Chapter 4
Martial Practices and Warrior Burials: Humeral Asymmetry and Grave Goods in Iron Age Male Inhumations from Central Italy

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Introduction

This chapter discusses archaeological and skeletal evidence from several Iron Age cemeteries dating to the Orientalizing and Archaic periods (*c*.800–500 BC), from the Central Apennines mountain range in Italy (Fig. 4.1). The study explores the relationship between the deposition of martial paraphernalia in graves and the participation in martial practices of the individual buried therein, as inferred from the biomechanical properties of their upper limbs. The aim of the research is to investigate military practices (including weapon training) and their significance among Iron Age communities of the Central Apennines.

Roman historians collectively refer to the numerous Oscan-speaking tribes (e.g. Pentri, Irpini, Vestini, and several others), which dwelled in the mountainous areas of central Italy in the late 1st millennium BC, as the 'Samnites' (La Regina 1989, 301–4). Tagliamonte (1997) further defined 'proto-Samnites' the pre-fourth-century BC communities of the area, so as to identify a number of social groups with shared cultural traits but which had not yet reached the stage of political development typical of the later periods. Bestowing later Roman ethnic labels upon pre- and

This chapter is dedicated to the memory of Domenico Mancinelli.

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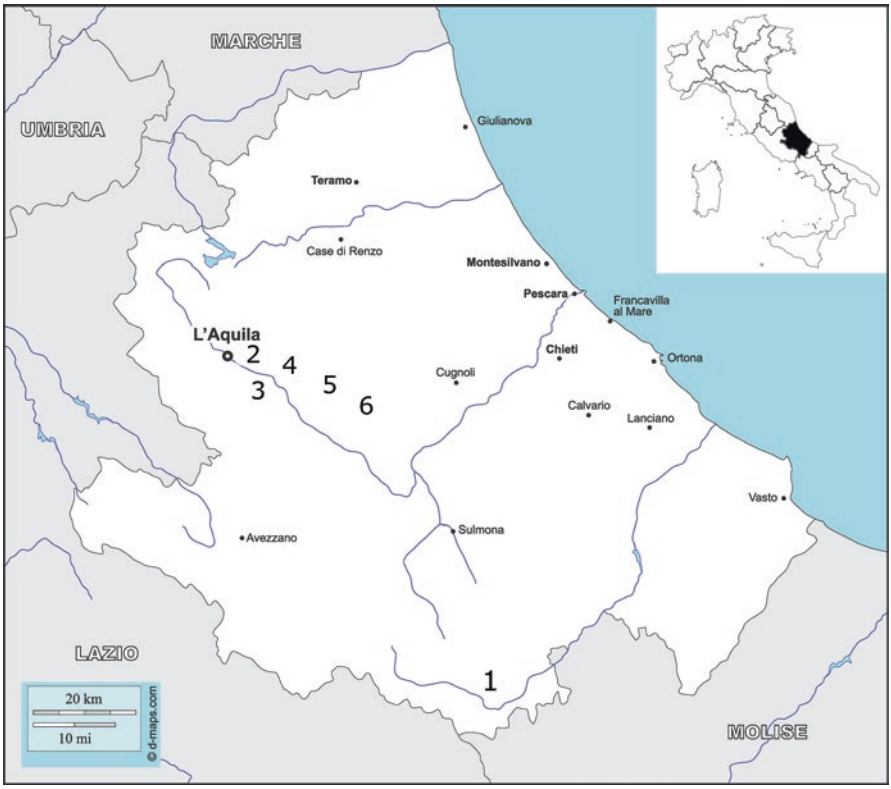

Fig. 4.1 Map of modern-day Abruzzo region with the burial sites mentioned in this study: *1* Alfedena and other cemeteries in the Aterno Valley; *2* Bazzano; *3* Fossa; *4* Barisciano and Poggio Picenze; *5* San Pio-Colli Bianchi and San Pio-Campo Rosso; *6* Cinturelli (Map base from http://www.d-maps.com)

proto-historic communities is of course problematic, since the exercise does not take into account population movement, regroupings, and changes in the perception of ethnic identity over time (Dench 1995). Nevertheless, while bearing these problems in mind, in this chapter we refer to the Iron Age communities of the Central Apennines as 'Samnites' for the sake of simplicity (see also Bispham 2007, 179).

Based on historical, iconographic, and archaeological evidence, the Iron Age Samnites have long been considered a warlike society, in which martial practices held considerable social significance (Bispham 2007; D'Ercole 1999; Salmon 1967; Scopacasa 2015, 89; Tagliamonte 1999). By the Orientalizing and Archaic periods, the Samnite communities were probably organized around tribal chiefs and their retinues (Bietti-Sestieri et al. 2000; Boatwright et al. 2004). During this phase, cemeteries were organized in circles of burials containing kin-related males (as inferred from anthropological data) featuring varying degrees of wealth in terms of grave goods, including weaponry (Bietti-Sestieri et al. 2000: 232; Bispham 2007; Bondioli

et al. 1986; Rubini 1996; Tagliamonte 1997: 85). This may suggest the presence of competing elite groups based on kinship.

Osteological research supports the martial attitude hypothesized for these populations by reporting the presence of a high prevalence (12.9%) of healed and perimortem sharp and blunt force trauma among adult males (Macchiarelli et al. 1981; Paine et al. 2007; see also Bennike 1985; Jurmain 2001; Fibiger et al. 2013; Robb 1997a, b). Furthermore, recent research (Sparacello et al. 2015) has presented biomechanical evidence of functional adaptations to weapon use among 'high-status' males of the Orientalizing-Archaic period, corroborating the thesis of the existence of elite Samnite militias (D'Ercole 1999; Tagliamonte 1999).

Despite the wealth of research on the subject, the relationship between the military component of the funerary assemblage (represented by weapons and defensive gear) and the actual involvement of the deceased in martial activities has largely been left unexplored. The chapter examines the vast bioarchaeological database available for the region with the aim of narrowing the gap between the representation that Samnite communities gave of themselves in death and their lifetime habitual activities (including weapon training), as seen through indicators of upper limb biomechanical adaptations.

Archaeological Proxies of Martial Practices Among Iron Age Samnites from the Central Apennines

Early historical accounts depict Samnite 'tribes' as divided into small communities intent on regularly raiding neighbouring villages (Salmon 1967; Tagliamonte 1994, 1997, 1999). The warlike attitude of these populations is further suggested by the presence of swords, spears, and armour, found in male burials of the Orientalizing and Archaic periods alongside feasting and banqueting equipment (Bispham 2007; Scopacasa 2015, 84–118; Tagliamonte 1997, 1999). Furthermore, one of the very few examples of Iron Age Samnite figurative art, the so-called Warrior of Capestrano (a sixth-century BC life-sized statue; Fig. 4.2), portrays a political leader exhibiting martial paraphernalia including two spears, an axe, a sword, and a disc breastplate (Barker et al. 1995, 177; Bispham 2007, 190; Calderini et al. 2007; D'Ercole 1999; D'Ercole and Cella 2007; Scopacasa 2015, 73–74).

During the Orientalizing period (*c*.800–600 BC), the military equipment included in Central Apennines Samnite graves consisted of a limited combination of weapons. Spears were most common; their point size varied considerably, from 10 to over 50 cm in length (D'Ercole 2011: 161). They were often deposited as pairs and were frequently (but not always) accompanied by butt spikes. The two spears depicted on either side of the 'Warrior of Capestrano' show an *amentum*[1] on their shafts, supporting the idea that at least some of these weapons could have been used

[1] A strap (usually made of leather) attached to a javelin, which can be looped around the first two fingers of the warrior's hand to increase the speed and range of the throw.

Fig. 4.2 Close-up of the statue of the 'Warrior of Capestrano' (total height: 210 cm) with sword, axe, and breastplate visible on the chest (Courtesy of Museo Archeologico Nazionale d'Abruzzo - Villa Frigerj, Chieti, Italy)

in ranged combat (D'Ercole 2011: 161; D'Ercole and Cella 2007). Daggers (*c*.30–35 cm in length) were also common, often with antennas (*stami*) on their hilts (Weidig 2008). These were replaced by longer, cross-hilted swords (c.75 cm in length) in the Archaic period (*c*.600–500 BC), while spearheads were still used in large numbers (D'Ercole 1999, 2011). Protective armour, such as bronze disc breastplates, have also been found, albeit rarely, in burials dating to the Orientalizing and Archaic periods (D'Ercole 1999, 2011). Shields were likely used, although no surviving specimen has ever been found as they were presumably made of perishable materials such as wood, wicker, or hides (D'Ercole 2011: 152).

Mace heads were considerably rarer than other weapons in early Samnite burials. Furthermore, while daggers, swords, and spears may have constituted the only piece of weaponry in the grave, maces were only found alongside other weapons. Most mace heads consist of heavy undecorated spheres of iron, with a hole or a socket to host the handle; such items appear to be fully functional fighting tools (D'Ercole 2011: 160). However, several burials from the wider Central Apennine region have yielded decorated maces, which are best interpreted as insignias of power (Weidig 2015: 247–249). Maces are also represented in Iron Age iconography from ancient Samnium, with the 'Fibula of Pizzoli', a bronze brooch from an eighth-century BC male inhumation, being one such example (Fig. 4.3). The brooch is decorated with a series of figurines (possibly enacting a ritual or ceremony; Tuteri 2011), one of which is holding a mace in its right hand and a small round shield – somewhat similar to a medieval buckler – in its left hand. Incidentally, the brooch provides first-hand evidence of the use of this kind of defensive equipment in Iron Age Samnium. Perhaps more importantly, this masterpiece of prehistoric metallurgy exemplifies the in-depth connections that must have existed between finely crafted items, weaponry, and belief systems in early Samnite society.

Fig. 4.3 The 'Fibula of Pizzoli' (length: 9 cm) (Courtesy of Museo Archeologico Nazionale d'Abruzzo - Villa Frigerj, Chieti, Italy)

Axes are the rarest type of weapons found in Samnite burials and can sometimes be the only piece of military equipment in the grave assemblage (D'Ercole 2011). For this reason, and since the 'Warrior of Capestrano' holds an axe in his right hand (Fig. 4.2), it has been suggested that axes may have been symbols of prestige and power rather than actual weapons to be used on the battlefield (D'Ercole 2011: 161). By the fifth-century BC, weapons, as well as other grave goods, ceased to be placed in Samnite burials of the region, probably due to the introduction of sumptuary laws preventing the display of wealth (D'Ercole 1999, 2011).

The lack of heavy protective armour in burial contexts argues against the adoption of tight 'phalanx-like' formations among these peoples (D'Ercole 2011: 150–1; cf. Schwarz 2013). Although specific imagery and archaeological evidence are currently absent, it can be speculated that Samnite warriors might have used light body armour made from perishable materials, in addition to the aforementioned bronze disc breastplates. The 'Fibula of Pizzoli' indicates that shields lacking reinforcing metal bosses were probably used by early Samnite warriors. Although the addition of such bosses would have increased the effectiveness and durability of shields, these have never been recognized in early Samnite burials.

Drawing upon the panoplies found in graves (assuming that burial assemblages and imagery provide accurate pictures of the warfare equipment used by early Samnites), it seems likely that early Samnite combat tactics would have involved loose formations of lightly armed warriors, who would have first attacked the enemy at distance throwing their spears/javelins and subsequently engaged in close-range combat using hand-held spears and swords (or daggers). They would have relied on skill and mobility, rather than heavy armour, for protection. This kind of approach to fighting is typical of the lightly armed troops of non-state societies (cf. Keeley 1996; Otterbein 1985).

Aim of the Study and Expected Outcomes

The purpose of this research is to gain insights into the martial practices of Iron Age Samnite communities through the joint analysis of funerary treatment and biological traits related to the use of weapons. Previous biomechanical studies of Samnite male burials have given insights into the degree of asymmetry in mechanical strength in the upper limbs, through the analysis of paired humeri (Sparacello et al. 2011, 2015; Sparacello and Coppa 2014). When the asymmetry value is particularly high, this is assumed to be informative about the training in one-handed activities, which in this context can be inferred to be weapon use.

Studying the same skeletal series of Orientalizing-Archaic males examined in this research, Sparacello et al. (2015) found a correlation between the degree of humeral asymmetry and the Status Index – an assessment of the 'richness' of a burial based on the quantity and rarity of grave goods (Bernabei et al. 1995; Cuozzo 2003; D'Andrea 2006; Melandri 2010). They interpreted such a correlation as indicative of the military organization typical of early Samnites, which would have been based on elite militias composed of individuals from the highest social strata. Here, we expand upon their analysis by examining in more detail the layout of the grave goods and the typology of the weapons. In addition, we consider whether humeral asymmetry in the deceased was due to them having a more robust right or left arm, which is informative about the preferential use of one arm over the other, and therefore on handedness in vivo (Shaw 2011).

This research aims to analyse whether the evidence provided by biomechanical stress in relation to one-handed weapon training and handedness is coherent with early Samnite mortuary rituals. In particular, we aim to:

1. Assess whether weapons were consistently deposited with highly asymmetric individuals, which are expected to be those who most likely took part in martial activity
2. Assess whether handedness was reflected in the location of the sword or the dagger in the burial, i.e. whether it is consistently contralateral to the dominant arm and thus functional to unsheathing the weapon

The null hypothesis is that there is no correlation between the presence and position of weapons in the grave and the level and directionality of humeral asymmetry. A significant correlation would suggest the existence of a funerary ritual that (1) acknowledged the martial practice of the deceased through the deposition of weapons and/or (2) acknowledged the specific way the individual fought or buried the individual wearing weapons in the same way they were worn in life.

In addition, we will determine whether the prevalence of left-handed individuals in our sample of early Samnite males is compatible with what is normally found in modern human populations. Assuming that early Samnite warriors fought in relatively loose ranks, we predict that left-handed individuals in the sample should be roughly as numerous as those normally found in human populations (c. 10%; Raymond and Pontier 2004), if not above the average, due to the advantage that left-handedness may provide in one-to-one combat (Raymond et al. 1996).

Materials and Method

Materials

The study analysed skeletal and archaeological data from male inhumations of the Orientalizing-Archaic period (*c*.800–500 BC), all unearthed from eight neighbouring cemeteries within modern-day Abruzzo in the east-central Apennines (Fig. 4.1). Grave goods data (used for calculating the Status Index) are available for all the 238 burials in the sample (Sparacello 2013). Upper limb mechanical rigidity via cross-sectional geometry data (CSG, see below) was calculated for 216 individuals which were deemed complete enough for the calculation of CSG properties; 153 of these were buried with weapons. Anthropological parameters of the individuals including determination of sex and estimation of age are detailed in Sparacello (2013). All cemeteries lie in what is believed to be the territory of early Samnite 'tribes': seven are clustered in the Aterno River Valley and are traditionally ascribed to the 'Vestini' tribe (D'Ercole 1990), while the necropolis of Alfedena, some 50 km further south, is commonly attributed to the 'Pentri' community (Parise Badoni and Ruggeri Giove 1980). Of the 171 burials containing weapons, only 82 have yielded reliable information concerning the layout of these objects in the grave as well as skeletons complete enough to gather CSG data. Although most of the cemeteries examined for this research have been excavated in the last few decades, only Bazzano (Weidig 2014), Fossa (D'Ercole and Benelli 2004), and Alfedena (Parise Badoni and Ruggeri Giove 1980) are fully published. This explains the lack of contextual data for several burials in the sample.

Status Index Analysis

Grave goods have long been used in archaeology to make inferences about the social role of the deceased and the organization of ancient communities (e.g. Bietti Sestieri 1992; Binford 1971; Saxe 1970). Nevertheless, as the dead do not bury themselves, the nature of burial assemblages is determined by the living according to their own cultural values, beliefs, and several other contingent factors including ideas about individual and group identity (Morris 1992; Brown 1995; Parker Pearson 1999: 8–9). In addition to assuming that grave goods belonged to the dead, another problem is that objects may have changed their meanings upon entering the mortuary domain (Ekengren 2013: 182). These issues are particularly important in later prehistoric studies. The widespread practice of depositing weapons in burials has sometimes been interpreted as evidence of the rise of an elite warrior class in later European prehistory (Kristiansen and Larsson 2005). On the other hand, the prevalence of weapons in wealthy burials may indicate that weaponry was used to signal status rather than the actual participation of the deceased in martial practices (Sørensen 2013: 221). Furthermore, one could postulate that in occurrences of 'bad

deaths' (Humphreys 1980; Langdon 2005), high-status individuals may have been buried with poor or otherwise anomalous grave good assemblages. This suggests that the relationship between weapon-rich graves and the graves of actual warriors may not be straightforward (Härke 1990; Whitley 2002). As burial rites do not provide an unambiguous portrayal of the social identity, role, and lifetime activities of the deceased, we should ask ourselves if, and to what extent, funerary contexts allow insights into past martial practices and the societal values attached to them (see also Lehoerff, Chap. 14, this volume). This research attempts to address this question by considering both skeletal and archaeological data. It has been noted that, in Samnite burial practices, 'richness' is most often expressed in quantitative rather than qualitative terms, since the same categories of objects tend to recur in both 'rich' and 'poor' burials, albeit in different quantities (Tagliamonte 1997). For this reason, our investigation of status has been grounded in the quantitative, rather than qualitative, appraisal of the grave goods.

The Status Index (SI) used in this study as a proxy for lifetime status was calculated for 238 Orientalizing-Archaic burials following the formulae discussed in Bernabei et al. (1995; see also Cuozzo 2003; D'Andrea 2006; Melandri 2010). Grave goods were divided into several categories (including weapons, meat-grilling equipment, banqueting equipment, and food containers; details in Sparacello 2013), and a 'coefficient of status' was calculated for each category. The coefficient measures two properties of each category: how frequently the object (or set of objects) is found in the assemblage and, when found, how many other items are present in the burial. The SI of a burial is the sum of the number of items in each category multiplied for its coefficient of status (see Sparacello 2013 for raw data and further details on the calculation of the SI). For the statistical analysis, the SI was categorized based on the analysis of histograms showing the frequency of burials for the whole range of SI in the sample (details in Sparacello 2013). Individuals were considered of low status when the SI was between 0 and 15, medium status when the SI was between 15 and 45, and high status when the SI was above 45 (Sparacello et al. 2015).

It should be noted that the method utilized in Sparacello (2013) does not consider the intrinsic value of the goods, for example, whether a certain item is finely crafted or imported. Potentially important information concerning past ideas of status is, therefore, overlooked, and a typological analysis of each grave good would certainly give a more accurate depiction of the level of prestige associated with each burial. By distinguishing between 'common' and 'rare/prestigious' weapons, this study attempts a first step towards a more in-depth analysis.

Assessing Humeral Biomechanical Asymmetry (HUMBA) and its Directionality

Cross-sectional geometry (CSG) of the humerus is the method used here to evaluate the mechanical competence of the upper limb, which provides insights about the levels and types of past physical activity. This method is based on the widely accepted notion that bone tissue responds dynamically to mechanical load.

According to what is loosely referred to as 'Wolff's Law', bone tissue is deposited in the shaft's cross-section where mechanical loads require it to prevent strains in excess of the elastic limit; below a certain strain threshold, the bone tissue is reabsorbed (for review see Pearson and Lieberman 2004; Ruff et al. 2006). The shape and dimension of the bone cross-section are therefore informative about the mechanical loads applied in vivo. Through CSG analysis, the polar moments of area (J) can be calculated; this is a quantitative measure of the mechanical competence of long bones correlating with torsional rigidity (Ruff et al. 2006). After standardization to take body size into account, this value is informative about the activity-induced mechanical loads, which in turn provide insights on subsistence activities performed using the upper and lower limbs, mobility levels, and the preferential use of one arm, or humeral biomechanical asymmetry (HUMBA).

In this research, the so-called 'Solid CSG' method was used to determine the mechanical competence of long bones (Sparacello and Pearson 2010). The protocols used for data collection (i.e. reconstruction of the mid-distal cross-section) and extraction of CSG properties from the humeri are standard in the field of CSG (see Ruff 2003) and are described in detail elsewhere (see Sparacello 2013; Sparacello et al. 2015).

The variable HUMBA [(maximum J – minimum J)/minimum J] is particularly important because it is associated with the repetitive and intensive use of the dominant arm in single-handed activities. In a modern Western sample, people would show asymmetry values around 10% due to physiological handedness caused by lack of high muscular stress to either the right or the left hand. High lateralization in modern samples is due to sports practices involving asymmetric use of the upper limb (e.g. tennis and various throwing-based sports: Churchill et al. 1996, 2000; Haapsalo et al. 2000; Ireland et al. 2013; Shaw and Stock 2009; Trinkaus et al. 1994). In bioarchaeological research, high asymmetry has been associated with spear throwing (Churchill et al. 1996, 2000) and the use of small hatchets (Marchi et al. 2006, 2011; Sparacello and Marchi 2008) and weapons (Rhodes and Knüsel 2005; Sparacello et al. 2011). Moreover, it has been noted that in the absence of specific and, above all, repetitive activities causing one arm to be preferentially loaded, the degree of asymmetry of agricultural human groups is still around 10%, although their level of mechanical strength (or 'robusticity') is much higher than in samples from industrial societies (Sparacello and Marchi 2008; Sparacello et al. 2011).

The high-status Orientalizing-Archaic individuals from our sample display levels of humeral asymmetry (*c*.30%) similar to those found today in cricket bowlers who had trained since adolescence (cf. Shaw and Stock 2009). This has been attributed to weapon training and use, in particular swords and spears (Sparacello et al. 2015). Although other activities such as metallurgy and woodworking may increase asymmetry, they were probably not the cause of high asymmetry in high-status Orientalizing-Archaic males. In fact, a significant decrease in asymmetry is present in males from later periods, when weapons disappear from burials, but no evidence is available to suggest a decrease in metallurgical production or woodworking (Sparacello et al. 2015).

Following Shaw (2011), in this study individuals with a HUMBA value above 5% were considered to be lateralized; below this threshold, asymmetry was categorized as 'low' and therefore ambiguous to interpret. Humeral asymmetry was further categorized as 'normal' between 5% and 15%, 'medium' between 15% and 25%, and 'high' above 25%.

Layout of Weapons in Early Samnite Burials

The layout of weapons in relation to the body of the deceased is used here to gain insights into funeral behaviour. Spear points are normally found to the side of the dead, near the head, or feet. Swords and daggers, on the other hand, are normally found in closer connection with the skeleton, suggesting that they may have been worn as part of a 'costume' (sensu Sørensen 1997). Archaeological and iconographic data indicate that swords and daggers were carried on the side, or on the torso, by means of a sort of a baldric made of metal chains (D'Ercole 2011, 157; Weidig 2008). If the location of swords and daggers within the grave mirrored the way in which they were carried during life, we would expect them to be positioned on the opposite side of the dominant arm, where one would be most comfortable unsheathing them upon use. Conversely, a significant deposition pattern on a specific side, with no regard for the dominant arm of the individual, would argue in favour of culturally sanctioned ways to carry the weapons, at least in death. For example, the Warrior of Capestrano carries the sword on the right side of the torso (Fig. 4.2). Assuming that he was right-handed, such an orientation would not be considered functional (see below) and may indicate that there were socially recognized preferences in the way weapons should be carried.

The location of one-handed weapons such as daggers and swords has been reconstructed based on excavation recording sheets and field pictures. These weapons were most commonly located on either side of the ribcage, next to either femur, and next to either arm of the deceased. However, considering that the layout of the grave goods could have been altered by post-depositional processes, we excluded from the study the burials in which the weapons lay too close to the central axis of the body and took into account only the side of the body on which the weapon was found (as opposed to the exact find spot). This rests on the assumption that it is unlikely that post-depositional processes may have been significant enough to cause such heavy objects as swords and daggers to move from one side of the body to the other.

Research Results

Table 4.1 plots weapons against humeral asymmetry category considering the presence of 'a weapon' as well as the weapon type (i.e. sword, dagger, or spear), if known. Considering that 'low' and 'normal' asymmetry categories yielded similar values, and so did 'medium' and 'high' asymmetry categories, these two groups

Table 4.1 Contingency table for categorized humeral asymmetry and presence/absence of weapons

All individuals	**Weapon**	**No weapon**	**Chi-square test**
High-medium asymmetry (>15%)	101	38	
Normal-low asymmetry (0–15%)	53	25	NS
	Sword	**No weapon**	
High-medium asymmetry (>15%)	30	38	
Normal-low asymmetry (0–15%)	23	25	NS
	Dagger	**No weapon**	
High-medium asymmetry (>15%)	37	38	
Normal-low asymmetry (0–15%)	18	25	NS
	Spear	**No weapon**	
High-medium asymmetry (>15%)	80	38	
Normal-low asymmetry (0–15%)	43	25	NS
	Spear	**No spear**	
High-medium asymmetry (>15%)	80	59	
Normal-low asymmetry (0–15%)	43	34	NS
Only armed individuals	**Spear**	**No spear**	
High-medium asymmetry (>15%)	80	21	
Normal-low asymmetry (0–15%)	43	9	NS

NS statistically non-significant at $\alpha = 0.05$

were pooled together. The table consistently shows that the frequency of individuals with medium/high asymmetry is not significantly different in armed versus unarmed individuals. The same is true when considering the presence/absence of the spear, which being also a throwing weapon is expected to highly influence humeral asymmetry. These data suggest that the presence or absence of weapons is independent from the level of biomechanical asymmetry of the individual buried in the grave.

Table 4.2 shows that rare and prestigious weapons such as maces and axes are consistently associated with highly lateralized individuals; the result is significant only at the $\alpha = 0.1$ level, probably due to the small size of the sample. Likewise, the even smaller subsample of individuals with 'prestige weapons' has, on average, higher humeral asymmetry than other armed (Mann-Whitney U test $P < 0.05$) and non-armed individuals (if marginally; Mann-Whitney U test $p = 0.053$). When considering the Status Index of the burials, 'prestige weapons' appear consistently in otherwise 'rich' burials (Table 4.3 and Fig. 4.4). No statistically significant relationship was observed between the dominant arm of the dead and the location of weapons on either side of the body (Table 4.4). Furthermore, the layout of one-handed weapons in relation to the deceased is highly variable – a fact that seems to argue against any strict rule for the placement of these objects in burial.

The incidence of left-handed individuals in the sample (12 out of 198; 6.1%, considering only individuals with asymmetry above 5%) is well within the range of modern populations and is not significantly different for those buried with weapons (9 out of 140; 6.4%) vis-à-vis those buried without weapons (3 out of 58; 5.2%).

Table 4.2 Contingency table for categorized humeral asymmetry and presence/absence of prestige weapons

Presence of prestige weapon (axe and mace)	**Yes**	**All individuals**	**Chi-square test**
High-medium asymmetry (>15%)	9	130	
Normal-low asymmetry (0–15%)	1	76	$P < 0.1$
	Yes	**Armed individuals**	
High-medium asymmetry (>15%)	9	92	
Normal-low asymmetry (0–15%)	1	51	$P < 0.1$
	Yes	**No weapon**	
High-medium asymmetry (>15%)	9	38	
Normal-low asymmetry (0–15%)	1	25	$P < 0.1$

Table 4.3 Contingency table for categorized Status Index (calculated without considering weapons) and presence/absence of prestige weapons

Presence of prestige weapon (axe and mace)	**Yes**	**All individuals**		**Chi-square test**
Status index >45	7	28		
Status index 15–45	3	129		
Status index 0–15	1	70		$P < 0.001$
	Yes	**Armed individuals**	**No weapon**	
Status index >45	7	22	6	
Status index 15–45	3	90	39	
Status index 0–15	1	48	22	$P < 0.001$

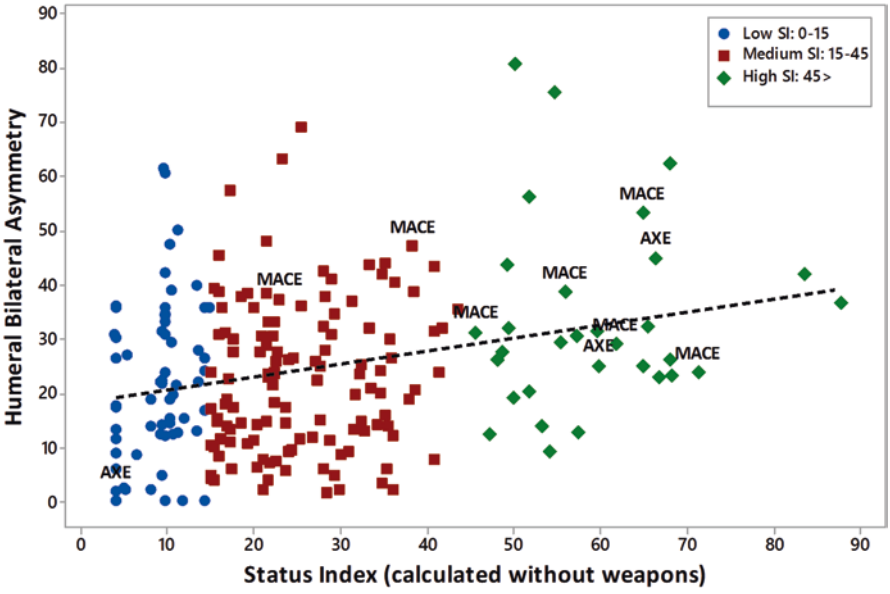

Fig. 4.4 Scatterplot showing humeral bilateral asymmetry against Status Index (calculated without considering weapons) in a sample of 216 Iron Age Samnite male burials, c.800–500 BC. The graves with 'prestige weapons' (i.e. axes and maces) are marked on the plot

Table 4.4 Contingency table for the side of deposition of weapons and 'handedness' inferred from the directionality of humeral asymmetry (HUMBA)

All individuals except for low HUMBA	Chi-square test		Chi-square right vs left	
Individuals with swords	*Right*	*Left*		
Right handed	23	16		
Left handed	2	0	NS	NS
Individuals with daggers	*Right*	*Left*		
Right handed	20	19		
Left handed	2	0	NS	NS
Swords and daggers cumulative	*Right*	*Left*		
Right handed	43	35		
Left handed	4	0	NS	$P < 0.1$
Individuals with swords and medium-high HUMBA	*Right*	*Left*		
Right handed	15	11		
Left handed	1	0	NS	NS
Individuals with daggers and medium-high HUMBA	*Right*	*Left*		
Right handed	16	14		
Left handed	1	0	NS	NS
Swords and daggers cumulative (medium-high HUMBA)	*Right*	*Left*		
Right handed	31	25		
Left handed	2	0	NS	NS

Individuals with low HUMBA (below 5%) were excluded due to lack of asymmetry. The chi-square test has been calculated taking into account two categories of side of deposition (right and left) and two categories of directionality in asymmetry (right and left handed). NS statistically non-significant at $\alpha = 0.05$

However, when considering the degree of humeral asymmetry in the sample, the number of left-handed individuals decreases with increased humeral asymmetry (Table 4.5 and Fig. 4.5). Even after excluding the individuals with very low asymmetry (<5%), for which laterality may be ambiguous, chi-square tests show that the pattern is still statistically significant.

Discussion

In this study, we employed a bioarchaeological approach for reconstructing the interplay between funerary rites and combat/training activities among the Samnite communities of the Orientalizing-Archaic period (*c*.800–500 BC). Based on previous research on the subject (Sparacello 2013; Sparacello et al. 2015), we identified individuals with skeletal evidence suggesting weapon training (and perhaps participation in combat) from a young age, as shown by high humeral asymmetry in mechanical rigidity, and verified their handedness for this variable. Previous studies have demonstrated a significant correlation between the level of humeral

Table 4.5 Contingency table for the categorized humeral asymmetry and 'handedness' inferred from the directionality of humeral asymmetry (HUMBA)

All individuals	**Right handed (*n*)**	**Left handed (*n*)**	**Right handed (%)**	**Left handed (%)**	**Chi-square test**
High asymmetry (>25%)	98	1	99.0	1.0	$P < 0.01$
Medium asymmetry (15–25%)	37	3	92.5	7.5	
Normal asymmetry (5–15%)	50	7	86.4	13.6	
Low asymmetry (<5%)	13	6	72.2	27.8	
All individuals	**Right handed (*n*)**	**Left handed (*n*)**	**Right handed (%)**	**Left handed (%)**	**Chi-square test**
High-medium asymmetry (>15%)	135	4	97.1	2.9	
Normal asymmetry (5–15%)	50	7	86	14	$P < 0.01$
Only armed individuals	**Right handed (*n*)**	**Left handed (*n*)**	**Right handed (%)**	**Left handed (%)**	**Chi-square test**
High asymmetry (>25%)	70	1	98.6	1.4	
Medium asymmetry (15–25%)	28	2	93.3	6.7	
Normal asymmetry (5–15%)	33	6	84.6	15.4	
Low asymmetry (<5%)	9	4	69.2	30.8	$P < 0.05$

Individuals with low HUMBA (below 5%) are reported in the table but excluded from the chi-square test

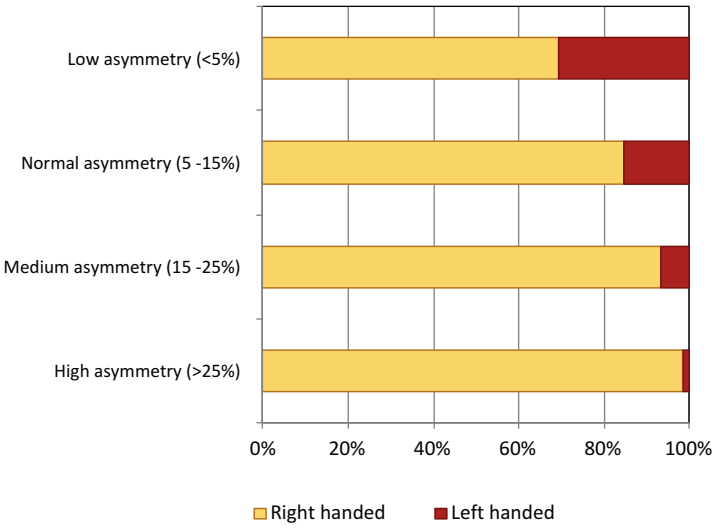

Fig. 4.5 Bar chart showing the percentage of left-handed and right-handed individuals across the different categories of humeral bilateral asymmetry identified in this research

asymmetry and the Status Index calculated from funerary treatment, suggesting the presence of militias consisting of elite individuals (Sparacello 2013; Sparacello and Coppa 2014; Sparacello et al. 2015). By studying the burial rite in more detail, in order to verify possible correspondences between biomechanical data, the presence/absence of weapons, and their location in the grave with respect to the body, this study has expanded upon these results.

Teasing Apart Warrior Burials and Burials of Warriors

Over two-thirds of the male graves in the sample (171 out of 238) included at least one weapon. Even considering possible biases caused by selective or anomalous burial rites, this figure highlights the importance of weapons as grave goods among early Samnite communities; it also emphasizes that not all the males were portrayed as warriors in death. Importantly, the analysis of biomechanical humeral asymmetry also shows that the most common weapons – such as daggers, swords, and spears – were often placed in the burials of non-lateralized people. Assuming that lack of lateralization means that these individuals did not train extensively in the use of weapons (Sparacello et al. 2015), this trend suggests a discrepancy between the representation of the dead as a warrior and his actual involvement in military training and martial practices.

It could perhaps be speculated that only individuals who died in battle were buried with weapons, while people who suffered from a ‘bad death’, perhaps away from the battlefield, might have been buried without martial paraphernalia (cf. Humphreys 1980; Langdon 2005). Among the males buried with weapons, however, there are also preadolescent individuals whose age seems incompatible with combat training, let alone taking part in battle (Cianfarani et al. 1978; Parise Badoni and Ruggeri Giove, 1980).

Another discrepancy between burial treatment and lifetime activities of the deceased emerges from the analysis of weapon placement within the grave. If swords and daggers were placed on the body so as to reflect the way they were worn in life (cf. Scopacasa 2015, 81), we would expect them to be located on the opposite side to the dominant arm as inferred from humeral asymmetry. This is not the case in the sample analysed here, in which weapons were deposited on either side of the body regardless of the dominant arm; the same is true of the highly lateralized individuals, for which no clear relationship between weapon placement and dominant arm is visible either. It can thus be inferred that the weapons were deposited in the grave without paying special attention to whether and how they were worn in life. This further disproves the hypothesis that burial behaviour would mirror actual use of the weapons in life.

While the placement of swords, spears, and daggers in burial vis-à-vis humeral asymmetry appears to challenge straightforward interpretations concerning early Samnite warrior roles, rarer weapons such as maces and axes were consistently deposited with individuals showing significantly higher degrees of asymmetry than

the rest of the sample. Furthermore, maces and axes are present in burials showing a high Status Index, even upon excluding the weapons (including axes and maces) from the SI calculation.

These weapons were likely imbued with meaningful cultural values; for example, the 'Warrior of Capestrano', ostensibly a Samnite political leader of the Archaic period (Barker et al. 1995, 177; Bispham 2007, 190; Calderini et al. 2007; D'Ercole and Cella 2007; D'Ercole 1999; Scopacasa 2015, 73–74), holds an axe in his right hand (Fig. 4.2), while one of the figurines depicted on the 'Fibula of Pizzoli' holds a mace (Fig. 4.3). The special meaningfulness of the latter weapon emerges upon considering that the brooch illustrates what seems to be a ritual rather than an explicitly martial practice. Axes and maces are also far rarer than swords and spears in early Samnite burial sites, thus further suggesting their special significance for these communities.

It therefore appears that, while ordinary weapons cannot be taken to directly mirror the martial practices carried out by the deceased in life, a significant correlation is found in the sample between high humeral asymmetry, Status Index, and special weapons such as maces and axes. Consequently, the existence among early Samnite communities of a warlike ideology in which social prestige was not only tied to the display of warrior prowess but also to actual martial practices is, at least partly, supported by the research results.

Asymmetry, Handedness, and the Role of Weapon Training in Early Samnite Burials

Another significant result of this research lies in the discovery that left-handedness in males with high humeral asymmetry (as arising from sustained weapon training from a young age; Sparacello et al. 2015) is significantly underrepresented in the sample. In fact, the subsample of highly asymmetrical individuals shows an almost complete absence of left-handed people among their ranks. Cross-cultural studies show that left-handed individuals make up about 10% of human populations (Faurie and Raymond 2004; Papadatou-Pastou et al. 2008; Shawn 2011). An oft-cited hypothesis explaining this pattern suggests that left-handedness survival in human evolution is due to it being a significant factor for frequency-dependent selection. In formulating the so-called fighting hypothesis, Raymond et al. (1996) observed relatively high rates of left-handed athletes in close-combat disciplines. To account for this pattern, they argue that being left-handed may be advantageous for those engaging in fighting, which in turn can perhaps explain the survival of left-handedness as a minority trait in human evolution.

The fighting advantage of left-handed individuals is not merely to be ascribed to the use of a different arm than the opponent but rather to the combat stances influenced by the leading hand (cf. the southpaw and orthodox stances in contemporary boxing). For instance, in a sword-and-shield combat, contenders hold their sword with the dominant hand: when two fighters with the same leading hand face each

other, their swords face the opponent's shield. Conversely, when a left-handed fighter faces a right-handed fighter, the positions of the weapons are not inverted but mirrored, with shields and swords being on the same side. Since left-handed people have always been a minority, combat training for both left-handed and right-handed fighters is mainly focused on dealing with a right-handed opponent; at parity of skill, this favours the left-handed fighter. Gursoy (2009) observed that left-handed boxers have a considerably higher success rate than right-handed ones, and similar results have been recorded with regard to wrestlers (Ziyagil et al. 2010).

Based on these considerations, left-handedness was expected to be substantially represented in the sample of individuals we identified as highly combat-trained based on their humeral asymmetry. The opposite pattern emerged instead. Importantly, it was also noted that left-handedness is present in a normal ratio within the total sample but is unevenly distributed among the different humeral asymmetry groups, indicating that left-handedness was not discouraged within the society as a whole. Results therefore suggest a relationship between right-handedness and high asymmetry, which we argue to be due to intensive combat training (Sparacello et al. 2015).

The weapons known from these communities do not seem to have a particular design feature that may restrict their use to the right hand only. Therefore, it seems reasonable to ascribe the prevalence of right-handed individuals among the most military trained members of society to particular combat tactics and styles rather than to the combat tools themselves. One might see in this pattern a proxy for combat in tight-rank formations, perhaps a type of less complex precursor of the 'phalanx' known from Greek and Roman armies. When fighting in a formation of this kind, warriors hold shields in their left hand and a one-handed weapon, normally a spear, in the right: every member is expected to protect the right side of the man next to him with his shield, thus forming a solid frontline (Keegan 1993, 248). It follows that a warrior holding his weapons the other way round would have breached the tightness of the rank. Consequently, in a society in which such combat tactics were adopted, martial training would have focused on achieving the skill necessary to operate with others as a single fighting unit, encouraging the use of the right arm to strike and of the left arm to defend.

There is little additional evidence suggesting that tight ranks might have been in use in the Italian peninsula during the Orientalizing-Archaic period. The decoration of the sixth-century BC Certosa *situla* (a bucked-shaped bronze vessel) from Bologna in northern Italy portrays a military parade consisting of warriors equipped with long spears, large shields, and helmets: a warfare equipment that is compatible with this kind of tactic (Cherici 2003). On the other hand, the existence of tight ranks in such an early period is not fully supported by the archaeological record, mainly due to the lack of heavy protective gear (Cherici 2003: 529; D'Ercole 2011: 150; see also above). The only piece of evidence that is not at odds with the use of tight combat formations in the Orientalizing period in the area of study is the adoption of the dagger, which appears suitable for fighting in close ranks, where one may have extremely limited room for manoeuvring (D'Ercole 1999: 116–7). During the Archaic period, however, the dagger is replaced by the sword, a weapon with a longer reach and

likely different use mechanics (D'Ercole 2011: 156–7). Unfortunately, by dividing the sample into dagger and sword bearers, results are not significant as the subsamples become too small (Table 4.5). At this stage of the research, it is therefore not possible to evaluate diachronic changes in the degree of asymmetry and handedness from the Orientalizing to the Archaic period.

Another possible reason for favouring right-handed weapon training may be found in the dearth of heavy defensive gear, as inferred from early Samnite iconography and grave goods. Holding the spear or sword in the right hand would have resulted in exposing mainly the right side of the body, while keeping the left side (where the heart is located) better protected by the shield. Attacking with the right arm would thus improve the odds of receiving non-lethal wounds instead of fatal strikes (Harris 2010: 37–8).

Finally, it should be said that alternative interpretations of the archaeological and skeletal data are possible. Combat techniques are learned and internalized in a given cultural and social milieu and do not necessarily follow parameters of functionality and efficiency alone (Horn 2014; Mauss 1973). Widespread reluctance to use of the left arm for wielding a weapon might be explained by cultural values and beliefs typical of this warrior community (cf. Mandal 1999; Medland et al. 2004). In the absence of a much-needed comparative framework, our inferences of military tactics based on handedness can only be regarded as preliminary.

Conclusion

The multidisciplinary approach employed in this research has provided new insights into several aspects of proto-historic Samnite communities from the Central Apennines. Departing from merely decoding how a society represents itself in burial, the combined archaeological and osteological approach adopted here has allowed a better understanding of significant social practices carried out by the community of the living and how they were represented in the mortuary realm.

The study of the depositional patterns of daggers, swords, and spears suggests that these weapons were deposited in burials of varying degrees of wealth, which were often characterized by non-asymmetric individuals who presumably had not received any sustained weapon training during their lives. This suggests that the weapons may have been deposited to signal affiliation to certain social categories, which may or may not result from actual involvement in martial practices. On the other hand, the presence of rare weapons such as maces and axes in the burials of highly lateralized individuals (who were also endowed with lavish grave goods) hints at a society in which status and wealth may have been intertwined with the display and practice of martial prowess and combat skills.

Biomechanical analysis of humeral asymmetry and arm dominance has challenged what was expected to be found in a population allegedly bent on raiding and loose-rank combat. As a matter of fact, highly asymmetric left-handed individuals are exceedingly rare in the sample, which would be expected if the military organization

was based on tight ranks. However, left-handedness in weapon training may have also been discouraged for hitherto unexplored reasons, and one must leave the door open to alternative interpretations.

The data and interpretations presented in this chapter intend to stimulate new debates and avenues of research. The multidisciplinary approach applied here, which is grounded in the combined analysis of skeletal, iconographic, and archaeological evidence, has advanced our knowledge and understanding of early Samnite society. Similar approaches can fruitfully be applied to other periods and regions in order to carry out cross comparisons with societies with different attitudes to warfare. Likewise, future advances in the investigation of use-wear on iron weaponry (going beyond current applications to copper alloys; Dolfini and Crellin 2016), as well as applications of the methodology proposed in this chapter to Bronze Age contexts, would certainly allow new, and indeed more in-depth, reconstructions of past combat practices and of their social significance.

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