfare
Sk 2924	F	Young Adult		3				L Ulna	Unknown	Yes	Warfare
								L Radius	Unknown	Yes	Warfare
								L Proximal Foot Phallange	Unknown	Yes	Warfare
Sk 1490	UNK	Adult		1				R Tibia	Unknown	Yes	Gaming
Sk 2431	M	Adult		2				L Rib	Oblique	Yes	Warfare/Gaming
								Rib	Transverse	Yes	Warfare/Gaming
Sk 1634A	M	Middle Adult		1				Frontal	Depression	Yes	Warfare
Sk 2278	UNK	Adult		3				L Femur	Unknown	Yes	Warfare/Gaming
								R Femur	Unknown	Yes	Warfare/Gaming
								L Tibia	Unknown	Yes	Gaming
Sk 2379	M	Middle Adult		1				L Ulna	Oblique	Yes	Warfare
Sk 2340	UNK	Young Adult		1				L Radius	Short Oblique	Yes	Warfare
Sk 1097	F	Middle Adult		1				L Radius	Short Oblique	Yes	Warfare
Sk 1016	F	Young Adult		1				R Parietal	Depression	Yes	Warfare
Sk 2865	F	Adult		1				Rib (1st and 2nd fused)	Crush	Yes	Warfare
Sk 1333	F	Adolescent		1				L Metatarsal 5	Crush	Yes	Warfare
Sk 1604	F	Young Adult		1				L Calcaneus	Unknown	Yes	Warfare
Sk 2680	UNK	Adolescent		1				Mandible	Unknown	Yes	Warfare/Gaming
Sk 2963	F	Young Adult		1				L Ulna	Short Oblique	Yes	Warfare
Sk 2578A	F	Young Adult		1				Rib	Transverse	Yes	Warfare
Sk 2339	F	Middle Adult		1				L Metacarpal 4	Transverse	Yes	Warfare