



The emergence of human warfare: Current perspectives

Marc Kissel¹ | Nam C. Kim²

¹Department of Anthropology, Appalachian State University College of Arts and Sciences, Boone, North Carolina

²Department of Anthropology, University of Wisconsin-Madison, Madison, Wisconsin

Correspondence

Marc Kissel, Department of Anthropology, ASU Box 32016, 348 Anne Belk Hall, 224 Joyce Lawrence Lane, Boone, NC 28608.
Email: kisselm@appstate.edu

Abstract

The origins of warfare have long been of interest for researchers across disciplines. Did our earliest ancestors engage in forms of organized violence that are appropriately viewed as approximations, forms of, or analogs for more recent forms of warfare? Assessed in this article are contrasting views that see warfare as being either a product of more recent human societies or a phenomenon with a much deeper chronology. The article provides an overview of current debates, theories, and methodological approaches, citing literature and data from archaeological, ethnographic, genetic, primatological, and paleoanthropological studies. Synthetic anthropological treatments are needed, especially in efforts to inform debates among nonacademic audiences, because the discipline's approaches are ideally suited to study the origins of warfare. Emphasized is the need to consider possible forms of violence and intergroup aggression within Pleistocene contexts, despite the methodological challenges associated with fragmentary, equivocal, or scarce data. Finally, the review concludes with an argument about the implications of the currently available data. We propose that socially cooperative violence, or "emergent warfare," became possible with the onset of symbolic thought and complex cognition. Viewing emergent warfare as a byproduct of the human capacity for symbolic thought explains how the same capacities for communication and sociality allowed for elaborate peacemaking, conflict resolution, and avoidance. Cultural institutions around war and peace are both made possible by these changes. Accordingly, we suggest that studies on warfare's origins should be tied to research on the advent of cooperation, sociality, and communication.

KEYWORDS

Pleistocene, violence, warfare

1 | INTRODUCTION

Organized violence is a major aspect of modern life for many societies, and research indicates that this has been the case for the past several millennia. Some of humanity's earliest historical records attest to the presence and significance of collective violence within ancient contexts, clearly demonstrating that forms of warfare were not limited to historically recent periods of the late Holocene. In recent decades, numerous anthropological studies have presented compelling evidence that interpersonal violence and warfare, in varying degrees, have been a noteworthy part of humanity's social history in mid-Holocene contexts (Haas, 2004; Keeley, 1996; Kim & Kissel, 2018; LeBlanc, 2003). There is much ongoing debate about the ubiquity, intensity, frequency, and causal factors for warfare in varying world regions throughout the Holocene (see Ferguson, 2013b). Some scholars have suggested that

the "origins" of consequential warfare are associated with certain conditions only met since the mid-Holocene onward, such as greater degrees of sedentism, higher population densities, and the emergence of more complex forms of social organization (Ferguson, 2006, 2013a; Fry, 2006, 2013; Fry & Soderberg, 2013; Mead, 1940; Sponsel, 1996). On the other hand, other researchers have pointed to mounting evidence indicating that warfare need not be restricted to larger, sedentary, and politically complex societies (Allen, 2014; Bowles, 2009; Gat, 2015; Golitko & Keeley, 2007; LeBlanc, 2014; Pinker, 2011), thus suggesting that warfare occurred, and may have been socially significant, for certain early Holocene communities as well.

At its crux, the debates ask whether warfare is a product of more recent human societies, or if it has a longer chronology. It should be noted that even within these general schools of thought, there is much debate about precise definitions, chronologies, causal conditions, and

consequences. Evaluating different perspectives on warfare to determine origins is a difficult task, especially as there is a tendency when synthesizing complex topics to take nuanced perspectives and turn them into strict dichotomies. As noted by anthropologist Allen (2014, p. 17), there is a general continuum in views for the antiquity of warfare, with longer and shorter chronologies at the two ends and ongoing debate over what should even be considered "long" and "short." A wide range of opinions continue to influence our collective thinking, whether in academic and specialist circles or outside of it, with views on warfare's antiquity falling on either end of the spectrum or points in between. Most researchers fall into shades of both categories, with differences of degree separating their perspectives. On the topic of Western social scientific research on warfare's origins, Otterbein (2004, p. 30) points out how warfare is seen by some to have begun as early as 2 million years ago or as late as 6,000 years ago, depending on one's definitions and interpretations of data. Some researchers have even made distinctions between forms of warfare, such as "primitive" or "ritual" warfare versus "true" or "civilized" warfare, separated by a "military horizon" where warfare undergoes a qualitative transformation (Keegan, 1993). In the end, arguments have been offered for various "earlier" and "later" origin points, replete with different sets of causes. Although it is possible that warfare began in the mid- to late Holocene owing to general shifts to lifeways involving large-scale, sedentary, politically centralized, agricultural settlements (i.e., what some refer to as "civilizations"), it is also quite possible that such a conclusion might be an artifact of preservation bias. In other words, the material record yields an increase in the volume of material signatures for warfare in the mid- to late Holocene simply because of access—we have more evidence of all lifeways in general. With larger, more permanent settlements, we have greater access to evidence related to residential patterning, subsistence practices, refuse, material products, burials, and so forth. This may account, at least in part, for why we see more evidence of warfare after the rise of so-called civilizations or complex societies—because we have far more cultural data to examine. Consequently, finding signs of violence in prehistoric, smaller-scale communities, many of which tended to be highly mobile with fewer material indicators for the full range of their lifeways, can be very telling.

The archaeological record currently suggests that cultural practices related to intergroup, organized violence, has been a part of many kinds of communities, regardless of population size, scale, modes of subsistence, social organization, or other dimensions. Whether or not such instances of violence qualify as "warfare" largely depends on one's definition. However, we assert that to truly understand warfare in more contemporary settings, it is vital to trace the phenomenon's developmental trajectories into the distant past and to explore its earliest constituent parts. Moreover, any exercise seeking to identify the roots of warfare and the presence of warfare-related practices in early contexts does not equate with an assumption that warfare was prevalent or ubiquitous across settings. Rather, seeing any evidence should be taken as a cue for us to be open to the possibility that outbreaks of warfare occurred, however frequently or infrequently, across a variety of humanity's social settings through time and space.

In the midst of such ongoing debates, it thus becomes necessary to ask if organized violence has played a substantial role in shaping

human culture and societies throughout not only the Holocene but also in earlier contexts. If various kinds of societies are capable of organized violence, as recent archaeological studies suggest, then what accounts for warfare's origins and how early can we see them? In other words, current studies lead us to ask about warfare's earliest manifestations, and whether or not some of our earliest ancestors engaged in organized violence that are viewable as approximations, forms of, or analogs for more recent kinds of human warfare. Indeed, some studies have even suggested that coalitionary violence may have been a key component in shaping the course of human evolution in contexts far earlier than the Holocene (Glowacki, Wilson, & Wrangham, 2017; Kelly, 2000; Otterbein, 2009; Wrangham, 1999). For some evolutionary anthropologists, forms of warfare far predate the emergence of anatomically modern humans (c. 300,000–200,000 BP), raising the possibility that violent behavioral patterns played a role in affecting or driving hominin biological evolution (Glowacki et al., 2017; Wrangham, 1999).

For our purposes in this article, we will not be focusing on the question of causes or onset of warfare during the Holocene, though we acknowledge the important debates that continue to persist on questions related to types of warfare and precipitating causes. Instead, we ask whether or not earlier contexts can help us to understand some of the earliest underpinnings of intergroup violence. This article is thus concerned with the topic of warfare's rudimentary origins, and anthropology's contributions to these general debates. We take a deep time perspective, asking if intergroup conflict can be identified in the Pleistocene and what we might glean from such insights. We acknowledge, of course, that forms of warfare can look very different. For instance, warfare as prosecuted by modern nation-states or ancient empires can differ markedly from raiding and ambushes associated with smaller-scale, foraging societies. However, we assert that many of the differences are arguably contrasts in scale and not necessarily in kind. The existence of ideas, beliefs, and attitudes that underlay cultural practices related to group violence can exist in any human society. The choices to cooperatively use violence against others, to view certain communities as threats or targets for aggression, to fight for economic, ideological, or political reasons—these are all aspects of a society's decision to engage in organized violence. Similarly, choices made to refrain from violence and build mechanisms for resolving or avoiding conflict are also culturally constructed. Seen from this perspective, we wish to explore the deeper past for clues about what we propose to call "emergent warfare."

On warfare's origins, we question the notion that warfare is: (a) strictly a product or byproduct of the interactions associated with large-scale states or civilizations; and/or (b) a phenomenon largely created by shifts to sedentary or agriculturally lifeways. Such views restrict the range of cultural activities that might constitute categories of warfare, running the risk of obscuring our ability to recognize emergent warfare. We adhere to a more inclusive definition of warfare as *organized aggression and violence between socially distinct or autonomous groups of people*, and we: (a) recognize the potential for it to have been a significant part of behaviorally modern human societies, whether within the past several thousand years or earlier; and (b) are open to the possibility that certain facets of emergent warfare may have appeared at different points throughout the evolutionary history

of hominin lineages. Ultimately, we do not believe it prudent to assume a natural state of either "peace" or "war" for our species and its evolutionary history. Consequently, in asking about the onset of emergent warfare or peacemaking, we see questions about the appearance of cultural practices of behaviorally modern humans as highly relevant.

Specifically, we argue that once members of the genus *Homo* were capable of greater levels of symbolic thought, complex forms of communication, and sophisticated forms of sociality and cooperation, they would have been also capable of what we may call *socially cooperative violence*. "Human behavior is plastic, open equally to both altruistic cooperation and deadly conflict" (Ferguson, 2013b, p. 192). We would agree with Ferguson's assessment, and we would also add that altruistic cooperation within a group can sometimes lead to aggression and violence directed against another group. In other words, social obligations sometimes call for cooperative violence targeting others. The activities involved in socially cooperative violence stand in contrast to forms of lethal intergroup violence found elsewhere in the natural world, as the former involves human ideas, motivations, beliefs, morals, symbols, communications, and cultural logics. When such forms of socially cooperative violence became directed at those deemed "outsiders" or "others," and when violence took on an inter-community dimension, it arguably constitutes what we propose to call emergent warfare. Thus, we suggest that the story of warfare is necessarily part of the larger story of being, and processes of becoming, human. In the end, this is not simply a story about how, when, and why human warfare emerged, but is also a larger narrative about *Homo sapiens*. The emergence of warfare (and of "peacefare" or "emergent peacemaking," for that matter) is intimately connected to the emergence of human nature.

The cognitive and behavioral capabilities associated with "behavioral modernity" would have afforded our ancestors the ability to produce cultural ideas and attitudes about violence, and to cooperate in ways to use or avoid it. In that regard, sophisticated communication and language would have been a crucial ingredient for emergent warfare. We contend that: (a) warfare stems from sophisticated abilities of sociality, higher cognition, symbolic thought and communication; and (b) these abilities emerge gradually throughout the Pleistocene, giving ancestral groups the capacity to engage in intergroup aggression and violence.

We see this position as a way to bridge exciting research from two different anthropological domains, namely biological anthropological research into behavioral/cognitive modernity and the archaeological study of warfare. In the past one to two decades, these two domains have witnessed significant ongoing debate, with resulting theoretical insights, but there has yet to be much crossover. For us, a way to move forward the understanding of warfare's origins would be to combine research approaches and datasets, allowing new ways to frame questions and hypotheses.

2 | GENERAL PERSPECTIVES AND ANTHROPOLOGICAL VOICES

"War, in one form or another, appeared with the first man."

-President Barrack Obama, during acceptance speech for Nobel Peace Prize.

"[W]arfare of this sort is an invention like any other of the inventions in terms of which we order our lives, such as writing, marriage, cooking our food instead of eating it raw, trial by jury or burial of the dead, and so on."—Mead (1940, p. 415).

Warfare is a topic that generates much thought, opining, scholarship, and debate. As encapsulated in the two quotations above, considerable disagreement remains on the question of warfare's origins, its chronological depth, and its potential significance for past populations. As famously argued by anthropologist Mead (1940), warfare may be a relatively recent "invention" or cultural innovation, precluding the possibility that it played any substantial role in human evolutionary change. On the opposite extreme, researchers contend that not only is warfare as old as humanity, but that it could have been a significant driver of human evolution (see Wrangham, 1999). Anthropology is uniquely suited to propose and test hypotheses about warfare's origins and antiquity, given the discipline's mix of subfields and associated methodological approaches. An integrative (Fuentes, 2015) or holistic (Harkin, 2010) anthropology is key in fully considering warfare's origins, since the nature of the topic involves such a variegated set of data, ranging from material remains to present-day observations of living primates. In that spirit, this article briefly outlines major anthropological views and interpretive challenges in data collection and model development. We believe continued and greater anthropological attention is needed for this important topic, especially since ongoing research indicates the possibility that ancestral human populations living well before the Holocene may have been participating in collective or intergroup violence.

Within anthropological studies of aspects of violence, comparatively more attention has been placed on the Holocene record, particularly the latter half of it. Earlier time periods have received less consideration, contributing to contrasting, generalized views that tend to perceive warfare as either significant or insignificant prior to the mid-Holocene, perspectives within what some researchers have respectively dubbed "hawk" or "dove" camps of thought (Allen, 2014; Otterbein, 2004; Wrangham, 1999). Such divergent anthropological views have permeated into the ideas of nonspecialists, nonanthropologists, and general audiences. Many nonanthropological researchers have used anthropological data and arguments as the basis for their own conclusions about warfare and human nature (see, for instance, Gat (2006, 2015), Gómez, Verdú, González-Megías, & Méndez (2016), Smith (2007), and Pinker (2011)). Some authors rely on these data to promote specific views as to whether or not humans are inherently violent, sometimes accompanied by generalizations that are not always well supported. The arguments, and the popular publications that convey them, continue to influence public views about humanity's past and its relationship to collective violence. For instance, evolutionary psychologist Pinker (2011) cites, sometimes uncritically, archaeological and ethnographic research to conclude that the past was far more violent than the present (see Kim, 2012). Likewise, Shermer (2015) argues in the *Moral Arc* that if you lived 10,000 years ago and were a man "there was about a one in four chance that you would die violently" (p. 92).

In some cases, the perspectives over-generalize and misrepresent the state of anthropological thought. For instance, columnist Goldberg (2018) writes: "This is no longer a debated point among most serious scholars. People who think we once lived in glorious harmony with each other—and the environment—are scientists, they're poets and

propagandists. The evidence for mankind's blood-soaked past can be found in the archaeological record, DNA analysis, the writings of ancient commentators, and historians, and the firsthand reports of those remaining societies that have so far resisted modernity" (p. 31). Generalized views about humanity's violent past such as Goldberg's are problematic, especially when these views offer summary claims about anthropological research and specific findings. For instance, is a "blood-soaked" past actually indicated by the archaeological record, or by DNA analysis? Is the onset of modernity tied to greater levels of peace? Not all anthropologists agree about the prevalence and significance of violence in prehistoric contexts, and, as we discuss in this article, much of the current genetic research is inconclusive.

With researchers from various backgrounds continuing to theorize about the onset of warfare in humanity's deepest pasts, a case can be made for more research studies to be pursued that are based on integrated, anthropological approaches. Furthermore, we feel such studies and resulting perspectives should be made more accessible to general audiences. These kinds of synthetic treatments require balanced consideration and a willingness to engage with the insights, as well as the methodological challenges, associated with various lines of evidence. There are strong examples of such anthropological research publications (e.g., Ferguson, 2013a; Glowacki et al., 2017; Guilaine & Zammit, 2001; Kelly, 2005; Otterbein, 2009; Roscoe, 2007; Wrangham, 1999), and these past studies, combined with new cases and data, provide the basis for ongoing work on this important topic.

One major reason for the comparatively less attention placed on the Pleistocene, relatively speaking, is a general absence of clear material indicators for violence. This has contributed, in part, to a conclusion that warfare was either absent or relatively inconsequential during the staggering temporal expanse of humanity's history, in contexts where our ancestors lived in smaller-scale, more mobile communities. Although this may be valid in many cases, we propose that this supposition needs to be more critically examined. As compared to larger-scale societies, especially sedentary ones, smaller-scale communities would have left far less material remains for us to uncover and analyze. In that sense, the absence of evidence does not automatically mean the absence of certain behaviors. Not all forms of intimidation, coercion, and violence would have left direct material traces. Consider, for example, the uses of refuges to hide or flee from physical attack. For late prehistoric Hawai'i, Kolb and Dixon (2002) demonstrate how ethnohistoric information is vital in allowing researchers to infer the use of lava tubes as places of refuge during times of warfare. Without such information the use of these features as safe havens from violence could have been overlooked entirely. Rather than assuming that warfare is inconsequential or nonexistent in our earliest histories, it is necessary to ask how we can test hypotheses to determine if forms of organized violence did occur prior to the mid-Holocene. To be tested is the notion that forms of warfare could have occurred and were significant for either social or biological evolution for hominin and human lineages. Seeing the vast majority of humanity's history as largely devoid of consequential social violence requires a rigorous exploration of evidence and should not rest on any potential *a priori* assumptions about the absence or insignificance of warfare prior to the mid-Holocene and into far earlier Pleistocene contexts. Accordingly, we might begin by asking how we can identify warfare in eras where the material record may

be highly fragmentary, scant, and ambiguous. By doing so, we better prepare ourselves to recognize salient clues as they become available.

This effort requires engagement with material remains and analogical reasoning. Researchers rely on various threads of evidence from anthropological subfields, notably ethnographic and primatological data, to develop referent models and inform interpretations of early Holocene and Pleistocene material evidence. In addition, researchers are also exploring potential links between genetics and aggression. We will briefly explore these sources of data before moving onto a discussion of material evidence suggestive of interpersonal and possibly collective violence in the fossil and material records of the Pleistocene and early Holocene. Salient material data come from highly differentiated, spatial and temporal settings, such as Gran Dolina in Spain (Otterbein, 2011), Nataruk, Kenya (Lahr et al., 2016; Stojanowski, Seidel, Fulginiti, Johnson, & Buikstra, 2016), Gough's Cave, UK (Bello, Saladié, Cáceres, Rodríguez-Hidalgo, & Parfitt, 2015), and Schoneck-Kilianstadten, Germany (Meyer, Lohr, Gronenborn, & Alt, 2015), to name just a few. We review new methodological and theoretical advances being used to assess such cases, thereby extending the dialogue presented in recent research publications (e.g., Gasperetti & Sheridan, 2013; Judd, 2008; Martin & Harrod, 2015; Roksandić, Djurić, Rakocević, & Seguin, 2006) and other scientific reports. Moreover, with this article we hope to contribute to long-standing and ongoing efforts within the field of biological anthropology to play a larger role in addressing questions about early human behaviors possibly related to warfare (e.g., Brosnan, 2013; Sapolsky, 2013; Sussman & Marshack, 2010; Wilson, Wallauer, & Pusey, 2004; Wrangham, 1999; Zefferman & Matthew, 2015).

3 | CONCEPTUALIZATIONS

To properly situate debates about warfare's chronology, it is first necessary to clarify how we define both warfare and certain dimensions of the phenomenon, namely aggression and violence. Defining phenomena obviously will influence how related behavioral patterns and cultural practices are recognized and perceived within research studies.

Violence and aggression are not restricted to humans. In a comprehensive treatment of aggression, Lorenz (1963) notes animal aggression across a spectrum of vertebrates. Essentially, he describes a "fighting instinct" or propensity to act aggressively under certain conditions, perpetrated by both "beast and man" and directed against the same species. Because we seek to answer questions about humans fighting against other humans, we deal with conspecific aggression and violence for this article. The popular literature depicts aggression, particularly male aggression, as being both deeply-rooted and evolutionarily advantageous: "The larger size, strength, and upper-body mass of men is a zoological giveaway of an evolutionary history of violent male-male competition" (Pinker, 1997, p. 316). These sorts of models assert that physical attributes in human males exist because of adaptations for aggressive tendencies.

Aggression is not a discrete trait that can be easily identified or measured (Fuentes, 2012). Rather, it covers a wide spectrum of behaviors, which can include direct interpersonal violence, verbal threats of violence, the signaling of intention to commit harm, and

harassment. Separating agonistic behavior in general from the more specific versions of direct aggression is important, but not easily accomplished.

Some divide aggression into proactive and reactive types (Feshbach, 1964) while others take a more direct approach. Scholars may want to separate fear-based aggression from predatory aggression, and sex-related aggression from territorial aggression (Siegel & Victoroff, 2009). However, this may oversimplify the case as aggression can often be mixed and not all occurrences can fit neatly into ideal types. As Siegel and Victoroff (2009) note, "human aggression is more difficult to pigeonhole. Inter-male aggression, such as gang fighting, involves a mix of planning and highly charged affect. Territorial wars serve instrumental purposes but engage high nationalistic emotions" (p. 210).

We favor a simple conceptualization of aggression as actions directed against others, which can be perceived as threatening and potentially violent. As noted by McCall and Shields (2008), aggression can be tied to a state of arousal associated with various emotional communicative strategies, such as shouting or gesturing. With violence, such aggressive behavior can lead to actual harm. Therefore, violence can be seen as physical attack or assault that occurs in a context of aggressive behavior (McCall & Shields, 2008). Aggression can be seen as purposeful behavior that results in harm (be it psychological, physical, or other) for an individual (or group) caused by another individual (or group). In this sense, violence lays at the extreme end of aggression.

The World Health Organization (Krug, Dahlberg, Mercy, Zwi, & Lozano, 2002, p. 5) sees violence as: "The intentional use of physical force or power, threatened or actual, against oneself, another person, or against a group or community, that either results in or has a high likelihood of resulting in injury, death, psychological harm, maldevelopment or deprivation." It is important to note, however, that there are other kinds of aggression and violence that are neither direct nor physical, all of which can leave very little direct traces in the material record. Scholars have recently suggested that we need to be cognizant of violence that occurs *outside* of direct person-to-person interactions. For instance, slow violence (Nixon, 2011) refers to the effects of deforestation, climate change, oil spills, and other pervasive forms of ecological threats that often are not instantaneous but are rather incremental in nature. Whether or not such a form existed before modern eras is difficult to say, but the effect of climate change on people has been demonstrated in the more recent past (Schug, 2011).

Given the complexities involved in aggression and violence, it is not surprising that definitions of warfare vary significantly. Scholars from diverse fields produce radically different definitions, often based upon the specific datasets they rely on or the questions they wish to answer. For instance, many political scientists see "war" as part of the historically recent and modern interstate world (see Levy & Thompson, 2010 for a discussion). Kaldor (2013), for example, argues that the 21st century has seen the rise of organized violence in a way that is distinguished from earlier forms of war. She suggests we are in a period of "new wars" which are different in that they are fought both by the state and by non-state actors. Secondly, the goals of new wars are often in terms of identity rather than political interests or ideology. Thus, the aim of these new wars is to provide access to the state for a certain group of people. Finally, she notes that new wars are often fought

through political means, rather than military ones, so that in these new wars, actual battles are rare.

While we would agree with much of Kaldor's descriptions about the culturally variable character and conduct of warfare, we would argue that this kind of variability is not restricted to the current century. Indeed, forms of warfare likely occurred for many societies well before the advent of "state" societies. Moreover, specific tactics and activities related to intergroup or intercommunity aggression in these past, "pre-state" contexts could have also been similarly marked by concerns over identity, representation, and a host of other symbolically charged concepts.

Some researchers also point out that violence between individuals does not equate with war, and that war is more than one violent act. "One-person-killing-one person reflects homicide or manslaughter, not coalitional killings or war" (Fry & Soderberg, 2013, p. 272). This view is salient to how we interpret archaeological examples indicating homicide, which in many cases might have been an outcome of violence between members of a family, clan, or small community. However, we would suggest that an assumption of non-warfare cannot be automatically inferred. We would need more information, such as whether or not the individual was killed by someone from an outside society, or if the violence occurred because of an ongoing larger dispute or state of hostilities between societies.

While acknowledging that warfare has changed over time, just as our societies and technologies have evolved, we submit that early *H. sapiens* were just as capable as we are today of manufacturing complex cultural ideologies, institutions, and conceptions about the uses (or avoidance) of violence. This kind of inclusive perspective is imperative if we are to understand warfare's long-term history of change and its many possible forms. This fact is not lost on political scientists Levy and Thompson (2011, p. 19) when they write: "The conduct of war has certainly evolved over the millennia—in terms of the nature and size of the political units, the number of combatants, and the nature and lethality of weaponry." For many ethnographers and archaeologists studying warfare, one simultaneously astonishing and sobering observation pertains to the cultural variability associated with practices of organized violence, and how communities of all kinds have been seen to participate in warfare. Given such variability, how should we define warfare? There are implications for the archaeological study of warfare, as different forms, attitudes, and practices would have left highly varied material signatures.

As is evident in Table 1, many anthropologists have offered different definitions for warfare in varied contexts. We would advocate a fairly general and inclusive conceptualization of warfare, which can be an effective starting point. Doing so allows us to consider forms no matter the causes or scale of conflict, while also allowing for a diverse range of associated cultural attitudes and practices. For our purposes we see organized actions related to aggression and violence between distinct groups of people as a part of warfare, whether they involve nation-states, tribes, village communities, nomadic bands, or even gangs or terrorist organizations. Consequently, we are referring to myriad forms, whether they comprise armies on a battlefield, revenge killings between smaller-scale societies, or intervillage raids related to feuding communities. This definition does not specify motivations, agendas, or objectives, but instead acknowledges that warfare can

TABLE 1 Sample definitions of “Warfare”

Definition of warfare/coalitional conflict	Source
Armed contest between two independent political units, by means of organized military force, in pursuit of a tribal or national policy	Malinowski (1936, p. 247)
Organized and sanctioned group violence that involves armed conflict, including confrontations that combatants recognize may result in deliberate killing	Webster (1998), p. 213
Armed combat between political communities	Otterbein (2009, p. 43)
Organized, purposeful group action, directed against another group that may or may not be organized for similar action, involving the actual or potential application of lethal force	Ferguson (1984, p. 5)
All organized forms of intergroup homicide involving combat teams of two or more persons, including feuding and raiding	Divale and Harris (1976), p. 521
Relationships in which coalitions of members of a group seek to inflict bodily harm on one or more members of another group; “groups” are independent political units. This definition is broader than many because it includes all kinds of fighting, whether in a surprise attack (raid or ambush), chance meeting or planned battle	Richard Wrangham and Luke Glowacki (2012, p. 8)
Organized lethal violence by members of one group against members of another group	Fuentes (2012, p. 130)
Intercommunity armed violence	Vencl (1984, p. 121)
Organized aggression and violence between socially distinct or autonomous groups of people	This paper

happen for many reasons, such as political disagreement, competition over resources, ideological or moral beliefs, and so forth. By emergent warfare, we are referring to forms of socially cooperative violence directed at those viewed as “outsiders” or “others,” and associated with contexts where violence was marked by an intercommunity dimension.

4 | ANTHROPOLOGICAL SOURCES

4.1 | Models, assumptions, and ethnographic research: Warfare among non-state societies

For the vast majority of humanity’s existence, social groupings were much smaller in size and scale, and subsistence was generally marked by scavenging or foraging practices and higher degrees of mobility. Unsurprisingly, the ethnographic study of warfare has produced numerous publications in recent decades looking at the role of violence and aggression in smaller-scale societies (Gat, 2015; Keeley, 1996; Otterbein, 2004). Some authorities see significant parallels between smaller-scale societies of the ethnographic present and people of the prehistoric past (Keeley, 1996). Accordingly, a productive starting point for exploring our earliest forms of social behavior and cultural practices requires an exploration of ethnographic data related to smaller-scale communities. To be sure, researchers do caution against an over-reliance on ethnographic analogs when considering the distant and prehistoric past, citing various methodological challenges (Ferguson, 2006; Haas & Piscitelli, 2013). As no population is living in a “pristine” condition completely devoid of direct or indirect impacts of state-level societies, it is difficult to ascertain the effects of globalization and colonialism on these datasets (see Whitehead & Ferguson, 2000). However, while the uncritical projection of current cultural practices into the contexts of the remote past can be fraught with problems (Wobst, 1978), the use of hunter-gatherer ethnographic data is an indispensable starting point to explore societies of the distant past. That being said, a review of the literature makes clear that enormous debates continue to exist within the field.

Data from ethnographic research suggests that in small-scale societies the proportion of individuals involved in coalitional violence is higher than those observed in modern states (Keeley, 1996). Scholars use this to support the notion of a violent, aggressive nature of humanity, as well as to demonstrate that violence has declined from the Pleistocene into the modern era (Pinker, 2011; Shermer, 2015). Others, however, suggest that this may be because of scaling laws and the demographic investment rather than a significant change in how humans are violent (Falk & Hildebolt, 2017; Oka et al., 2017).

Writing about societies of the Amazon rainforest, Chagnon (1988) argued that Yanomami men who killed someone else gained greater reproductive success and thus a higher fitness value, though numerous scholars have questioned the assumptions of this model (Ferguson, 1989; Miklikowska & Fry, 2012). As pointed out by Ferguson (1989), however, a man is more likely to become Unokai (a “killer”) as he gets older, and older men will have more children than younger men, thus potentially skewing the results. Ferguson also notes that headmen are almost all Unokai and that headmen tend to have more children. While Chagnon (1988) has addressed some of these criticisms, the issue of the age of the men in the sample is still debated (Miklikowska & Fry, 2012). Interestingly, among the Waorani of Ecuador the opposite connection was found, with warriors having lower reproductive success (Beckerman et al., 2009).

Some scholars have argued that ethnographic data confirm that war is deeply-rooted in human evolution (Bowles, 2009) while others are more skeptical. In a recent study, Fry and Soderberg (2013) examined ethnographic data from mobile forager band societies. Within these 21 populations they extracted data on 148 lethal events. Importantly, 55% of these involved one victim and one killer, which would not be sufficient for most definitions of war. Out of the 148 events, 85% of them involved participants from the same society with the reasons for these violent events involving revenge killings and interpersonal quarrels. Tellingly, the majority of the lethal events that did involve people of different groups took place among the Tiwi. “The findings suggest that [mobile forager band societies] are not particularly warlike if the actual circumstances of lethal aggression are examined” (Fry & Soderberg, 2013, p. 272). These data call into question

the notion that humans, particularly males, have evolved biological tendencies to participate in intergroup coalitionary violence.

Fry (2006) examined the evidence of lethal aggression in a large ethnographic sample, concluding that all of the complex, nonegalitarian societies of foragers engaged in war, but the majority of the mobile foragers in the sample did not. According to Fry, this suggests that changes associated with the development of social complexity—such as settling down, development of social hierarchies, population increase, rise of ambitious leaders, accumulation of stored food and other items to plunder—greatly increases the likelihood of warfare in such societies, distinguishing socially complex ones from communities characterized by the social organizations typically linked with mobile forager communities. This would suggest that the ways in which war was constructed underwent a significant change in the Middle Holocene, as many societies in several world regions became increasingly agricultural and sedentary.

Putting aside the ongoing debates about the prevalence of warfare in smaller-scale societies, one key takeaway from ethnohistoric and ethnographic cases is that the most common form of “combat” among such non-state societies has involved raiding or ambushing (Keeley, 1996, p. 65). Overall, the ethnographic records of contemporary small-scale societies indicate that human violence and warfare are culturally-laden. Associated values, behaviors, rituals, and motivations are what make these behavioral patterns distinct from forms of intergroup violence found elsewhere in the natural world. Human forms demonstrate the importance of cultural institutions of war-making, and how they are often intricately tied to many other aspects of societies, from religion to economics to identities. It is also clear that humans choose to adhere to certain ideas and practices related to war, as well as norms and social rules that promote peace. In other words, peace-making results from the very same basic human capacities for thought and interaction that war-making does. As suggested by Fry, Schober, and Bjorkqvist (2010) killing is not the norm among humans, which might indicate that natural selection has acted to favor nonkilling. Thus, the biological and cultural foundations for emergent warfare provide the same basis for what might be called “emergent peace.” The same sorts of kinship recognition that can be so important in triggering organized violence have the opposite effect as well—they can keep peace. In sum, ethnographic data demonstrate that warfare is not restricted to large-scale, state-level societies.

Another key observation from the ethnographic record is the highly variable nature of cultural attitudes and practices pertaining to violence and/or warfare, underscoring the significance of symbolic thought and ideologies (Kim & Kissel, 2018). Whether for ritual, political, ideological, or other reasons, humans engage in torture, sacrifice, overkill, and mutilation of other humans for many reasons, not all of which are performed to increase one's inclusive fitness. Recent scholarship reminds us that the context in which wars occur can be driven by more than just desire for power. Identity, ethnicity, and religious affiliation can also be prime movers. These observations combine to strongly suggest the origins of war are likely tied to how and when hominins became human. This leads to the question of just how far back in time we should be searching for clues, and whether or not aggressive behaviors and violence were significant drivers of human evolutionary change.

4.2 | Primatological research

As we have argued, warfare is not restricted to modern or historically recent eras, nor is it restricted to large-scale or politically complex societies. But, where should distinctions be made between general categories of coalitionary aggression and violence? Is warfare strictly a human phenomenon? This is not a trivial question, as it has implications for questions about human evolution. Indeed, warfare is a central topic for many evolutionary anthropologists because it involves uniquely human features but still shares intriguing similarities to intergroup aggression in other species, especially chimpanzees (Glowacki et al., 2017).

When considering forms of violent behavior, researchers have pointed out some parallels between primate species, namely cannibalism and intergroup conflict. As we will discuss in a later section, evidence of suspected cannibalism among our earliest ancestors figures prominently into debates about the origins of warfare. Recent research suggests cannibalism is a rare event among most primates, having been documented in only a few species (Dellatore et al., 2009). Among the great apes, it has been best documented in chimpanzees, though even here it seems to be an aberrant behavior. Though rare, data also indicate cannibalism occurs in gorilla and orangutan populations (Dellatore et al., 2009).

There is ample evidence of analogous intergroup violent behaviors within extant nonhuman species. As noted by Glowacki et al. (2017, p. 3), comparisons between human warfare and other species can be operationalized if we focus on a particular aspect of warfare, namely coalitionary killing. Among many nonprimate species, clear evidence of aggression and violence exists (Wrangham, 1999; Wrangham, Wilson, & Muller, 2006). Wrangham (1999, p. 4) observes that intraspecific killing occurs in a variety of species, commonly following patterns expected by natural selection theory. This can include spiders killing each other when competing over resources (see Austad, 1983), as well as intercolony aggression and raiding with ants (Adams, 1990; Wrangham & Peterson, 1996, p. 162). Thus, on the surface, patterns of human group aggression appear to follow larger, natural patterns of lethal aggression found in other species (Wrangham, 1999, p. 4). However, as Wrangham (1999, p. 4) further notes, much human killing occurs in contexts dominated by a coalitionary style of violence. Among many animals where aggression occurs in high rates, lethal violence is usually dyadic and not coalitionary. Concerning organized or coalitionary killing, the only non-primate mammal for which coalitionary killing is known to be commonly responsible for adult deaths is with wolves (see Mech et al., 1998). While uncommon, occasional coalitional killing of adults from neighboring groups has also been observed among other social carnivores, such as spotted hyenas, cheetahs, and lions (Wrangham, 1999, p. 4; Wrangham & Peterson, 1996, p. 160). Wrangham (1999, p. 4) distinguishes these data by suggesting that animals can be divided into three main categories: (a) species where conspecific killing is rare; (b) species where killing occurs more frequently, but only in dyadic interactions; and (c) species where killing is also frequent but is polyadic or coalitionary. Most species fall into the second category, whereas the third category is dominated by ants and “probably less than 10 mammalian species and perhaps no other vertebrates” (Wrangham, 1999, p. 5). Wrangham observes that, among primates, it is only within chimpanzees and humans where we see frequent

coalitionary killing, though others have noted instances of such behavior with spider monkeys (Campbell, 2006; Valero, Schaffner, Vick, Aureli, & Ramos-Fernandez, 2006) and gorillas (Rosenbaum, Vecellio, & Stoinski, 2016).

Wrangham and Peterson (1996) note that when it comes to patrilineal, male-bonded communities, only humans and chimpanzees are marked by intense systems of male-initiated, territorial aggression featuring lethal raiding. Lethal raiding can be seen as the "incursion of a coalition of males into the neighbors' territory and the surprise fatal attack against vulnerable neighbors" (Aureli, Schaffner, Verpoorten, Slater, & Ramos-Fernandez, 2006, p. 486). Aureli et al. (2006) note that this differs from coalitionary intergroup killing in that: (a) it is not defensive but a direct assault; and (b) members of the raiding group return to their home area rather than take over neighboring territory. Otterbein (2004) argues that these data may indicate the presence of fraternal interest groups for chimpanzee communities, somewhat akin to those observed with raiding patterns among human hunter-gatherer communities. He proposes that bands of related males within a hunter-gatherer community will form such fraternal interest groups, which may have existed among early hominin populations, and if so, could have been a pivotal component for organized aggression.

Contrasting with chimpanzee behavior, we can also look at bonobo communities. The research on bonobos (*Pan paniscus*) consists of fewer long-term study sites (Doran, Jungers, Sugiyama, Fleagle, & Heesy, 2002, pp. 14–15), but suggests that variation in conflict is common among the hominoids. As summarized by Wrangham and Peterson (1996, pp. 204–219), bonobo societies differ from chimpanzee ones in key ways when it comes to violence. "They have reduced the level of violence in relations between the sexes, in relations among males, and in relations between communities" (Wrangham & Peterson, 1996, pp. 204–205). Within bonobo communities, researchers have noted a general absence of males forcing copulations, battering females, or practicing infanticide. Deadly aggression has not been observed (de Waal, 2012). It is possible that female cooperation helps to maintain peace and deter male aggression. In a study by Tokuyama and Furuichi (2016), older females were observed supporting younger females by helping to attack males who were aggressive toward them. The researchers argue that such coalitions form to mitigate male harassment, and may also lead to more tolerance among females. Thus, female bonds between non-kin may help to prevent male aggression toward female bonobos. Additionally, there is comparatively less inter-community violence with bonobos, and in some cases, intercommunity interactions can be friendly and cordial. Social tolerance allows for more cooperation (Hare et al., 2007). While violence is not entirely foreign, researchers have not documented the sorts of border patrols, raiding, and lethal aggression seen with chimpanzees. Overall, it is clear that male bonobos do not exhibit the same kinds of violent behavioral patterns sometimes seen with male chimpanzees. For some researchers, this key contrast may be correlated to the hunting and killing of mammals by male chimpanzees (Wrangham & Peterson, 1996, p. 216).

It is possible that early hominins were more bonobo-like than chimp-like (de Waal, 2009). Such a hypothesis is partly supported by the apparent minimal sexual dimorphism of *Ardipithecus*. However, it is also possible that the ancestral condition was unlike either of these hominoids. de Waal (2000) argues that while we can clearly see

aggression in many species, it might be productive to view it not as an antisocial instinct but as a potential tool of both competition and negotiation. Chimpanzees will kiss and embrace after fights, whereas other nonhuman primates will engage in similar sorts of "reconciliations." After a fight, chimpanzees will try to console the victim, which seems to reduce their arousal and alleviates distress (Romero, Castellanos, & de Waal, 2010).

The commonalities between human and chimpanzee lethal raiding behaviors are intriguing for the possibility of coalitionary violence operating as a driver of human evolution, and thus provide a compelling basis for further hypothesis testing. However, there are contrasting perspectives that question the possible evolutionary link. For instance, some researchers suggest that the chimpanzee patrols are not aimed at coalitionary aggression, seeing patrols as evidence of security during "food-searching forays" rather than as searches for interlopers (Sayers, Raghanti, & Lovejoy, 2012, p. 120). Also, many features of chimpanzees seem to have evolved after the last common ancestor, and, as argued by Haslam (2012, p. 301), the current lack of comparative *Pan* fossils might erroneously promote a sense of stagnancy for the phenotype of all chimpanzees, past and present. As such, present-day chimpanzee behaviors may not be wholly representative of those of ancestral chimpanzees. Additionally, present-day chimpanzee interactions span a wide expanse of social behaviors, from peaceful and cooperative to competitive and aggressive (Wilson, 2013). But, the full range of these behavioral data is often overlooked in many popular accounts that emphasize chimpanzee violence.

When social relationships are important for a species, then "one can expect the full complement of natural checks and balances" that can promote cooperative and peaceful interactions within animal societies (de Waal, 2000, p. 586). Members of these communities recognize the social benefit for avoiding and mitigating the effects of conflict, they have been observed to participate in different behaviors, such as those variably described as "policing," "pacification," and "third-party mediation" (de Waal, 2000, p. 589). For de Waal, these tactics are elaborations on an underlying behavioral mechanism that protects cooperative bonds within social groups. "The evolutionary advantages of reconciliation are obvious for animals that survive through mutual aid: Reconciliation ensures the continuation of cooperation among parties with partially conflicting interests" (de Waal, 2000, p. 589). Prosocial tendencies and empathy are not the sole purview of humans. Empathy is biased toward the group (de Waal, 2012). As Campbell and de Waal (2011) showed, chimpanzees are more likely to take part in contagious yawning when the yawns are observed in in-group rather than out-group members. Reports of altruistic acts toward nonfamily group members, such as adoption, suggest that chimpanzees are capable of both aggressive and peaceable acts (Boesch, Bole, Eckhardt, & Boesch, 2010).

In addition, some researchers question a heavy reliance on the chimpanzee as the best referential model for early human behavior (Sayers et al., 2012), arguing that a "chimpancentric" (Pickering & Dominguez-Rodrigo, 2010, p. 109) view runs the risk of overlooking behavioral aspects of other referents. Within communities of the bonobo, for example, lower levels of violence have been documented in relations between sexes, in relations among males, and in interactions between communities (see Wrangham & Peterson, 1996,

pp. 204–205). Although violence is not entirely absent, researchers have not documented border patrols, raiding, and lethal aggression as seen with chimpanzees.

According to Sapolsky (2013, p. 421), there is no archetypal “non-human primate,” and enormous variability exists when it comes to sociality and social groupings among primate species. Recently, a study observed a high degree of social malleability between two different troops of baboons in Kenya, resulting in contrasting levels of aggression and sociality based on local environmental conditions and resource availability (Sapolsky, 2013). As anthropological knowledge of primate behavior has grown, it has become clear that significant diversity marks primate adaptation, and concepts such as aggression are less uniform among primates than often believed (Strier, 1994). As noted by Fuentes (2012, p. 124), a broad survey of the primatological research literature, encompassing the study of hundreds of species and tens of thousands of observation hours, demonstrates that intra-species violence resulting in death is extremely rare and not wide-scale. This does not mean that primate life is devoid of conflict or aggression, but it does mean that putting more emphasis on aggression runs the risk of downplaying the overwhelming majority of interactions that are more prosocial. Even if we were to accept the hypothesis that our earliest ancestors participated in analogous forms of intergroup aggression (particularly among males), it is still difficult to make inferences about frequencies and thus the potential for coalitionary violence to have been a major driver of evolutionary change.

A final point in the general use of primates as referent models for early human behavior is no extant primate possesses the same cognitive abilities that humans hold. Seeing human warfare as qualitatively distinct from intergroup or coalitionary violence among other species, it becomes necessary to scrutinize the material record for the earliest instances of such forms of human collective violence. This line of inquiry is especially pertinent for considerations of when we might expect emergent warfare to have made its earliest appearances.

In a meta-analysis of mammals Fry and Szala (2013) show that there are low rates of killing, especially in primates. “When it comes down to contact agonism between conspecifics, restrained, nonlethal aggression, in contrast to more risky escalated combat, has evolved as the predominant pattern in mammals and many other species” (Fry & Szala, 2013, p. 468). Their conclusion that natural selection favors nonlethality is similar to recent research from other researchers who study aggression. Recently, Gómez et al. (2016) utilized an expansive phylogenetic analysis across diverse animal taxa to suggest that lethal violence emerges as an adaptive trait in some lineages, including our own. They argue that a certain level of lethal violence in humans exists because of our position within the mammalian lineage. They also examine the percentage of violence at around 80 archaeological sites from the Paleolithic (while they define this period as between 50,000 BP and 12,000 BP, at least two of the sites on their list are significantly older than this).

As the preceding discussion indicates, there is considerable debate about the most appropriate uses of primate analogies as models for archaic human behaviors. The variability in primate behaviors presents a challenge. In addition, we suggest that another challenge in relying on primate models is that there is a qualitative difference between the symbolic abilities of humans and that of

nonhuman primates. This is not to say that humans are exceptional, but rather to note that the evolutionary pressure and histories of hominins led to a different way of conceptualizing the social and biological world and the invention of new ways of surviving in a complex social niche. There have been some claims for symbolic thought in nonhuman primates. The report of a chimpanzee drumming on a tree to communicate information has been described as symbolic communication (Boesch, 1991) and studies showing what seems like a human-like ability to use numbers in chimpanzees (Kawai & Matsuzawa, 2000) suggest complex numerical abilities. Others, though, have noted that chimpanzee understanding of number concepts seems not to be as open-ended (Hauser, Chomsky, & Fitch, 2002).

For our purposes, we view human warfare as qualitatively different from forms of lethal, intergroup violence seen elsewhere in the natural world. As argued by Wrangham (1999), male chimpanzees on patrols have been observed to attack outsiders, but only if there is an imbalance of power or numbers in their favor. They do not communicate or compel each other to participate with appeals to ideological reasons. Because of our highly complex cultural overlays pertaining to the uses of violence, humans will engage in organized violence even if the risk of death is extremely high or even guaranteed. Our forms of organized violence can thus be viewed as qualitatively distinct. This is not to say that nonhuman primates do not engage in cooperative violence, nor do we doubt that the raiding parties of chimpanzees are complexly organized and perhaps mediated by culture. We simply suggest that human symbolic expression (Deacon, 1997) allowed for many distinctively human traits and attitudes about appropriate uses or nonuses of violence.

4.3 | Archaeological research

In recent decades, researchers have developed methodological frameworks for the archaeological recognition of warfare in an array of cases across time and space, and these include several categories of material data, such as settlement data, defensive works, specialized weapons, iconography, and trauma on skeletal remains (see Arkush & Stanish, 2005; Golitko, 2015; Haas, 2001, 2004; Keeley, 1996; Keeley, Fontana, & Quick, 2007; Kim & Keeley, 2008; Kim, Kusimba, and Keeley 2015; Lambert, 2002; LeBlanc, 2003). Because warfare involves the behavior and actions of multiple individuals and affects various aspects of social life, several independent lines of evidence are necessary to bolster the presence of warfare related behaviors (Keeley, 2001, p. 339). Given the diversity in forms for warfare and practices related to it, a package of material signatures is required to document its existence and cultural importance. This, of course, represents the challenge for recognizing warfare, or any context of violence, in time periods where certain kinds of material markers would not likely exist or endure in the material record. For example, outside of Holocene contexts, we are not likely to find evidence for fortifications, buffer zones, or specialized equipment used exclusively for warfare (e.g., shields, armor, and so forth). The majority of kinds of technologies, tools, large-scale settlements, and other social features extant within the Holocene were simply absent throughout the Pleistocene. That being said, archaeological studies do provide a blueprint for posing and testing hypotheses for far earlier contexts, with methodological advances and insights emerging

over the last few decades having produced not just new data but new questions. Advances in taphonomic analysis have also allowed scholars to reassess finds.

For the consideration of smaller-scale societies of the Pleistocene, then, the most pertinent category of archaeological indicator would be evidence of trauma on human remains. "Bioarchaeology offers empirical data that help unravel large and important questions about humans and their long relationship with violence" (Martin, Harrod, & Perez, 2012, p. 2). The analysis of human remains is one of the most important ways to consider both interpersonal and organized violence, regardless of time period (Knusel & Smith, 2014; Martin et al., 2012; Walker, 2001). Archaeological study of human remains provides a unique source of data on both violent conflict and peaceful coexistence (Walker, 2001). Telltale signs for violence can include parry fractures on forearms, embedded projectile points, fractures, cut marks, or lesions from blunt-force trauma on bones, scalp or cut marks on crania, and dismemberment or other signs of trophy taking (Kim & Keeley, 2008). A single instance or indication may not be sufficient to indicate violence or warfare, but a package of material signatures and data would help build inferences.

In varied temporal and cultural contexts spanning the Holocene, bioarchaeological data (Boulestin et al., 2009; Frayer, 1997; Meyer et al., 2015) provide insights for not only instances of violence, but also of larger-scale events and social practices related to violence. For instance, bioarchaeological work has shown the presence of captives (Martin, Harrod, & Fields, 2010), uses of torture (Osterholtz, 2013), and the effects of military life on the health of soldiers (Meyer, 2003; Quade & Binder, 2018). In a suspected mass grave dating to 7,000 years ago in Talheim, Germany, linked to the Linearbandkeramik Culture (LBK), researchers uncovered the skeletal remains of some 34 individuals, all of whom appear to have been the victims of a massacre. The evidence includes indications of numerous lethal head wounds, several arrow wounds, and the placement of all of these individuals in the same burial pit (Price, Wahl, & Bentley, 2006). Roughly contemporaneous, the site of Herxheim in Germany yielded evidence of a fortified LBK village, where researchers found the remains of ~500 individuals within one of the outer fortification ditches. Much of the remains appears to have undergone mutilation of some kind, with many skulls having been fashioned into "calottes," perhaps as part of a ritualized practice (Boulestin et al., 2009). The LBK societies, while farming communities, are not considered to be large-scale "states" or civilizations. Indeed, they significantly predate such social manifestations anywhere in Europe.

However, the presence of many of these markers is equivocal for the Pleistocene, either because they did not exist, did not preserve in the material record, or require greater resolution than we currently have for Holocene sites. Additionally, diagenic and taphonomic processes may affect older fossils in different ways. For these reasons, the majority of evidence comes from bioarchaeological studies, taphonomic analysis, and genomics. Marks and trauma on human remains function as the most direct indicator of possible violence, and this is especially the case for the earliest cases from the Pleistocene. But, even then, there are significant hurdles in extrapolating behavioral patterns behind the resulting material signatures. Before exploring some of the most

relevant cases for possible violence in the Pleistocene, we first highlight current research related to genomics.

4.4 | "Warrior genes"

Some researchers have argued that there is a genetic component to aggression (McDermott, Tingley, Cowden, Frazetto, & Johnson, 2009). The so-called "warrior gene" (Gibbons, 2004) has been the source of much research over the last 20 years. This gene on the X chromosome codes for the enzyme monoamine oxidase A (MAOA). A genetic mutation close to the vicinity of the MAOA gene on the X chromosome causes the MAOA molecule to stop forming. Males who have a specific faulty MAOA gene are hypothesized to be more aggressive, with elevated levels of serotonin, dopamine, and norepinephrine in the brain (Brunner, Nelen, Breakefield, Ropers, & van Oost, 1993). However, MAOA deficiency is uncommon in humans as a whole (Schuback, Mulligan, Sims, et al., 1999) and we must be careful in linking the MAOA gene as a gene for violence, as the types of aggression humans undertake are numerous and thus hard to subsume all under one gene. Recent work has shown that there are variable number tandem repeats in the MAOA gene, with the specific number and type of repeat possibly being associated with different levels of aggression (Deckert et al., 1999; Sabol, Hu, & Hamer, 1998). Individuals who participated in a psychological study were more likely to dole out punishments if they had the low variant MAOA gene (McDermott et al., 2009). This is taken to indicate that, in general, people are not prone to violence but rather that under certain circumstances a subset of the general population is more likely to react violently than others (McDermott et al., 2009). Maltreatment in youth can also affect levels of serotonin and norepinephrine and may lead to aggressive behavior in adults (Caspi et al., 2002, 2003). Caspi et al. (2002, 2003) showed that individuals with the low-activity version of the MAOA gene who were raised under severe mistreatment have a higher likelihood of antisocial behavior than those with the high-activity variant. However, when there is no mistreatment the converse is true, suggesting that gene-environment interaction plays a key role.

In another study, Criminologist Beaver, Barnes, & Boutwell (2014) and Beaver, DeLisi, Vaughn, & Barnes (2010) examined the National Longitudinal Study of Adolescent Health ("Add Health") data to conclude that African-American adult males who have the two-repeat allele for MAOA are more likely than others to engage in a shooting or stabbing event. However, as they removed the Caucasian sample since the allele was too rare, they are left with an African-American sample size of 133. Not much is known about the individual history of the people involved in the specific aggressions, so it is hard to know how the environment affected them. Secondly, "shooting/stabbing" is a specific example and we need to consider the context of these studies. Are the differences in the brain the cause of antisocial behavior, is the environment of violence in some populations producing these changes, or is it something else? The living conditions of poverty can have significant effects on gene expression. The interaction of unfair treatment/discrimination and SNPs suggests that gene-environment interactions can have significant effects on historically disadvantaged

populations (Quinlan et al., 2016). Poverty and inequality may lead to violence for reasons removed from genetics.

Similarly, in an article presented at a genetics conference in 2006, scientists reported on the frequency of the three-repeat version of the MAOA allele (Perbal, 2013). Specifically, they noted that it was common in the Maori population (56%) and it was argued that the reason Maori males are more violent is because of the prevalence of this allele in the population. There are numerous issues with this interpretation. For one, it does not take into account poverty and other factors that are also associated with certain Maori communities. As pointed out by bioethicist Laurence Perbal (2013), the notion that this gene explains why Maori are violent fits the stereotype associated with this population but does not consider the context.

Overall, genetic research shows that context matters. Rhesus macaques reared by mothers and those reared in a nursery express differing responses to stresses (Newman et al., 2005). Studies have also been performed with monkeys raised in different types of deprivation from social contact. In some cases, monkeys are peer-reared, others are surrogate peer-reared, and the third group is raised by the biological mothers. While complex, the data suggest that when a monkey is exposed to adverse conditions early on in life they are at greater risk for excessive aggression (Dettmer & Suomi, 2014; Dettmer, Woodward, & Suomi, 2014).

Given the uncertainties and the complexities involved in shaping behavior, we can safely say at the moment that there is simply no conclusive evidence for a specific gene or hormone which will make someone more aggressive. There are almost 300 SNPs on the MAOA gene alone (Charney & English, 2012). The effect of a gene is mediated though, and influenced by, the environment. In the end, while the genetics research is intriguing, we see the material record, along with the analogical data to interpret those material data, as being the most significant for our preliminary understanding of emergent warfare.

5 | PALEOANTHROPOLOGICAL RESEARCH

5.1 | Assessing paleoanthropological materials

The genetic, archaeological, ethnographic, and primatological datasets suggest the possibility that warfare, broadly defined, might have its roots in the Pleistocene. However, the methods that are applied to earlier human populations are quantitatively and qualitatively different. Problematically, many of the earliest examples of interpersonal conflict are found in nonmodern humans (e.g., Neandertals, other members of the genus *Homo*, *Australopithecus*), which makes applying models derived from human societies difficult. To further complicate matters, we must also acknowledge the enormous challenges involved with the interpretation of fossil remains and how useful these material data may or may not be when it comes to recognizing violent behaviors. At a minimum, the presence of cut marks or blunt force trauma, for instance, can signal the potential that violent behaviors have occurred. Of course, such signatures alone are insufficient to indicate violence, much less organized violence between groups. Such isolated findings would need to be placed within a wider framework

of material indicators. Is there additional data to suggest that the trauma on the remains is perimortem and nonaccidental, and are there other indications that we are looking at intergroup interactions? Walker (2001) outlines a very useful methodological process for interrogating the material record for this sort of exercise. At the very least, any indications of possible trauma should not only be considered as possible intragroup violence (or homicide), but also as potential evidence for intergroup violence. Along those lines, we believe more attention ought to be placed on earlier cases, even if it may be challenging to test hypotheses.

In this section, we sketch some of the data that suggest the possibility of coalitional lethal violence. Many of the examples do not fit strict definitions of war, as there is little to no evidence of intergroup conflict. However, they may indicate the possibility, and we concentrate on three examples that have yielded substantial data.

As noted in Section 1, political leaders and pundits rely on the Pleistocene fossil record to make assertions about warfare's origin and the nature of human behavior. For science writer Shermer (2016), warfare existed when our earliest ancestors emerged, with those who critique this view being labeled as "aggressive anthropologists." We see problems in perspectives that compress the timeline of human evolution. For example, in making the argument that our earliest ancestors were more violent and aggressive than we are today, Pinker (2011) lists prehistoric war victims from archaeological sites from ~14,000 to ~700 years ago, with three sites from Africa, nine from North America, eight from Europe and one from Asia (for a critique of this see Ferguson, 2013a and Kim, 2012). The sites in his dataset would indeed be considered old from a historic perspective. But human history did not start in the Late Pleistocene. Such a view overlooks much of the evolutionary pressures that affected our ancestors. Evidence from Nataruk, Jebel Sahaba, and other cemetery burials demonstrate violence, and perhaps collective violence. However, anthropologists need to be clear that this represents only a tiny portion of the human evolutionary record. In this section, we summarize the earliest evidence for interpersonal conflict. As the context of these finds are nowhere near as clear, nor as detailed, as more recent examples, they are by their nature less definitive. However, taking an evolutionary view allows us to see them as examples of how warfare may have emerged and evolved.

Table 2 provides a summary of a small subset of the data from the Pleistocene (and see Figure 1 for geographic locations), though it is far from comprehensive. Our objective with this table is to complement existing research findings and to discern suspected instances of violence within a wider context spanning space and time. Wu et al. (2011) provide a listing of all the known traumatic lesions on *Homo* fossils that predate the Late Glacial Maximum of 13,000 years ago. Interestingly, all but one of the 79 fossils show some level of healing (in the form of bone remodeling), suggesting perhaps some form of compassion (see Spikins, 2015). The authors suggest that these data support the assertion of both high risk of injury and the ability to survive these incidences for many of these contexts. In another overview of the fossil record for interpersonal violence, only three out of the 69 examined cases were considered to be lethal (Sala et al., 2015).

One of the oldest examples of possible interpersonal violence is the Stw 53 maxilla from Member 5 of Sterkfontein, South Africa (Pickering et al., 2000). The Bodo cranium also shows cut marks (White, 1986). Indeed, many examples of cannibalism have been identified in the Pleistocene, though the exact purpose of this behavior is unclear (Kim & Kissel, 2018). Cannibalism is not uncommon in the animal world so we should not be too surprised to see it documented in these populations and it is possible individuals who had died of natural causes were eaten because of resource stress. Nonhuman populations are believed to regulate their population through the killing of the young, a behavior seen in brown bears (Young & Ruff, 1982). A similar behavior may occur in polar bears (Taylor, Larsen, & Schweinsburg, 1985). More generally, cannibalism occurs in animals during times of resource stress or population pressure (Polis, Myers, & Hess, 1984). The fact that such behaviors occur in nonhuman animals suggests that it is difficult to interpret the occurrence of particular forms of cannibalism from the current taphonomic data alone. But were these cases the result of violent actions? And if so, were they part of group-on-group, coalitional violence? Interpersonal violence is not the same as warfare and we cannot use these cases to support the assertion that warfare is ancient. We have no information about these acts being related to any sort of systematic exocannibalism, thus precluding anything more than speculation about collective violence, much less warfare.

5.2 | The cases of Nataruk and Jebel Sahaba

Lahr et al. (2016) recently reported on skeletons from the site of Nataruk, Kenya, dating to ~10,000 years ago. At a site located along the banks of what would have been a lagoon, researchers uncovered evidence of what may have been a massacre. Of a dozen individual skeletons, 10 show signs of lethal violence. The two skeletons that do not show signs of trauma (one male and one pregnant female) are oriented in such a way as to seem like they were bound. One individual has an obsidian blade from a nonlocal source embedded in a cranium. Of further interest is that the skeletons were not ritually placed into burials. The embedded projectile points and fractures clearly indicate violent trauma of an intergroup variety. The researchers suggest possible scenarios, such as raiding between groups, and state that "the deaths at Nataruk are testimony to the antiquity of intergroup violence and war" (Lahr et al., 2016, p. 397).

The notion of a single massacre event has been criticized (Stojanowski et al., 2016). Stojanowski et al. (2016, p. E8) argue that "the data suggest that the burials are not contemporaneous and that most of the observed cranial damage is inconsistent with blunt force trauma." For example, data that Lahr et al. argue indicate interpersonal trauma may be more consistent with postdepositional warping and cracking. Analyses for this case are still ongoing. However, if interpersonal violence is confirmed by further study and analysis, the Nataruk case may constitute one of the earliest cases of large-scale intergroup violence, further lending support to the argument that intergroup violence need not be restricted to larger-scale, complex societies.

Proponents of a long timescale for human violence often point to the site of Jebel Sahaba (site 117), located on the east bank of the Nile River in Sudan (Wendorf, 1968). With a sample of over 60 individuals, it is one of the earliest known cemeteries and provides high quality

evidence of large-scale interpersonal violence, though there is no occupation area nearby. Some burials have only one individual, while others have up to four people in one burial pit. The date of the site is unclear, but lithic analysis places the site ~14,000–12,000 years ago (Holliday, 2013). Of the 61 skeletons, 45% show signs of traumatic death, including points and barbs directly associated with burials (and a few artifacts embedded in the bone fragments themselves). Interestingly, analysis of body shape suggests the sample is more similar to sub-Saharan Africans than to Egyptians or Nubians (Holliday, 2013). Work on the skeletal material suggests there are even more taphonomic indicators of violent death in the form of arrow impact marks, suggesting that the individuals succumbed to attacks from archers (Keys, 2014). There are also healed injuries on the bones, which may suggest sustained violence over an individual's lifetime, and the ulnae of ~11% of the individuals show signs of parry marks (Judd, 2008).

As compelling as this case might be, there are some important points to keep in mind. Ferguson (2013a) has questioned much of this interpretation. For instance, while the artifacts found associated with the bodies are often referred to as arrowheads, they could also be microliths that were attached to shafts. He also notes that some of the artifacts are found inside skulls that have no recorded entry wounds, suggesting their placement is random rather than a signal of violent death. Of the 24 individuals that show direct signs of trauma, only four have embedded fragments of tools. This suggests to some researchers that trauma is closer to 10% rather than ~50% (Jurmain, 2001). Some form of intergroup and systematic violence may be present. It is an order of magnitude different from what is seen in earlier sites, where we do not have large burial centers. But if it is behaviorally different is harder to say.

Both of these examples date to near the Terminal Pleistocene, at a time when some populations in various world regions are becoming more sedentary. Earlier examples (see Table 2) tend to reflect only single instances of violence or are said to indicate cannibalism (which may or may not be part of hostile aggression).

Assessing the percentage of individuals who died traumatic death is difficult. Keeley (1996, p. 91) notes that the actual percentage of violent deaths may be much higher than the obvious examples seen in the archaeological record would tell us. If a small percentage of the ones found show trauma, he argues that traumatic events may actually be common since skeletons are rarely completely preserved and then excavated. We must account for the people who died during warfare but whose bodies do not show obvious signs of trauma, along with bodies that were not buried in a grave that would eventually be found by archaeologists. Similarly, Milner (2005)'s study of historic records suggests that arrowheads only damage bone one out of three times.

5.3 | The Gran Dolina case

Both the Nataruk and Jebel Sahaba examples are relatively recent. As Table 2 suggests, examples from before 15 ka are more difficult to assess. While Pinker (2011), p. 3 asks "What is it about the ancients that they couldn't leave us an interesting corpse without resorting to foul play?", this may be overselling the case. Many claims of violent death are difficult to confirm. The Předmostí remains have been lost, thus making it difficult to prove the case of violence (Svoboda, 2008).

TABLE 2 Evidence of possible violence in the Pleistocene and early Holocene

Name	Location	Approx. age	Species designation	Evidence indicating possible violence	Nature of behavior	References
Bodo	Ethiopia	~600 ka	<i>H. heidelbergensis</i>	Cutmarks on the bone surface suggesting postmortem defleshing	Possible cannibalism but context unclear	White (1986)
Dolni Vestonice 13–15	Czech Republic	26 ka	<i>H. sapiens</i>	Healed fractures on crania	Interpersonal violence	Trinkaus and Svoboda (2005)
Gough's Cave	UK	14.7 ka	<i>H. sapiens</i>	Cutmarked/modified remains and tooth marked bones	Cannibalism (maybe ritual)	Bello et al. (2015)
Goyet	Belgium	45–40 ka	Neandertal	Defleshing marks and use of human bone as tools	Cannibalism	Rougier et al. (2016)
Gran Dolina	Spain	949–772 ka	<i>H. antecessor?</i>	Cutmarked bones (see text)	Cannibalism/warfare/raiding	Carbonell et al. (2010)
Jebel Sahaba	Sudan	11.6–14.5 ka	<i>H. sapiens</i>	Multiple signs of trauma and weapons (see text)	Raiding/warfare	Wendorf (1988)
Krapina	Croatia	130 ka	Neandertal	Multiple signs of trauma	Interpersonal violence	Estabrook and Frayer (2013)
Les Rois	France	30–28 ka	Neandertal/modern human	Mandible with cutmarks	Possible cannibalism but context unclear	Ramirez Rozzi et al. (2009)
Maba	China	250–100 ka	Archaic human	Blunt force trauma on frontal bone	Interpersonal violence	Wu, Schepartz, Liu, and Trinkaus (2011)
Moula-Guercy	France	120–100 ka	Neandertal	Cutmarked bones	Cannibalism	Defleur, White, Valensi, Slimak, and Crégut-Bonouïre (1999)
Nataruk	Kenya	10 ka	<i>H. sapiens</i>	Multiple signs of trauma (see text)	Raiding/warfare	Lahr et al. (2016)
Předmostí	Czech Republic	27–25 ka	<i>H. sapiens</i>	Possible cutmarks on human bone	Interpersonal violence	Svoboda (2008)
San Teodoro Cave	Italy	Upper Paleolithic	<i>H. sapiens</i>	Flake embedded in female pelvis	Interpersonal violence	Bachechi (1997)
Shanidar 3	Iraq	~50 ka	Neandertal	Lesion on ninth rib, perhaps caused by sharp force of a lithic point	Interpersonal violence	Churchill, Fransiscus, McKean-Peraza, Daniel, and Warren (2009)
Sima de los Huesos	Spain	430 ka	Neandertal(?)	Fractured cranial bones of at least three individuals	Interpersonal violence	Sala et al. (2015)
St. Cesaire 1	France	36 ka	Neandertal	Healed fracture on cranium	Interpersonal violence	Zollikofer, Ponce de Leon, Vandemeersch, and Lévéque (2002)
Stw 53, Sterkfontein	South Africa	2.6–2 mya	<i>Australopithecus</i> or early <i>Homo</i>	Maxilla with cutmarks	Possible cannibalism but context unclear	Pickering, White, and Toth (2000); Pickering (2013)
Sungir 1	Russia	34.6–33.6 ka	<i>H. sapiens</i>	Incision on 1st thoracic vertebra said to be caused by sharp implement	Interpersonal violence	Trinkaus and Buzhilova (2012)
Xujiajiao	China	370–260 ka	<i>H. sapiens/Homo erectus</i>	Bone lesions on cranial fragments	Interpersonal violence	Wu and Trinkaus (2015)

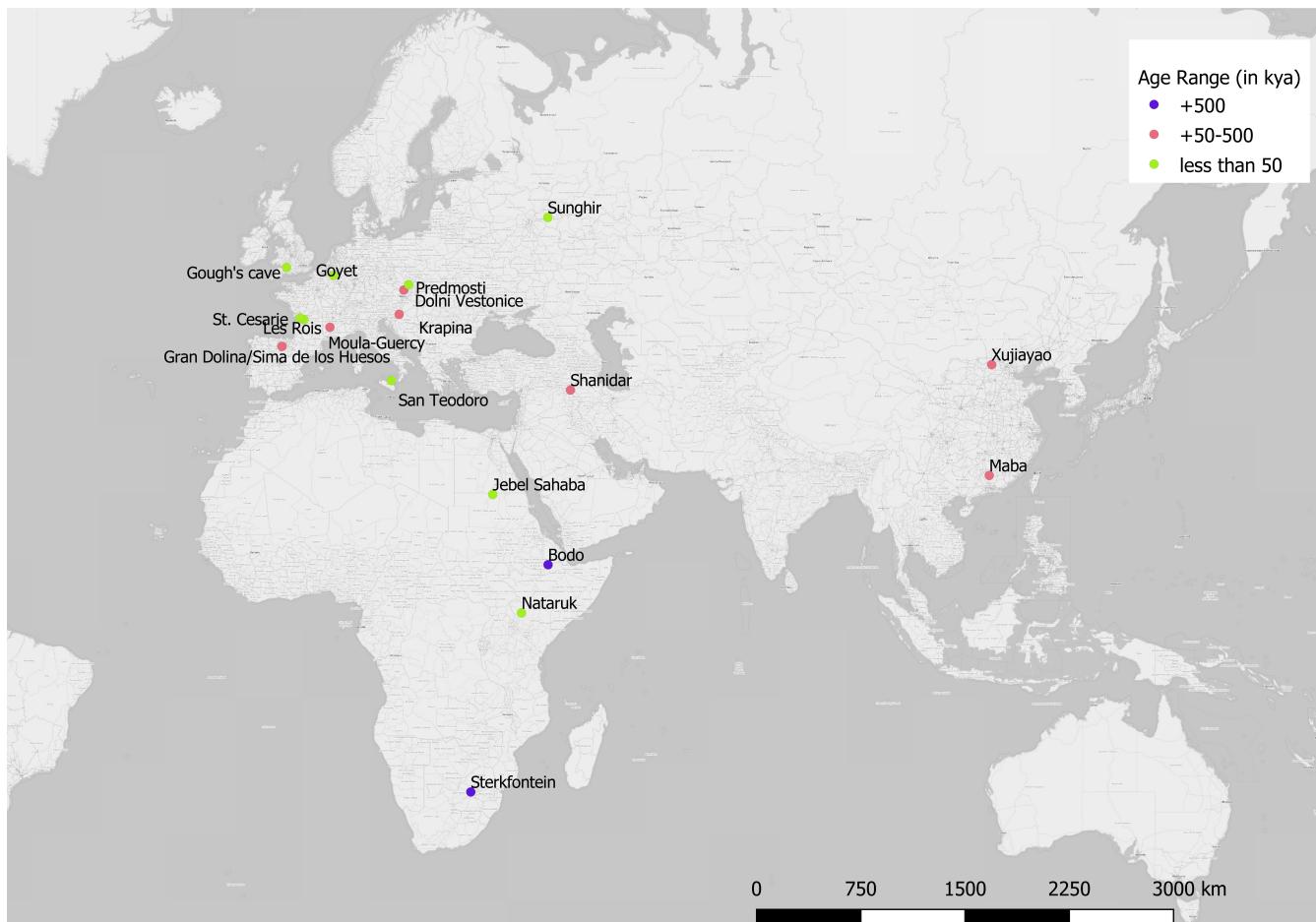


FIGURE 1 Geographic locations

Other sites were analyzed before detailed and systematic methods were in place. Furthermore, as population densities were most likely lower and people did not live in permanent settlements, the likelihood of uncovering mass graves and cemeteries is lower. Finally, many of these earlier examples come from nonmodern humans. To remove this sample would be undervaluing the human evolutionary record but at the same time we must be cognizant of the difficulties of discussing the behavior of these hominins.

A salient example comes from the TD6 layer at Gran Dolina, where remains attributed to *Homo antecessor* have been interpreted as being proof of cannibalism (Carbonell et al., 2010; Fernández-Jalvo, Diez, Bermúdez de Castro, Carbonell, & Arsuaga, 1996; Fernández-Jalvo, Diez, Caceres, & Rosell, 1999). Recent ESR dates by Duval et al. (2018) place this layer at 949–772 kya. The butchery techniques used to deflesh the hominins at TD6 were “aimed at meat and marrow extraction” (Fernández-Jalvo et al., 1999, p. 620). Was this (a) opportunistic meat consumption resulting from predation or scavenging, (b) a form of “culinary tradition” or other cultural practice with cultural meaning, (c) the killing and consumption of enemies, or (d) a ritual treatment of deceased kin? Carbonell et al. (2010) argue this practice had multiple benefits for the consumers. They suggest the cannibalism was a conscious decision on the part of the hominins living at TD6 to prevent their enemies from outcompeting them. The authors imply the cannibalistic

behavior associated with the Gran Dolina hominins may have been part of a system of values and beliefs within that society, perhaps connected to a symbolic component. While archaeological evidence of symbolic behavior is being pushed back in time (as discussed in a Section 6), at ~900 kya this is a striking case to make.

Without an extensive material record for TD6, it is not altogether clear how ancient forms and contexts of cannibalism can be distinguished from each other. What took place with the TD6 case may have been solely for nutrition through predation. Or, perhaps it is an example of endocannibalism without any sort of “modern” beliefs or practices (see Saladié et al., 2012). The absence of direct signs for extant, distinct social groups and communities prevents us from eliminating the possibility that endocannibalism can account for the pattern of remains, as the differences between endo- and exocannibalism are difficult to recognize in the archaeological record without tight controls of time. Carbonell et al. (2010) note that evidence of cannibalism was found in different archaeological units and there seems to have been a wide range of available animal species. The environmental conditions for TD6 do not indicate that this necessarily occurred during a starvation period. However, the resolution may not be sufficient to adequately evaluate the climatic conditions.

Intriguingly, in a comment on Carbonell et al.’ manuscript, Otterbein (2011) suggests that the behavior of the hominins of level TD6 at Gran Dolina might constitute the earliest archaeologically

documented evidence of warfare, a phenomenon he defines as "armed combat between political communities" (Otterbein, 2009, p. 117; Otterbein, 2011, p. 439). His conclusion is based on the premise that the hominins in question may have participated in the raiding of hunter-gatherer camps or settlements inhabited by outside groups, thus making this instance of potential cultural cannibalism also the earliest possible for warfare.

Otterbein believes the evidence shows that a group or community of hominins raided another group's settlement, with the possibility of reciprocal attack occurring. According to Otterbein, the preponderance of children among the victims suggests attacks upon settlements occurring when adult males had been away or had fled. In using the term "raiding," he proposes that bands of related males within a hunter-gatherer community, what he elsewhere calls "fraternal interest groups" (Otterbein, 2004, pp. 60–62), may have intentionally set out once or several times to raid the camp(s) of neighboring communities for the purpose of obtaining conspecific flesh. One question we raise would be how "raiding," if it did indeed occur, would be viewed and defined. How would we distinguish this behavior, which may be predation, from more complex behaviors associated with raids and defense against threats as seen in other contexts?

To be clear, we have no objection with Otterbein's general conceptualization of warfare, as we agree that a more inclusive definition affords a much greater understanding for the immensely varied ways in which forms of organized violence have emerged and been practiced throughout humanity. In fact, we agree that forms of raiding between foraging bands or hunter-gatherer communities do qualify as warfare. However, we question whether the evidence available in the Gran Dolina case is sufficient for such an interpretation of warfare. For instance, Otterbein acknowledges that Carbonell et al. make no mention of weapons. Nevertheless, Otterbein speculates that clubs were used, and possibly both stabbing and throwing spears. Though it is possible such hunting implements existed, we do not have unequivocal evidence this population of hominins was producing weapons, nor is there evidence the individuals expected the occurrence of "combat."

Related to the assumption that the case shows raiding between distinct "political communities" is the hypothesis espoused by Carbonell et al. that we are dealing with a case of exocannibalism (Carbonell et al., 2010, p. 548) or exogenous cannibalism (Carbonell et al., 2011, p. 441). The lack of evidence for distinct "political communities" suggests endocannibalism may be an equally valid interpretation. As noted earlier, there is simply no clear evidence that the specimens exhibiting signs of butchering were victims taken from an outside group or community. Furthermore, studies of modern chimpanzee populations suggest that killings of infants were typically intragroup by nature (Wrangham et al., 2006).

In their reply to Otterbein, Carbonell et al. (2011) reiterate their evaluation that the TD6 case does represent exocannibalism given the treatment of the dead and the way the remains were abandoned. However, Carbonell et al. also note the ambiguous nature of the data when it comes to the social context of the behaviors, making them reluctant to conclude that warfare was occurring. If these hominins were capable of symbolic thinking, perhaps their notion of "proper" treatment is radically different from our own conceptions, thus not conforming to our expectations and giving the impression of exocannibalism. In order for Otterbein's argument (of earliest material

evidence for "warfare") to be valid, the TD6 data need to clearly support a scenario of exocannibalism, which requires the cannibalism to have been precipitated by a cultural practice of cooperative hunting and raiding for victims to be eaten.

Even if we are to accept the TD6 cut marks as evidence for cannibalism of a more culinary and less predatory nature, an evidentiary bridge is still required to infer warfare. Instances of apparently intentional cut marks and defleshing on hominin skulls by others of the same species have limitations on associated contextual information. This makes it difficult to determine the motivations behind the acts, as motivations can run the gamut from cannibalism, to anatomical curiosity, to ritual manipulation of body parts. Sites such as TD6 provide tantalizing clues, but trying to apply modern definitions to Pleistocene cases is complicated by lack of direct analogy. For many of these cases, it is not clear how "human" the hominins were. Thus, we need to be careful in applying these ideas.

Given the vast temporal and geographic spread of the data discussed here it is difficult to assess how common interpersonal violence was in the past. There are many factors at work. For one, we would imagine studies showing evidence of warfare are more likely to be published than ones that do not, leading to a "file drawer" problem. Secondly, the interpretation of bioarcheological indicators of violence is far from straightforward. Earlier claims of warfare based on taphonomic markers may need to be reassessed with modern techniques that are better able to distinguish anthropogenic and natural modifications.

6 | EMERGENT WARFARE: AN OUTCOME OF HUMAN EVOLUTIONARY CHANGE

"The story of the human race is War. Except for brief and precarious interludes there has never been peace in the world; and before history began murderous strife was universal and unending." -Winston Churchill, 1929.

The majority of the skeletal remains from the pre-Holocene record shows the absence of unequivocal signs of violence. But does this mean that warfare did not exist? Putting aside issues of preservation and quantity of evidence, we turn to another potential avenue by which we might infer the presence of rudimentary forms of warfare in the Pleistocene. As stated above, we suspect that the biological developments in our species that permitted highly complex cognitive abilities also permitted very sophisticated ways to socialize, cooperate and communicate. These abilities allowed for complex forms of intra- and intergroup behavior to develop, and the range of interactions could have included violent practices. We are not arguing that the Pleistocene world was filled with rampant violence. The archaeological study of warfare in the Holocene has revealed times with virtually no signs of violent conflict in various world regions (Keeley, 2014, p. 30). Nevertheless, rather than assuming that the absence of evidence indicates the absence of warfare, perhaps another way to view the record is to consider the possibility that varied cultural mechanisms developed by which past human communities attempted to prevent outbreaks of organized violence and maintain "peace" (see Dye, 2013; Ferguson, 2013a, 2013b; Fry, 2006; Milner et al., 2013).

Currently, there is insufficient conclusive material evidence from the Pleistocene to see warfare as having been a principal driving force for human evolution. Though there are material signals for possible violence, we feel that the available evidence does not allow us to make definitive conclusions about the wider social contexts within which such violence may have been occurring. However, we would argue that studies on the origins of warfare cannot be restricted simply to direct signs of violence. As researchers have done through analogical reasoning through referent models (e.g., chimpanzees), we suggest that there are other ways to evaluate the underpinnings of warfare, and we discuss these below.

In addition, while the evidence does not allow us to speak conclusively about the presence of warfare in the bulk of the Pleistocene, we would also argue that it does not permit us to conclude that warfare was wholly absent, either. The various indications of possible Pleistocene violence, however fragmentary, should prompt us to be open to the possibility of humans or ancestral humans having engaged in collective violence, even if rarely or infrequently. We advocate beginning with a more neutral research position wherein we see our deepest past as neither filled with only war or only peace.

"Admittedly, any theory of violence has moral implications, because biological analyses can be misused. But no theory, however benign or malevolent or whether based on biology, psychology, or culture, is immune to co-option by ideologues and propagandists" (Wrangham, 1999, p. 26). Building from the sentiment offered by Richard Wrangham, we suggest that anthropologists should continue to consider and reconsider the question of warfare's origins, especially given all of the intriguing new findings that continue to emerge which highlight early aspects of human cognition, cooperation, and signs of violence. Elements of human behavior that functioned as the integral building blocks of highly complex cooperation related to violence likely developed in timeframes far earlier than the Holocene. In other words, we suspect various aspects of human biology, cognition, and culture combined to set the stage for socially cooperative violence and the earliest manifestations of warfare.

If we are to return to our earlier conceptualization of warfare and its highly cultural nature, this leads us to ask when hominins became human. This, we propose, is when the necessary dimensions of warfare (and not just coalitionary violence analogous to that seen in other species) would have been present. When were we able to plan, communicate, convince, and compel one another to cooperate in the use of violence against other individuals or groups of individuals? When were we able to devise institutions that dictated or prescribed the social conditions under which organized violence, regardless of costs, was acceptable, necessary, or to be avoided? It is once our ancestors became capable of manufacturing elaborate reasons to fight, along with rituals related to violence, that we see the origins of warfare. Rather than reacting to simple social cues or environmental conditions, warfare involves the cultural production of artificial conditions, such as notions of social substitutability, as discussed by Kelly (2000).

On the surface, these earliest manifestations, constituting what we propose to call "emergent warfare," may not strictly adhere to the kinds of warfare that come to mind when considering the contemporary world. However, when we consider the basic elements involved in warfare, such as cooperative decision-making and strategies to use

aggression, intimidation, force, and violence to effect certain social outcomes, we can acknowledge the likelihood that our ancestral lineages would have been quite capable of developing cultural institutions related to emergent warfare. Implicit in this view is the notion that cooperative strategies that lead to the group use of aggression or violence are both planned and cultural. In that sense, then, emergent warfare ought to coincide with emergent capabilities for complex planning and foresight as well as the ability to create and recognize symbolic meanings related to violence. In other words, we do not feel it prudent to accept "peace" or a general absence of warfare as a default state of human nature. For us, both the use of organized violence and the construction of social mechanisms to promote peaceful relations are outcomes of human collaborative strategies that require complex cognition, sociality, and communication. Peace is not simply the absence of warfare, it is a condition that is produced and safeguarded through elaborate social networks and mechanisms designed precisely to avoid violence (Kim & Kissel, 2018). Hence, whereas some researchers would stress a dichotomy, emphasizing either cooperation or competition as a key driver for human evolutionary changes in physical capacities and behavioral patterns, we would frame the debate in a different way. It is intragroup cooperation that permitted groups to move beyond instincts of territoriality and into the realm of other cultural motivations for violence. Instead of being a driver of human evolutionary change, socially cooperative violence became significant as a result of human cognitive changes. If anatomically and behaviorally modern people of the past several millennia have been capable of conceiving of and participating in cultural practices related to intergroup violence, then it stands to reason that people living in the past, whether at 50,000 BP or 200,000 BP, would have been just as capable.

We believe that language would have been critical to emergent warfare's inception. The ability to link a sign to an object symbolically is integral to language. "Many species communicate, but only humans have language, and only humans communicate through symbols" (Barnard, 2012, p. 3). Human language would have permitted complex ways for violence to be organized, invoked, rationalized, justified, mythologized, motivated, and institutionalized. We both engage in and justify violence via our belief systems, a practice which seems to separate us from other species.

When this evolved is unclear. Once groups of people began to fight, finding ways to promote peace also became necessary. But this likely did not involve a flashpoint of biological and cultural evolutionary change. Rather, emergent warfare probably followed an evolutionary trajectory that mirrored humanity's evolutionary development. Certain evolutionary developments allowed warfare (and avoidance of it) to become culturally constituted.

Currently, the available evidence suggests that the first signals for highly sophisticated, modern human behavior, cultural complexity, or what we might call "uniquely human capabilities" (Pickering, 2013), behavioral modernity, or behavioral variability, appear in the archaeological record within the past two to three hundred thousand years (Bouzouggar et al., 2007; d'Errico et al., 2003; Henshilwood, d'Errico, Vanhaeren, Niekerk, & Jacobs, 2004; McBrearty & Brooks, 2000; Shea, 2011). Specifically, intriguing evidence comes from the Olorgesailie Basin of Kenya that may be pertinent to our discussions (see

Brooks et al., 2018). By 300,000 years ago humans appear to have possessed the social and cognitive skills to manufacture refined lithic tools and to produce and use pigments, potentially for symbolic purposes (Kissel & Fuentes, 2018). These data not only suggest a technological shift, but also the early development of social exchange networks. It is plausible that when the environmental and social conditions called for it, such groups could have decided that the use of collective force would have been occasionally necessary. Having the cognitive abilities necessary for such complex forms of planning and culture would have also allowed for sophisticated ways to identify in- and out-groups, such as the use of bodily ornamentation, which likely would have been key in determining appropriate allies or adversaries. We see no reason to conclude that these ancestral human populations lacked the capacity to choose when to use violence and when to refrain from its use.

Our view generally sees outbreaks of intergroup violence not simply as reactive outcomes to certain environmental conditions or social cues. Instead, the argument sees warfare as stemming from culturally constituted motivations for violence. This type of cause or motivation for warfare emphasizes the cultural dimensions of warfare more than other views, such as Wrangham (1999)'s "imbalance of power" hypothesis, which emphasizes warfare as adaptive and rooted in genetic predispositions. For Wrangham (1999, p. 19), raiding derives from the advantages of gaining intergroup dominance and an ability to assess power imbalances in an environment of intergroup hostility, as well as power imbalances between parties from neighboring communities. While we are open to the hypothesis that imbalances of power could have been a contributing factor for coalitional killing among ancestral humans, we would emphasize the importance of the cultural dimensions of decision-making and practices related to both warfare and peacemaking. This view is not dissimilar from Wrangham (1999, p. 24)'s argument that culture can mediate perceptions of power and the perceived benefits of using violence or avoiding it.

Symbolic thought permitted the ability to conceive of elaborate reasons for selecting the uses of violence, and the ability to effectively motivate, persuade, induce, or compel fellow community members to participate in, or refrain from, aggressive actions. For emergent warfare, our ancestors became better equipped to cooperate in complex fashion, which in turn permitted socially cooperative violence, behaviors that might be considered basic or precursor forms of warfare. In that sense, cooperation and competition are not diametrically opposed. Instead, both are byproducts of biological and cultural changes in our hominin lineages. From that standpoint, we propose that emergent warfare would have been part of a suite of human behavioral patterns as early as 200–300 kya, however common or uncommon it may have been for various human populations. There are, however, two key caveats with this argument. First, it does not speak to frequency or intensity of warfare activities. Second, it does not argue that warfare was a causal factor or driver for human evolutionary change. On the contrary, complex forms of sociality and cooperation were necessary precursors for ancestral humans to engage in emergent warfare. These were also necessary for emergent peacemaking, for that matter. As suggested by intriguing primatological research on extant primates, the roots of human peace-building may be tied to agonism, restrained fighting, and other behaviors of conflict

avoidance (Fry & Szala, 2013). In our estimation, behavioral modernity allowed humans to create culturally laden and complex mechanisms to promote both peaceful and violent interactions.

To be clear, symbolic thought did not cause warfare, nor did it cause cooperation. We see emergent warfare and peacemaking as epiphenomenal aspects of the origins of the human cultural niche. Symbolic thought allowed humans to thrive in the complex, multifaceted landscape created by new technologies and social innovations. As humans became better at recognizing and interpreting signs, they also gained the ability to use these signs to establish biological and cultural boundaries that helped to define group membership or categories of kinship.

Analogously, not long ago many researchers believed that early forms of civilization and sociopolitical complexity required agriculture and sedentary lifestyles, as seen in the mid-Holocene. Today, intriguing evidence of monumentality at the site of Gobekli Tepe in Turkey (Schmidt, 2000), which at 11,000 BP long predates the onset of "civilizations" in the region, suggests the importance of ideological or spiritual practices and their motivations for monumentality. When we combine these observations with the data all around us today for violence rooted in religious motivations, it makes sense to assume that communities living well before the mid-Holocene were just as capable of deciding that warfare was at times a necessary or preferable course of action, and that these communities had the ability to organize themselves for such courses of action. And if so, it behooves us to ask when we became capable of such existential questions, and what the consequences would have been for that type of thinking. Accordingly, under the emergent warfare hypothesis, we would not be surprised if future research were to uncover material evidence for organized violence pre-dating the Terminal Pleistocene.

7 | FUTURE DIRECTIONS

"By combining primatological, paleontological and behavioral-ecological evidence, anthropologists can provide especially rich tests of evolutionary hypotheses" (Wrangham, 1999, p. 26). Two decades since this statement was written, we echo Wrangham's sentiment in stressing the need for continued anthropological research on the origins of warfare. As illustrated throughout this article, many researchers have been blending datasets from various fields to address warfare's origins. Moving forward, we submit that more emphasis could be placed on early Holocene and Pleistocene contexts in future studies related to both emergent warfare and emergent peacemaking, and we suggest greater recognition of a general set of observations.

First, researchers should be cognizant of the variability involved with uses of coercion, intimidation, and violence, and that varied cultural practices will leave different kinds of material signatures. Directly observable material traces will not always result (e.g., skeletal trauma), nor does violence always result in death. Ongoing anthropological studies demonstrate variable forms of violence, such *slow violence* (Nixon, 2012) and *structural violence* (Klaus, 2012), making it clear that culture is a powerful lens for shaping the perceptions, attitudes, and decisions around violence. In agreement with Fuentes (2012), we argue for a more comprehensive perspective on the multitudes of

types of violence and aggression, many of which are tied to cultural perceptions and not simply environmental or ecological motivations.

Second, when instances of interpersonal violence are identified, this should lead to further questions or hypothesis-testing regarding the wider social context of the communities in which the individual lived and interacted with others. Are there ways to identify intra- or intergroup dynamics or representations of identity across geographies? Can we see evidence of intergroup hostilities? Additionally, and to the extent it is methodologically feasible, more emphasis should be placed on female participation in collective violence. For a variety of reasons, the majority of research on warfare has been male-centric, with much attention placed on male-driven aggression. We ought to be cognizant, however, that there may be inherent biases in our past approaches to the topic of warfare (Zihlman, 1997). Female aggression and roles within warfare have been, comparatively speaking, understudied and under-theorized. Just as our observations of recent or contemporary warfare make clear warfare's cultural variability, such studies also indicate that women often play significant roles in various dimensions of a society's overall process of warfare (including logistical preparation, rituals, participation in violence, postviolence ceremonies, and so forth) (Cross & Campbell, 2014; Doucette, 2001; Guliaev, 2003; Hollimon, 2001; Ness, 2007; Otto, Thrane, & Vandkilde, 2006). Many studies have explored the potential role of warfare and aggression in the evolutionary development of male primates, and more studies could explore both female participation and the potential role of warfare on female evolutionary development. An example of the latter comes in a recent study by Michelle Scalise Sugiyama (2014) in which the fitness costs of warfare for women are explored. Recent observations of chimpanzees fashioning and hunting with spears at the Fongoli site in Senegal, Africa is all the more interesting because the primary participants of this behavior are mature females (Pruett et al., 2015). In the end, our studies would be enriched by a comprehensive examination of a wider range of theoretical and empirical research.

Third, and perhaps most importantly, we believe that the study of both emergent warfare and emergent peacemaking needs to be explicitly tied to ongoing research on the origins of behavioral modernity or behavioral variability. Rather than assuming "peace" as a default state of human nature, we see both warfare and peacemaking as outcomes of elaborate cooperation and planning. As argued by Fry et al. (2010, p. 123), "In any case, the existence of peaceful societies demonstrates that humans, both female and male, can construct social worlds that are virtually free of lethal violence." As such, research around the underpinnings of related cultural practices and institutions necessitates engagement with ongoing paleoanthropological studies of the emergence of behavioral and cognitive modernity. This would include research on elaborate tool production, uses of iconography or adornment, language, practices of cultural identification, and hunting to name a few. For instance, others have long highlighted the potential link between human evolution and hunting behaviors, resulting in a rich set of data and theories (Pickering, 2013; Pickering & Bunn, 2012; Pickering & Dominguez-Rodrigo, 2012; van der Dennen, 1995; Wrangham, 1999). We suggest that another potentially fruitful line of related inquiry would be the evidence of production and uses of adornment items, particularly if they might be correlated to differentiation between contemporaneous communities within a given area.

While some researchers question the link between beads and language, manipulation and uses of beads offer strong indications that people were thinking symbolically, at a minimum. Shell beads have been found in Israel and Algeria in even earlier time periods, dating to between 100,000 and 135,000 years ago, also indicating symbolic human behavior (Vanhaeren et al., 2006). Other scholars have suggested that the complex Neandertal toolkit (e.g., hafting, sewn clothing, burial of the dead, body decorations, and others) would also indicate some sort of language capacity (Dediu & Levinson, 2013).

A capacity for and usage of language may have also been a vital means to differentiate between groups as well, since different communities may have plausibly been using different languages. For d'Errico et al. (2003, p. 55), regional variability seen in stone tool styles from approximately 70,000 BP and later may reflect linguistic differentiation and boundaries. Consequently, perhaps the earliest, rudimentary instances of ethnic difference and variable identity would have been tied to how groups dressed, acted, and spoke differently from each other. Language acquisition may have been a crucial component for powerful notions of ethnolinguistic identity and complex forms of interaction, which in turn could have fostered ever more sophisticated kinds of cooperative relations. By that same logic, language and identity could have also contributed to intragroup cohesion and cooperative behavior, especially if occasions arose for hostilities with members of outside groups. If so, there would be implications for questions about emergent warfare, wherein groups created social environments that heightened the probabilities that collective violence could occur. As proposed by Kelly (2000), notions of identity could have been very important for communities to apply a concept of social substitutability or segmentation to cultural logics related to violence.

For us, the combination of anthropological findings to date would suggest that emergent warfare and cooperation are aspects of a distinctively human niche that has its origins within the Pleistocene. Warfare required certain physical capacities, such as language (speech), as well as the cognitive ability to think in abstract ways. These characteristics allowed us to create and identify complex networks of affiliation and affiliate bonds. Direct kinship ties might have been broadened into larger social networks. In this fashion, human niche construction involved an interplay between biology, culture, and the environment (see Fuentes, 2015).

In the end, the notion that emergent warfare would have been possible within the Pleistocene is admittedly speculative and hypothetical, requiring much more evidentiary support. However, acknowledging the possibility allows us to continue posing appropriate questions. We believe it to be productive to move beyond a dichotomous ("hawks vs. doves") discussion of violence in human evolutionary development. We are in general agreement with anthropologist Paul Roscoe (2013, p. 475) when he notes an oddity in how many anthropologists approach war and peace, often phrasing them in binary terms, "as though communities are either at war or at peace". Rather than seeing our ancestors as either warlike or peaceful, we emphasize the sociality of our ancestors, suggesting that any debate on human warfare must include discussions of human prosociality and peace. A fuller understanding of warfare cannot be divorced from a study of "emergent peacemaking." The biological adaptations that allowed for complex forms of human thought, communication, and

cooperation opened the door for a multitude of highly plastic social behaviors. We hypothesize that the onset of socially cooperative violence and emergent warfare are tied not only to the origins of modern human behavior and human culture, but also to the origins of peace-making. Those of our ancestors possessing cognitive qualities approximating what we can refer to as behavioral modernity or variability, would have been just as capable of warfare given the right conditions as humans are today.

ACKNOWLEDGMENTS

This research is dedicated to the memory of Lawrence Keeley, who inspired many researchers to continue considering the nature of warfare and its antiquity. The authors are very grateful to the editorial members of the journal, including Agustin Fuentes and Lyle Konigsberg, for their guidance and efforts. The authors would also like to thank all of the colleagues, too numerous to mention here, that generously shared their thoughts on this topic. Finally, the authors greatly appreciate the insightful and helpful comments provided by three anonymous reviewers, which served to strengthen the article.

ORCID

Marc Kissel  <https://orcid.org/0000-0002-4004-1996>

REFERENCES

- Adams, E. (1990). Boundary disputes in the territorial ant Azteca trigona: effects of asymmetries in colony size. *Animal Behaviour*, 39, 321–328.
- Allen, M. (2014). Hunter-gatherer conflict: The last bastion of the pacified past? In M. Allen & T. Jones (Eds.), *Violence and warfare among hunter-gatherers* (pp. 15–25). Walnut Creek, CA: Left Coast Press.
- Arkush, E., & Stanish, C. (2005). Interpreting Conflict in the Ancient Andes. *Current Anthropology*, 46(1), 3–28.
- Aureli, F., Schaffner, C., Verpoorten, J., Slater, K., & Ramos-Fernandez, G. (2006). Raiding parties of male spider monkeys: Insights into human warfare? *American Journal of Physical Anthropology*, 131, 486–497.
- Austad, S. (1983). A game theoretical interpretation of male combat in the bowl and doily spider (*Frontinella pyramitela*). *Animal Behaviour*, 31, 59–73.
- Bachechi, L. (1997). An arrow-caused lesion in a Late Upper Palaeolithic human pelvis. *Current Anthropology*, 38, 135–140.
- Barnard, A. (2012). *Genesis of Symbolic Thought*. Cambridge: Cambridge University Press.
- Beaver, K. M., Barnes, J. C., & Boutwell, B. B. (2014). The 2-repeat allele of the MAOA gene confers an increased risk for shooting and stabbing behaviors. *The Psychiatric Quarterly*, 85, 257–265.
- Beaver, K. M., DeLisi, M., Vaughn, M. G., & Barnes, J. C. (2010). Monoamine oxidase A genotype is associated with gang membership and weapon use. *Comprehensive Psychiatry*, 51, 130–134.
- Beckerman, S., Erickson, P. I., Yost, J., Regalado, J., Jaramillo, L., Sparks, C., ... Long, K. (2009). Life histories, blood revenge, and reproductive success among the Waorani of Ecuador. *Proceedings of the National Academy of Sciences*, 106, 8134–8139.
- Bello, S. M., Saladié, P., Cáceres, I., Rodríguez-Hidalgo, A., & Parfitt, S. (2015). Upper Palaeolithic Ritualistic Cannibalism at Gough's Cave (Somerset, UK): The human remains from head to toe. *Journal of Human Evolution*, 82, 170–189.
- Boesch, C. (1991). Symbolic communication in wild chimpanzees? *Human Evolution*, 6, 81–89.
- Boesch, C., Bole, C., Eckhardt, N., & Boesch, H. (2010). Altruism in Forest chimpanzees: The case of adoption. *PLoS One*, 5, e8901.
- Boulestin, B., Zeeb-Lanz, A., Jeunesse, C., Haack, F., Arbogast, R.-M., & Denair, A. (2009). Mass cannibalism in the Linear Pottery Culture at Herxheim (Palatinate, Germany). *Antiquity*, 83, 968–982.
- Bouzouggar, A., Barton, N., Vanhaeren, M., d'Errico, F., Collcutt, S., et al. (2007). 82,000-year-old shell beads from North Africa and implications for the origins of modern human behavior. *Proceedings of the National Academy of Sciences*, 104(24), 9964–9969.
- Bowles, S. (2009). Did warfare among ancestral hunter-gatherers affect the evolution of human social behaviors? *Science*, 324, 1293–1298.
- Brooks, A., Yellen, J., Potts, R., Behrensmeyer, A., Deino, A., Leslie, D., et al. (2018). Long-distance stone transport and pigment use in the earliest middle stone age. *Science*, 360, 90–94.
- Brosnan, S. (2013). Conflicts in cooperative social interactions in nonhuman primates. In D. P. Fry (Ed.), *War, peace, and human nature: The convergence of evolutionary and cultural views* (pp. 406–420). New York, NY: Oxford University Press.
- Brunner, H. G., Nelen, M., Breakefield, X. O., Ropers, H. H., & van Oost, B. A. (1993). Abnormal behavior associated with a point mutation in the structural gene for monoamine oxidase A. *Science*, 262, 578–580.
- Campbell, C. (2006). Lethal intragroup aggression by adult male spider monkeys (*Ateles geoffroyi*). *American Journal of Primatology*, 68, 1197–1201.
- Campbell, M. W., & de Waal, F. B. M. (2011). Ingroup-outgroup bias in contagious yawning by chimpanzees supports link to empathy. *PLoS One*, 6, 19–22.
- Carbonell, E., Cáceres, I., Lozano, M., Rosell, J., Lorenzo, C., Huguet, R., ... Bermúdez de Castro, J. M. (2010). Cultural cannibalism as a Paleoeconomic system in the European lower Pleistocene. *Current Anthropology*, 51, 539–549.
- Carbonell, E., Cáceres, I., Lozano, M., Saladié, P., Rosell, J., Lorenzo, C., ... Bermúdez de Castro, J. M. (2011). A reply to Otterbein. *Current Anthropology*, 52, 441–441.
- Caspi, A., McClay, J., Moffitt, T., Mill, J., Martin, J., Craig, I., ... Poulton, R. (2002). Role of genotype in the cycle of violence in maltreated children. *Science*, 297, 851–854.
- Caspi, A., Sugden, K., Moffitt, T. E., Taylor, A., Craig, I. W., Harrington, H., ... Poulton, R. (2003). Influence of life stress on depression: Moderation by a polymorphism in the 5-HTT gene. *Science*, 301, 386–389.
- Chagnon, N. A. (1988). Life histories, blood revenge, and warfare in a tribal population. *Science*, 239, 985–992.
- Charney, E., & English, W. (2012). Candidate genes and political behavior. *The American Political Science Review*, 106, 1–34.
- Churchill, W. (1929). *The World Crisis: 1918–1928. The aftermath*. 1929 (Vol. 4). C. Scribner's sons.
- Churchill, S. E., Franciscus, R. G., McKean-Peraza, H., Daniel, J., & Warren, B. R. (2009). Shanidar 3 Neandertal rib puncture wound and paleolithic weaponry. *Journal of Human Evolution*, 57, 163–178.
- Cross, C., & Campbell, A. (2014). Violence and aggression in women. In T. Shackelford & R. Hansen (Eds.), *The evolution of violence* (pp. 211–232). New York, NY: Springer.
- Dellatore, D., Waitt, C., & Foitova, I. (2009). Two cases of mother-infant cannibalism in orangutans. *Primates*, 50, 277–281.
- d'Errico, F., Henshilwood, C., Lawson, G., Vanhaeren, M., Tillier, A., et al. (2003). Archaeological evidence for the emergence of language, symbolism, and music—An alternative multidisciplinary perspective. *Journal of World Prehistory*, 17, 1–70.
- Dediu, D., & Levinson, S. (2013). On the antiquity of language: The reinterpretation of Neandertal linguistic capacities and its consequences. *Frontiers in Psychology*, 4, 1–17.
- Defleur, A., White, T., Valensi, P., Slimak, L., & Crégut-Bonroure, É. (1999). Neanderthal cannibalism at Moula-Guercy, Ardeche, France. *Science*, 286, 128–131.
- Divale, W., & Harris, M. (1976). Population, warfare, and the male supremacist complex. *American Anthropologist*, 78, 521–538.
- de Waal, F. (2000). Primates—A natural heritage of conflict resolution. *Nature*, 289, 586–590.
- de Waal, F. B. M. (2009). *Age of empathy*. New York, NY: Broadway Books.
- de Waal, F. B. M. (2012). The antiquity of empathy. *Science*, 336, 874–876.
- Deacon, T. W. (1997). *The symbolic species: The co-evolution of language and the brain*. New York, NY: W. W. Norton.
- Deckert, J., Catalano, M., Syagailo, Y. V., Bosi, M., Okladnova, O., Di Bella, D., ... Lesch, K. P. (1999). Excess of high activity monoamine

- oxidase A gene promoter alleles in female patients with panic disorder. *Human Molecular Genetics*, 8, 621–624.
- Dettmer, A. M., & Suomi, S. J. (2014). Nonhuman primate models of neuropsychiatric disorders: Influences of early rearing, genetics, and epigenetics. *ILAR Journal*, 55, 361–370.
- Dettmer, A. M., Woodward, R., & Suomi, S. J. (2014). Reproductive consequences of a matrilineal overthrow in rhesus monkeys. *American Journal of Primatology*, 77, 346–352.
- Doran, D., Jungers, W., Sugiyama, Y., Fleagle, J., & Heesy, C. (2002). Multivariate and phylogenetic approaches to understanding chimpanzee and bonobo behavioral diversity. In C. Boesch, G. Hohmann, & L. Marchant (Eds.), *Behavioural diversity in chimpanzees and bonobos* (pp. 14–34). Cambridge, UK: Cambridge University Press.
- Doucette, D. (2001). Decoding the gender bias: Inferences of atlats in female mortuary contexts. In B. Arnold & N. Wicker (Eds.), *Gender and the archaeology of death* (pp. 159–177). Lanham, MD: AltaMira Press.
- Dye, D. (2013). Trends in Cooperation and Conflict in Native Eastern North America. In D. P. Fry (Ed.), *War, Peace, and Human Nature: The Convergence of Evolutionary and Cultural Views* (pp. 132–150). New York: Oxford University Press.
- Estabrook, V. H., & Frayer, D. W. (2013). Trauma in the Krapina Neandertals: Violence in the Middle Paleolithic? In M. J. Smith & C. Knusel (Eds.), *The Routledge Handbook of the Bioarchaeology of Human Conflict* (pp. 67–89). New York: Routledge.
- Falk, D., & Hildebolt, C. (2017). Annual war deaths in small-scale versus state societies scale with population size rather than violence. *Current Anthropology*, 58, 805–813.
- Ferguson, R. B. (1984). Introduction: Studying war. In R. Ferguson (Ed.), *Warfare, culture, and environment* (pp. 1–81). Orlando, FL: Academic Press.
- Ferguson, R. B. (1989). Do Yanomamo killers have more kids? *American Ethnologist*, 16, 564–565.
- Ferguson, R. B. (2006). Archaeology, cultural anthropology, and the origins and intensifications of war. In E. Arkush & M. Allen (Eds.), *The archaeology of warfare: Prehistories of raiding and conquest* (pp. 469–523). Gainesville, FL: University Press of Florida.
- Ferguson, R. B. (2013a). Pinker's List. In D. P. Fry (Ed.), *War, peace, and human nature: The convergence of evolutionary and cultural views* (pp. 112–131). New York, NY: Oxford University Press.
- Ferguson, R. B. (2013b). The prehistory of war and peace in Europe and the near east. In D. P. Fry (Ed.), *War, peace, and human nature: The convergence of evolutionary and cultural views* (pp. 191–240). New York, NY: Oxford University Press.
- Fernández-Jalvo, Y., Diez, J. C., Bermúdez de Castro, J. M., Carbonell, E., & Arsuaga, J. L. (1996). Evidence of early cannibalism. *Science*, 271, 277–278.
- Fernández-Jalvo, Y., Diez, J. C., Caceres, I., & Rosell, J. (1999). Human cannibalism in the early Pleistocene of Europe (Gran Dolina, Sierra de Atapuerca, Burgos Spain). *Journal of Human Evolution*, 37, 591–622.
- Frayer, D. W. (1997). Ofnet: Evidence for a Mesolithic massacre. In D. L. Martin & D. W. Frayer (Eds.), *Troubled times: Violence and warfare in the past* (pp. 181–216). Amsterdam, the Netherlands: Gordon and Breach Publishers.
- Feshbach, S. (1964). The function of aggression and the regulation of aggressive drive. *Psychological Review*, 71, 257–272.
- Fry, D. (2006). *The human potential for peace: An anthropological challenge to assumptions about war and violence*. Oxford, UK: Oxford University Press.
- Fry, D. (2013). Cooperation for survival: Creating a global peace system. In D. P. Fry (Ed.), *War, peace, and human nature: The convergence of evolutionary and cultural views* (pp. 543–558). New York, NY: Oxford University Press.
- Fry, D. P., Schober, G., & Bjorkqvist, K. (2010). Nonkilling as an evolutionary adaptation. In N. Societies (Ed.), *Joam Evans Pim* (pp. 101–128). Honolulu, Hawaii: Center for Global Nonkilling.
- Fry, D. P., & Soderberg, P. (2013). Lethal aggression in mobile forager bands and implications for the origins of war. *Science*, 341, 270–273.
- Fry, D. P., & Szala, A. (2013). The evolution of agonism: The triumph of restraint in nonhuman and human primates. In D. Fry (Ed.), *War, peace, and human nature* (pp. 451–474). New York, NY: Oxford University Press.
- Fuentes, A. (2012). *Race, monogamy, and other lies they told you*. Berkeley, CA: University of California Press.
- Fuentes, A. (2015). Integrative anthropology and the human niche: Toward a contemporary approach to human evolution. *American Anthropologist*, 117, 302–315.
- Gasperetti, M. A., & Sheridan, S. G. (2013). Cry havoc: Interpersonal violence at early bronze Age Bab Edh-Dhra'. *American Anthropologist*, 115, 388–410.
- Gat, A. (2006). *War in human civilization*. Oxford, UK: Oxford University Press.
- Gat, A. (2015). Proving communal warfare among hunter-gatherers: The Quasi-Rousseauian error. *Evolutionary Anthropology*, 24, 111–126.
- Gibbons, A. (2004). Tracking the evolutionary history of a "Warrior" gene. *Science*, 304, 818–819.
- Goldberg, J. (2018). *Suicide of the west: How the rebirth of tribalism, populism, nationalism, and identity politics is destroying American democracy*. New York, NY: Crown Forum.
- Golitko, M. (2015). *LBK realpolitik: An archaeometric study of conflict and social structure in the Belgian early Neolithic*. Oxford: Archaeopress.
- Golitko, M., & Keeley, L. (2007). Beating ploughshares back into swords: Warfare in the Linearbandkeramik. *Antiquity*, 81, 332–342.
- Gómez, J. M., Verdú, M., González-Megías, A., & Méndez, M. (2016). The phylogenetic roots of human lethal violence. *Nature*, 538, 233–237.
- Glowacki, L., Wilson, M., & Wrangham, R. (2017). The evolutionary anthropology of war. *Journal of Economic Behavior and Organization* in press.
- Guilaine, J., & Zammit, J. (2001). *Origins of war: Violence in prehistory*. Oxford: Blackwell Publishing.
- Guiliaev, V. (2003). Amazons in the Scythia: New finds at the middle Don, Southern Russia. *World Archaeology*, 35, 112–125.
- Haas, J. (2001). Warfare and the evolution of culture. In G. Feinman & T. Douglas Price (Eds.), *Archaeology at the millennium: A sourcebook* (pp. 329–350). New York, NY: Kluwer/Plenum.
- Haas, J. (2004). The origins of war and ethnic violence. In J. Carman & A. Harding (Eds.), *Ancient warfare: Archaeological perspectives* (pp. 11–24). Stroud, UK: Sutton Publishing Limited.
- Haas, J., & Piscitelli, M. (2013). The prehistory of warfare: Misled by ethnography. In D. P. Fry (Ed.), *War, peace, and human nature: The convergence of evolutionary and cultural views* (pp. 168–190). New York, NY: Oxford University Press.
- Hare, B., Melis, A. P., Woods, V., Hastings, S., Wrangham, R., & Carolina, N. (2007). Tolerance allows bonobos to outperform chimpanzees on a cooperative task. *Current Biology*, 17, 619–623.
- Harkin, M. (2010). Uncommon ground: Holism and the future of anthropology. *Reviews in Anthropology*, 39, 25–45.
- Haslam, M. (2012). Towards a prehistory of primates. *Antiquity*, 86, 299–315.
- Hauser, M. D., Chomsky, N., & Fitch, W. T. (2002). The faculty of language: What is it, who has it, and how did it evolve? *Science*, 298, 1569–1579.
- Henshilwood, C., d'Errico, F., Vanhaeren, M., Niekerk, K., & Jacobs, Z. (2004). Middle stone age Shell beads from South Africa. *Science*, 304, 404.
- Holliday, T. W. (2013). Population affinities of the Jebel Sahaba skeletal sample: Limb proportion evidence. *International Journal of Osteoarchaeology*, 25, 466–476.
- Hollimon, S. (2001). Warfare and gender in the Northern Plains: Osteological evidence of trauma reconsidered. In B. Arnold & N. Wicker (Eds.), *Gender and the archaeology of death* (pp. 179–193). Lanham, MD: AltaMira Press.
- Jurmain, R. (2001). Paleoepidemiological patterns of trauma in a prehistoric population from Central California. *American Journal of Physical Anthropology*, 115, 13–23.
- Judd, M. A. (2008). The parry problem. *Journal of Archaeological Science*, 35, 1658–1666.
- Kaldor, M. (2013). In Defence of new wars. *Stability*, 2(4), 1–16.
- Kawai, N., & Matsuzawa, T. (2000). Numerical memory span. *Nature*, 403, 39–40.
- Keeley, L. (1996). *War before civilization*. Oxford, UK: Oxford University Press.
- Keegan, J. (1993). *A History of Warfare*. New York: Vintage Books.
- Keeley, L. (2001a). Giving War a Chance. In G. Rice & S. LeBlanc (Eds.), *Deadly Landscapes: Case Studies in Prehistoric Southwestern Warfare* (pp. 331–342). Salt Lake City: The University of Utah Press.
- Keeley, L. (2001b). Giving War a Chance. In G. Rice & S. LeBlanc (Eds.), *Deadly Landscapes: Case Studies in Prehistoric Southwestern Warfare* (pp. 331–342). Salt Lake City: The University of Utah Press.

- Keeley, L. (2014). War before civilization—15 years on. In T. Shackelford & R. Hansen (Eds.), *The evolution of violence* (pp. 23–31). New York, NY: Springer.
- Keeley, L., Fontana, M., & Quick, R. (2007). Baffles and bastions: The universal features of fortifications. *Journal of Archaeological Research*, 15, 55–95.
- Kelly, R. (2000). *Warless societies and the origin of war*. Ann Arbor, MI: University of Michigan Press.
- Kelly, R. (2005). The evolution of lethal intergroup violence. *Proceedings of the National Academy of Sciences*, 102, 15294–15298.
- Keys, D. (2014). Saharan remains may be evidence of first race war. 13,000 years ago. *Independent*, (July 13).
- Kim, N. (2012). Angels, illusions, hydras and chimeras: Violence and humanity. *Review of Anthropology*, 41, 239–272.
- Kim, N., & Keeley, L. (2008). Social violence and war. In D. Pearsall (Ed.), *Encyclopedia of archaeology* (pp. 2053–2064). San Diego, CA: Elsevier Academic Press.
- Kim, N., & Kissel, M. (2018). *Emergent warfare in our evolutionary past*. New York, NY: Routledge.
- Kim, N. C., Kusimba, C. M., & Keeley, L. H. (2015). Coercion and warfare in the rise of state societies in Southern Zambezia. *African Archaeological Review*, 32, 1–34.
- Kissel, M., & Fuentes, A. (2018). Behavioral modernity' as a process, not an event, in the human niche. *Time and Mind*, 11, 163–183.
- Klaus, H. D. (2012). The bioarchaeology of structural violence: A theoretical model and a case study. In D. L. Martin & R. P. Harrod (Eds.), *The bioarchaeology of violence*. Gainesville, FL: University Press of Florida.
- Knusel, C., & Smith, M. (2014). Introduction: The bioarchaeology of conflict. In C. Knusel & M. Smith (Eds.), *The Routledge handbook of the bioarchaeology of human conflict*. New York, NY: Routledge.
- Kolb, M., & Dixon, B. (2002). Landscapes of war : Rules and conventions of conflict in ancient Hawai'i (and elsewhere). *American Archaeology*, 67(3), 514–534.
- Krug, E., Dahlberg, L., Mercy, J., Zwi, A., & Lozano, R. (Eds.). (2002). *World report on violence and health*. Geneva, Switzerland: World Health Organization.
- Lambert, P. (2002). The archaeology of war: A North American perspective. *Journal of Archaeological Research*, 19, 207–241.
- Lahr, M. M., Rivera, F., Power, R. K., Mounier, A., Copsey, B., Crivellaro, F., ... Foley, R. A. (2016). Inter-group violence among early Holocene hunter-gatherers of West Turkana, Kenya. *Nature*, 529, 394–398.
- LeBlanc, S. (with Katherine Register). (2003). *Constant battles*. New York, NY: St. Martin's Press.
- LeBlanc, S. (2014). Forager warfare and our evolutionary past. In M. Allen & T. Jones (Eds.), *Violence and warfare among hunter-gatherers* (pp. 26–46). Walnut Creek, CA: Left Coast Press.
- Levy, J., & Thompson, W. (2010). *Causes of war*. Malden, MA: Wiley-Blackwell.
- Levy, J., & Thompson, W. (2011). *The arc of war: Origins, escalation, and transformation*. Chicago, IL: University of Chicago Press.
- Lorenz, K. (1963). *On aggression*. New York, NY: Harcourt, Brace and World.
- Malinowski, B. (1936). The deadly issue. *The Atlantic Monthly*, 158, 659–669.
- Martin, D., & Harrod, R. (2015). Bioarchaeological contributions to the study of violence. *American Journal of Physical Anthropology*, 156, 116–145.
- Martin, D., Harrod, R., & Fields, M. (2010). Beaten down and worked to the bone: Bioarchaeological investigations of women and violence in the ancient southwest. *Landscapes of Violence*, 1, 1–19.
- Martin, D., Harrod, R., & Perez, V. (2012). Introduction. In D. Martin, R. Harrod, & V. Perez (Eds.), *The bioarchaeology of violence* (pp. 1–10). Gainesville, FL: University Press of Florida.
- Mech, L. D., Adams, L., Meier, T., Burch, T., & Dale, B. (1998). *The Wolves of Denali*. Minneapolis: University of Minnesota Press.
- McBrearty, S., & Brooks, A. (2000). The revolution that wasn't: A new interpretation of the origin of modern human behavior. *Journal of Human Evolution*, 39, 453–563.
- McCall, G., & Shields, N. (2008). Examining the evidence from small-scale societies and early prehistory and implications for modern theories of aggression and violence. *Aggression and Violent Behavior*, 13, 1–9.
- McDermott, R., Tingley, D., Cowden, J., Frazzetto, G., & Johnson, D. D. P. (2009). Monoamine oxidase a gene (MAOA) predicts behavioral aggression following provocation. *Proceedings of the National Academy of Sciences*, 106, 2118–2123.
- Mead, M. (1940). Warfare is only an invention, not a biological necessity. *Asia*, 15, 402–405.
- Meyer, C. (2003). Osteological evidence for the battles of Zürich, 1799: A glimpse into soldierly of the past. *International Journal of Osteoarchaeology*, 13, 252–257.
- Meyer, C., Lohr, C., Gronenborn, D., & Alt, K. (2015). The massacre mass grave of Schoneck-Kilianstädten reveals new insights into collective violence in early Neolithic Central Europe. *Proceedings of the National Academy of Sciences*, 112, 11217–11222.
- Miklikowska, M., & Fry, D. P. (2012). Natural born nonkillers. In D. Christie & J. E. Pim (Eds.), *Nonkilling psychology* (pp. 43–70). Honolulu, Hawaii: Center for Global Nonkilling.
- Milner, G. (2005). Nineteenth century arrow wounds and perceptions of prehistoric warfare. *American Antiquity*, 70, 144–156.
- Milner, G., Chaplin, G., & Zavodny, E. (2013). Conflict and Societal Change in Late Prehistoric Eastern North America. *Evolutionary Anthropology*, 22, 96–102.
- Ness, C. (2007). The rise in female violence. *Daedalus*, 136(1), 84–93.
- Newman, T. K., Syagalo, Y. V., Barr, C. S., Wendland, J. R., Champoux, M., Graessle, M., ... Lesch, K. P. (2005). Monoamine oxidase a gene promoter variation and rearing experience influences aggressive behavior in rhesus monkeys. *Biological Psychiatry*, 57, 167–172.
- Nixon, R. (2011). *Slow violence and the environmentalism of the poor*. Cambridge, MA: Harvard University Press.
- Oka, R. C., Kissel, M., Golitko, M., Sheridan, S. G., Kim, N. C., & Fuentes, A. (2017). Population is the main driver of war group size and conflict casualties. *Proceedings of the National Academy of Sciences*, 114, E11101–E11110.
- Osterholtz, A. J. (2013). Hobbling and torture as performative violence: An example from the prehistoric Southwest. *Kiva: Journal of Southwestern Anthropology and History*, 78, 123–144.
- Otterbein, K. (2004). *How war began*. College Station, TX: Texas A&M University Press.
- Otterbein, K. (2009). *The anthropology of war*. Long Grove, IL: Waveland Press.
- Otterbein, K. (2011). The earliest evidence for warfare? *Current Anthropology*, 52, 439–439.
- Otto, T., Thrane, H., & Vandkilde, H. (2006). *Warfare and society: Archaeological and social anthropological perspectives*. Aarhus, Denmark: Aarhus University Press.
- Perbal, L. (2013). The "warrior gene" and the māori people: The responsibility of the geneticists. *Bioethics*, 27, 382–387.
- Pickering, T. (2013). *Rough and tumble: Aggression, hunting, and human evolution*. Berkeley, CA: University of California Press.
- Pickering, T., & Bunn, H. (2012). Meat foraging by Pleistocene African hominins: Tracking behavioral evolution beyond baseline inferences of early access to carcasses. In M. Dominguez-Rodrigo (Ed.), *Stone tools and fossil bones: Debates in the archaeology of human origins* (pp. 152–173). Cambridge, UK: Cambridge University Press.
- Pickering, T., & Dominguez-Rodrigo, M. (2010). Chimpanzee referents and the emergence of human hunting. *The Open Anthropology Journal*, 3, 107–113.
- Pickering, T., & Dominguez-Rodrigo, M. (2012). Can we use chimpanzee behavior to model early hominin hunting? In M. Dominguez-Rodrigo (Ed.), *Stone tools and fossil bones: Debates in the archaeology of human origins* (pp. 174–197). Cambridge, UK: Cambridge University Press.
- Pickering, T. R., White, T. D., & Toth, N. (2000). Brief communication: Cut-marks on a Plio-Pleistocene hominid from Sterkfontein, South Africa. *American Journal of Physical Anthropology*, 111, 579–584.
- Pinker, S. (1997). *How the mind works*. New York, NY: Norton.
- Pinker, S. (2011). *The better angels of our nature: Why violence has declined*. New York, NY: Viking.
- Polis, G., Myers, C., & Hess, W. R. (1984). A survey of intraspecific predation within the class Mammalia. *Mammal Review*, 14, 187–198.
- Price, T. D., Wahl, J., & Bentley, R. A. (2006). Isotopic evidence for mobility and group organization among Neolithic farmers at Talheim, Germany, 5000 BC. *European Journal of Archaeology*, 9, 259–284.
- Pruett, J. D., Bertolani, P., Boyer Ontl, K., Lindshield, S., Shelley, M., & Wessling, E. G. (2015). New evidence on the tool-assisted hunting

- exhibited by chimpanzees (*Pan troglodytes verus*) in a savannah habitat at Fongoli, Sénégal. *Royal Society Open Science*, 2, 140507.
- Quade, L., & Binder, M. (2018). Life on a Napoleonic battlefield: A bioarchaeological analysis of soldiers from the Battle of Aspern, Austria. *International Journal of Paleopathology*, 22, 23–38.
- Quinlan, J., Pearson, L. N., Clukay, C. J., Mitchell, M. M., Boston, Q., Gravlee, C. C., & Mulligan, C. J. (2016). Genetic loci and novel discrimination measures associated with blood pressure variation in African Americans living in Tallahassee. *PLoS One*, 11, 1–22.
- Ramirez Rozzi, F. V., d'Errico, F., Vanhaeren, M., Grootes, P. M., Kerautret, B., & Dujardin, V. (2009). Cutmarked human remains bearing Neandertal features and modern human remains associated with the Aurignacian at Les Rois. *Journal of Anthropological Science*, 87, 153–185.
- Roksandic, M., Djurić, M., Rakočević, Z., & Seguin, K. (2006). Interpersonal violence at Lepenski Vir Mesolithic/Neolithic complex of the iron gates gorge (Serbia-Romania). *American Journal of Physical Anthropology*, 129(3), 339–348.
- Romero, T., Castellanos, M. A., & de Waal, F. B. M. (2010). Consolation as possible expression of sympathetic concern among chimpanzees. *PNAS*, 107, 12110–12115.
- Roscoe, P. (2007). Intelligence, coalitional killing, and the antecedents of war. *American Anthropologist*, 109, 485–495.
- Roscoe, P. (2013). Social signaling, conflict management, and the construction of peace. In D. P. Fry (Ed.), *War, peace, and human nature: The convergence of evolutionary and cultural views* (pp. 475–494). New York, NY: Oxford University Press.
- Rosenbaum, S., Vecellio, V., & Stoinski, T. (2016). Observations of severe and lethal coalitionary attacks in wild mountain gorillas. *Nature Scientific Reports*, 6, 1–8.
- Rougier, H., Crevecoeur, I., Beauval, C., Posth, C., Flas, D., Wißing, C., ... Krause, J. (2016). Neandertal cannibalism and Neandertal bones used as tools in Northern Europe. *Nature Scientific Reports*, 6, 1–11.
- Sabol, S. Z., Hu, S., & Hamer, D. (1998). A functional polymorphism in the monoamine oxidase A gene promoter. *Journal of Human Genetics*, 103, 273–279.
- Sala, N., Arsuaga, J. L., Pantoja-Pérez, A., Pablos, A., Martínez, I., Quam, R. M., ... Carbonell, E. (2015). Lethal interpersonal violence in the middle Pleistocene. *PLoS One*, 10, e0126589.
- Saladié, P., Huguet, R., Rodríguez-Hidalgo, A., Cáceres, I., Esteban-Nadal, M., Arsuaga, J. L., ... Carbonell, E. (2012). Intergroup cannibalism in the European early Pleistocene: The range expansion and imbalance of power hypotheses. *Journal of Human Evolution*, 63, 682–695.
- Sapolsky, R. (2013). Rousseau with a tail: Maintaining a tradition of peace among baboons. In D. P. Fry (Ed.), *War, peace, and human nature: The convergence of evolutionary and cultural views* (pp. 421–438). New York, NY: Oxford University Press.
- Sayers, K., Raghanti, M. A., & Lovejoy, C. O. (2012). Human evolution and the chimpanzee referential doctrine. *Annual Review of Anthropology*, 41, 119–138.
- Schmidt, K. (2000). Gobekli Tepe, southeastern Turkey: A preliminary report on the 1995–1999 excavations. *Paléorient*, 26, 45–54.
- Schuback, D.E., Mulligan, E.L., Sims, K.B., Tivol, E.A., Greenberg, B.D., Chang, S.F., ... Hsu, Y.P. (1999). Screen for MAOA mutations in target human groups. *American Journal of Medical Genetics*, 88, 25–28.
- Schug, G. R. (2011). *Bioarchaeology and climate change: A view from south Asian prehistory*. Gainesville, FL: University of Florida Press.
- Shea, J. (2011). *Homo sapiens* is as *Homo sapiens* was. *Current Anthropology*, 52, 1–35.
- Shermer, M. (2015). *The moral arc: How science makes us better people*. New York: Henry Holt and Co.
- Shermer M. 2016. On slates and tweets: A reply to David Sloan Wilson on ancient warfare and the blank slate. Retrieved from <https://evolution-institute.org/blog/on-slates-and-tweets-a-reply-to-david-sloan-wilson-on-ancient-warfare-and-the-blank-slate/>
- Siegel, A., & Victoroff, J. (2009). Understanding human aggression: New insights from neuroscience. *International Journal of Law and Psychiatry*, 32, 209–215.
- Smith, D. L. (2007). *The Most dangerous animal*. New York, NY: St. Martin's Press.
- Spikins, P. (2015). *How compassion made us human: The evolutionary origins of tenderness, trust and morality*. South Yorkshire, UK: Pen & Sword Books Ltd.
- Sponsel, L. (1996). The natural history of peace: The positive view of human nature and its potential. In T. Gregor (Ed.), *A natural history of peace* (pp. 95–125). Nashville, TN: Vanderbilt University Press.
- Stojanowski, C. M., Seidel, A. C., Fulginiti, L. C., Johnson, K. M., & Buikstra, J. E. (2016). Contesting the massacre at Nataruk. *Nature*, 539, E8–E10.
- Strier, K. (1994). Myth of the typical primate. *American Journal of Physical Anthropology*, 37, 233–271.
- Sugiyama, M. S. (2014). Fitness costs of warfare for women. *Human Nature*, 25, 476–495.
- Sussman, R., & Marshack, J. (2010). Are humans inherently killers? Center for Global Nonkilling. *Global Nonkilling Working Papers*, 1, 7–50.
- Svoboda, J. A. (2008). The upper Paleolithic burial area at Predmosti: Ritual and taphonomy. *Journal of Human Evolution*, 54, 15–33.
- Taylor, M., Larsen, T., & Schweinsburg, R. E. (1985). Observations of intra-specific aggression and cannibalism in polar bears (*Ursus maritimus*). *Arctic*, 38, 303–309.
- Tokuyama, N., & Furuichi, T. (2016). Do friends help each other? Patterns of female coalition formation in wild bonobos at Wamba. *Animal Behavior*, 123, 27–35.
- Trinkaus, E., & Buzhilova, A. P. (2012). The death and burial of sunghir 1. *International Journal of Osteoarchaeology*, 22, 655–666.
- Trinkaus, E., & Svadoba, J. A. (2005). The Paleobiology of the Pavlovian people. In E. Trinkaus & J. A. Svadoba (Eds.), *Early modern human evolution in Central Europe*. Oxford, UK: Oxford University Press.
- Valero, A., Schaffner, C., Vick, L., Aureli, F., & Ramos-Fernandez, G. (2006). Intragroup lethal aggression in wild spider monkeys. *American Journal of Primatology*, 68, 732–736.
- van der Dennen, J. M. G. (1995). The origin of war: The evolution of a male-coalitional reproductive strategy. In *Groningen*. the Netherlands: Origin Press.
- Vanhaeren, M., d'Errico, F., Stringer, C., James, S., Todd, J., & Mienis, H. (2006). Middle Paleolithic shell beads in Israel and Algeria. *Science*, 312, 1785–1788.
- Vencl, S. (1984). War and warfare in archaeology. *Journal of Anthropological Archaeology*, 3, 116–132.
- Walker, P. (2001). A bioarchaeological perspective on the history of violence. *Annual Review of Anthropology*, 30, 573–596.
- Webster, D. (1998). Warfare and status rivalry. In G. Feinman & J. Marcus (Eds.), *Archaic states* (pp. 311–351). Santa Fe, NM: School of American Research Press.
- Wendorf, F. (1968). Site 117-a Nubian final Paleolithic graveyard near Jebel Sahaba. In F. Wendorf (Ed.), *The prehistory of Nubia* (pp. 954–995). Dallas, TX: Southern Methodist University.
- White, T. D. (1986). Cut marks on the Bodo cranium: A case of prehistoric defleshing. *American Journal of Physical Anthropology*, 69, 503–509.
- Whitehead, N., & Ferguson, B. (Eds.). (2000). *War in the tribal zone: Expanding states and indigenous warfare*. Santa Fe, NM: School of American Research Press.
- Wilson, M. (2013). Chimpanzees, warfare, and the invention of peace. In D. P. Fry (Ed.), *War, peace, and human nature: The convergence of evolutionary and cultural views* (pp. 361–388). New York, NY: Oxford University Press.
- Wilson, M., Wallauer, W., & Pusey, A. (2004). New cases of intergroup violence among chimpanzees in Gombe National Park, Tanzania. *International Journal of Primatology*, 25, 523–549.
- Wobst, H. M. (1978). The Archaeo-ethnology of hunter-gatherers or the tyranny of the ethnographic record in archaeology. *American Antiquity*, 43, 303–308.
- Wrangham, R. (1999). Evolution of coalitionary killing. *Yearbook of Physical Anthropology*, 42, 1–30.
- Wrangham, R., & Glowacki, L. (2012). Intergroup Aggression in Chimpanzees and War in Nomadic Hunter-Gatherers: Evaluating the Chimpanzee Model. *Human Nature*, 23, 5–29.
- Wrangham, R., & Peterson, D. (1996). *Demonic males: Apes and the origins of human violence*. Boston, MA: Houghton Mifflin.

- Wrangham, R. W., Wilson, M. L., & Muller, M. N. (2006). Comparative rates of violence in chimpanzees and humans. *Primates*, 47, 14–26.
- Wu, X., Schepartz, L., Liu, W., & Trinkaus, E. (2011). Antemortem trauma and survival in the late middle Pleistocene human cranium from Maba, South China. *Proceedings of the National Academy of Sciences*, 108, 19558–19562.
- Wu, X. J., & Trinkaus, E. (2015). Neurocranial trauma in the late archaic human remains from Xujiayao, northern China. *International Journal of Osteoarchaeology*, 25, 245–252.
- Young, B., & Ruff, R. (1982). Population dynamics and movements of black bears in east Central Alberta. *Journal of Wildlife Management*, 46, 845–860.
- Zefferman, M., & Matthew, S. (2015). An evolutionary theory of large-scale human warfare: Group-structured cultural selection. *Evolutionary Anthropology*, 24, 50–61.
- Zihlman, A. (1997). The Paleolithic glass ceiling: Women in human evolution. In L. Hager (Ed.), *Women in human evolution* (pp. 105–128). London: Routledge.
- Zollikofer, C., Ponce de Leon, M. S., Vandermeersch, B., & Lévéque, F. (2002). Evidence for interpersonal violence in the St. Césaire Neanderthal. *Proceedings of the National Academy of Sciences*, 99, 6444–6448.

How to cite this article: Kissel M, Kim NC. The emergence of human warfare: Current perspectives. *Am J Phys Anthropol*. 2019; 168:S67:141–163. <https://onlinelibrary.wiley.com/doi/10.1002/ajpa.23751>