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Instructions for Contributors
Slinging in the Biblical World: 
And What We Can Learn about David Defeating Goliath

Boyd Seevers and Victoria Dennis

Slings, such as those used by David and countless other slingers in the greater biblical world have, served as weapons for millennia in warfare, herding, hunting, and sport. This paper surveys how slings are made and used, what types of ammunition slingers have used, how slingers have functioned throughout military history, how far and accurately a slinger could sling, and how much damage a sling could inflict. This information helps us better understand David’s defeat of Goliath.

Keywords: sling, slinging, David and Goliath, slingstone, lead pellet

The famous biblical story of David defeating Goliath demonstrates David’s faith and courage as well as his skill in using a sling—a simple but effective weapon used throughout most of the biblical world during most of biblical history and beyond. This article will survey how slingers in the biblical world used this weapon, what kinds of ammunition they used, how slingers have been used throughout military history, and how far and accurately they could sling and how much damage they could inflict. The results of this study should add clarity and color to the subject of slinging as well as the famous story of the shepherd boy who defeated a powerful foe by using a simple weapon with notable skill.

A common sling, like what David used, probably consisted of two cords joined to a central pouch (fig. 1). One cord typically ends in a loop while the other cord often ends with a knot. The slinger places the loop over one finger of the throwing hand and holds the knot between the thumb and index finger. He or she places a stone or some other type of ammunition in the pouch, then whirls it one or more revolutions overhead or at the side of the body until releasing the knotted cord to send the stone flying toward the target. Thus the slinger uses the sling plus centrifugal force to launch a projectile with greater power and range than one could generate simply by throwing it (Echols 1950, 227).

Slings are simple and cheap to produce, and compact to carry. They can be as simple as a one-meter-long leather strap, but usually they are woven from flexible and durable animal hair or plant fiber such as wool, goat’s hair, linen, or hemp. Keeping the ammunition in the pouch as it whirls can be problematic, so the pouch is often woven with hemmed edges or made in two or even three divisions that separate to hold the projectile more securely until the point of release. Sling cords vary in length. Longer slings produce more velocity and work better for longer distances, whereas shorter slings are more accurate. 1 Ancient slingers could carry ammunition in pouches (1 Sam 17:40) or in the fold of their cloak. Or, they could stack it at their feet.

The following passage describes an Arab shepherd in premodern Palestine caring for his sheep and weaving a sling from wool, perhaps much like David did three thousand years ago:

As [the shepherd] watches over the feeding sheep, he cuts a little wool from the back of one, spins it with the aid of only a smooth pebble, and then converts the yarn into a sling such as is always carried in the [shepherd’s pouch]. With this he becomes expert in [cast]ing stones to a great distance and with much precision. It not only serves as a weapon of defense, but when a sheep or goat wanders off and will not return at his call, he will drop

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People have used slings for thousands of years throughout most of the world. Evidence for slinging comes from every inhabited continent except Australia (Korfmann 1973, 42). Slings have been used for warfare, herding, hunting, and sport—all applications that continue until today. Notably, the two most common uses of slings—warfare and herding—were the two that we know applied to David.

Because slings are made of organic material that nearly always decomposes over time, the earliest evidence for slings is pictorial. Perhaps the oldest picture of a slinger comes from Çatalhöyük—a Neolithic site in southern Turkey—often dated to about 7000 BC (fig. 2; Langer 1972, 9). Extant slings date back to about 2000 BC in Peru. The oldest surviving slings from the biblical world come from Egypt; two linen slings were among the finds in Tutankhamen’s tomb (ca. 1320 BC) and Petrie dated a sling that he recovered from Lahun in Faiyum, Egypt to approximately 800 BC. Slings also appear across the biblical world in the records of most of the major armies that appear in the Bible: Egyptian, Assyrian, Israelite, Persian, Greek, and Roman.

Methods of Slinging

In addition to this general history, what can we learn from ancient pictures and texts about the techniques that slingers employed when using their weapons? First, along with the basic sling already described, the Greeks and Romans also had a different type called a staff sling, which continued in use through the Middle Ages until fast cavalry and armor made them obsolete (Korfmann 1973, 41). As the name suggests, the staff sling incorporated a staff or pole, approximately one meter long, with one end of the sling tied to the pole, and the free end looped over the end of the pole or knotted and set in a notch on the end (fig. 3). The user loaded the projectile into the pouch and snapped the pole up from horizontal to vertical, releasing the free end and launching the projectile. Staff slings had less range than regular slings but required less skill and could launch larger and heavier ammunition. They continued in use into the seventeenth century AD, even after the invention of gunpowder, for launching grenades (Korfmann 1973, 38).

Given that the basic sling was the most common style by far, what techniques did the ancients practice when using it? The information is mixed. As with the account of David and Goliath (“David . . . took out a stone and slung it”),
most texts simply mention slingers or slingstones or their effects without describing slinging technique. However, a limited number of ancient pictures do offer some clues about technique.

Some pictures appear to show ancient slingers whirling the sling horizontally over their heads. At Medinet Habu, an Egyptian relief of the naval battle with Sea Peoples in the early twelfth century BC shows a slinger in the crow’s nests of each Egyptian ship (fig. 4). His arm extends upward and behind him, and the sling extends at almost a right angle to the forearm, apparently whirling horizontally just above his head. Likewise, an Aramean relief from Tell Halaf (in what is now northern Syria) dating to the tenth century BC appears to portray a similar technique (fig. 5). The slinger’s free hand looks to be loading or holding the pouch just before it begins whirling, again in an apparently horizontal path. Similarly, images of slingers on Greek coins from the fourth century BC appear to display the same technique (fig. 6).

By contrast, other ancient pictures seem to portray slingers in the biblical world whirling their slings vertically beside their bodies. One of the best-known pictures of ancient slingers comes from the Assyrian attack on the Judean city of Lachish in 701 BC (fig. 7). King Sennacherib directed the conquest and then had his artists decorate a major room in his new palace in Nineveh with carved reliefs portraying various aspects of the attack and its aftermath. The scenes include multiple slingers preparing to cast baseball-size am-

Figure 4. Egyptian slinger in crow’s nest (ca. 1180 BC).

Figure 5. Aramean slinger at Tel Halaf in Syria-Turkey (tenth century BC).

Figure 6. Greek slinger on coins (fourth century BC).

Figure 7. Assyrian slingers attacking Lachish in Judah (701 BC).
munition while their free hands hold their next rounds, and a pile of additional ammunition sits at their feet. Their sling- ing arms reach up and slightly back, and their slings extend straight in line with their arms, making it appear that their arms and slings are rotating vertically at their sides rather than overhead.

Perhaps not coincidentally, the Assyrian reliefs also show a Judean defender on the city’s rampart slinging in the same manner. Whereas the Assyrian slingers were on the ground outside the city seemingly with plenty of room, the Judean slinger stands behind the fence on top of the relatively narrow wall, perhaps behind some of his fellow defenders as well (fig. 8). Whirling a sling vertically behind such obstructions would seem difficult if not impossible, regardless of whether the cast was to be overhand or underhand. This suggests that the Assyrian artists may simply have portrayed Judean slingers as they did their own even if not entirely accurate—a common issue to consider when interpreting such imagery.

A Roman image from Trajan’s Column in Rome in the early second century AD also shows a slinger with his sling- ing arm straight and the sling extending straight out from the arm (fig. 9). He carries his ammunition in a fold of his cloak and bears a shield with his left hand as well. Perhaps in contrast, a major Roman military author named Vegetius (fourth century AD) wrote, “The slingers should be taught to whirl the sling but once about the head before they cast the stone” (Epitoma 2.23). Vegetius seems to be emphasizing efficiency by releasing the projectile after just one revolution rather the apparently customary three or four revolutions. His comment that slingers should whirl their slings “about the head” appears to suggest that at least some slingers used the horizontal technique in the fourth century, but how common that technique was is not clear.

Perhaps the information about ancient technique is inconsistent because different slingers or groups of slingers in antiquity used different methods, much as they do today. Modern slingers use a variety of whirling techniques including horizontal, vertical (underhand or overhand), figure eight (a vertical whirl on each side of the body before releasing), and whirling behind the back followed by a sidearm release (Skov 2013, 58–64).

**Types of Sling Ammunition**

Just as we find apparent variety in the techniques of ancient slingers, so we find a variety of ammunition used with slings throughout biblical history. Logically, the most common sling projectile throughout history has been the fieldstone, but fieldstones used as ammunition are usually impossible to differentiate archaeologically. Even the more rounded brook stones can be difficult to identify as sling ammunition. Early in slinging history, people began shaping sling ammunition to be more uniform and aerodynamic. Spherical rocks appear before the beginning of the sixth millennium BC, followed by biconical and ovoid projectiles. Their makers fashioned these earliest shapes from stone, but clay also appears as early as 5000 BC throughout much of the world (Korfmann 1973, 38–39).
Clay Projectiles

Pure clay, used without chaff or other forms of temper, is dense, easily worked, and makes for good sling ammunition. Clay projectiles in the East are typically sun dried, but biconical baked clay shots are common finds at Roman forts in Britain and elsewhere. A hoard of 6,000 clay projectiles came to light at a Roman fortress at Lambaesis in Africa (Griffiths 1989, 258). Clay sling ammunition generally weighed 20–50 grams (Korfmann 1973, 39).

Spherical Stones

Spherical slingstones appear in the Israelite archaeological record as early as the Early Bronze period (3300–2000 BC) (Sellers 1939, 42) and they continue through the Iron Age (1200–586 BC) and beyond. They were usually made from locally available hard stone (Stiebel 2003, 220; 2005, 100), and likely shaped by pecking with other hard stones (Squitieri and Eitam 2016, 1–10). For example, about three hundred flint and limestone slingstones came from the excavations of the Middle-Late Bronze Age fortress at Khirbet el-Maqatir, north of Jerusalem (fig. 10).7 Rounded slingstones are rather common finds from Iron Age excavations in Israel, more so in Iron Age II than Iron Age I. They are mostly flint, limestone, or basalt, and range in diameter from 2.5 cm to 12.5 cm with most being 5–8 cm (Rodriquez 2009, 246–48, app. 4). Olga Tufnell, the early excavator at Lachish, describes such stones and their manufacture as follows: “. . . common (were) round balls of flint with a diameter of about 6 cm and weighing about 265 grammes. From the quantity and uniform nature of these spheres, their preparation must have formed a considerable industry,”8 The Bible actually includes a rare textual reference to such military production of sling- and ballista stones during Iron Age II. “Uzziah provided . . . slingstones for the entire army. In Jerusalem he made devices . . . so that soldiers could . . . hurl large stones from the walls” (2 Chr 26:14–15). While stones cast by machines can be and typically are larger than those cast from a sling, differentiating between large slingstones and small ballista stones found in excavations can be quite challenging.9

After the Iron Age, some use of large slingstones continued, but the overall trend was to smaller ammunition, perhaps because it allowed for increased range. Greek historian Diodorus of Sicily (first century BC) wrote that Carthage defeated Syracuse in one battle largely because the Carthaginians used one thousand Balearic slingers who cast large stones each weighing one mina (437 grams) (Korfmann 1973, 39). Later Roman slingers cast stone balls in various sizes: 300–655 grams (in heavy slings made with three-thonged pouches (Stiebel 2007, 187–88), 200–300 grams, and less than 200 grams, (Stiebel 2013a, 299; 2015, 438–41). The Greek soldier and historian Xenophon (Anabasis 3.3.16) wrote of the effectiveness of Rhodian slingers who used lead pellets and had twice the range of Persian slingers who slung stones as large as a hand.

Lead Pellets

During the Hellenistic and Roman periods, sling pellets were often cast from lead, which is easily worked and quite dense. Most lead sling pellets found in excavations in Israel are Hellenistic, but a few date to the Early Roman period (Stiebel 1997, 301n30; 2013b, 293; Sivan and Solar 1994, 173–74). Lead sling pellets were biconical, almond- or acorn-shaped (fig. 11), and ranged from 13 grams to 185 grams, with most weighing 20–25 grams. Many were cast bearing symbols such as scorpions, lightning bolts, arrowheads, inscriptions with the names of military commanders, or informal messages such as “ouch” or “for Pompey’s backside” (Stiebel 1997, 301; Korfmann 1973, 39). Occasionally the pellets even bore incised military intelligence sent by spies or sympathizers to the other side, etched into the soft lead of the pellet (Stiebel 1997, 305n21). In one example, someone in a besieged city slung a pellet with information about when provisions were to arrive, enabling the besiegers to intercept and capture the supplies (Hawkins 1847, 104).
Lead pellets could be cast in carefully produced molds like the terra-cotta mold from Olynthus in Greece that produced eleven projectiles at once, connected by a system of sprues (fig. 12). Pellets could also be cast during battle under less optimal conditions. Of the five hundred lead pellets recovered from a battle site at a Roman fortress in what is now the Netherlands, only one was formally molded. The rest were cast in holes made in the sand using a stick, a rotating spear point, or even a finger. The process took only an estimated 17–37 seconds, even for those that were hammered after molding. At the site of one Roman battle in Scotland in the second century AD, 10 percent of the pellets of the Roman attackers were noticeably smaller and had holes drilled in them. Tests showed that when slung, they made “a weird banshee-like wail,” apparently as a form of psychological warfare to terrify the badly outmatched Scottish defenders (Pringle 2017; Sprave 2016).

Brook Stones

As noted earlier, relatively few lead pellets recovered in Israel date to the Early Roman period. Perhaps one reason was an increasing reliance by the Romans on brook stones—natural stones rounded by the action of water, found along coastlines or in riverbeds or streambeds. Such rounded stones fly straighter than irregular-shaped fieldstones and they have been a common choice for sling ammunition throughout history. David famously “chose five smooth stones from the stream” as his ammunition before facing Goliath. Excavators at an Iron Age hill fort named Maiden Castle in Britain uncovered a total of 50,000 brook stones in various hoards, one such hoard numbering 22,260 (Wheeler 1943, 49, 115, plate 104). The Roman historian Livy noted that Achaean slingers “were trained from boyhood . . . in hurling with a sling at the open sea the round stones which . . . generally strew the coasts” (History 38.28.4). Vegetius called for Roman troops to collect brook stones for various types of projectile ammunition. “Round stones are very carefully collected from rivers, because they are . . . more suitable for throwing . . . the smallest for casting by sling” (Epitoma 4.8). The Roman troops who conquered Gamla and Masada made extensive use of such natural stones in the fighting at those sites, as did their Jewish opponents (Holley 2014, 50–51; Stiebel 1997, 305n30).

Uses of Slings in Military History

For thousands of years, armies around the world used slings. Vegetius may have exaggerated but made a valid point when he wrote, “It is universally known the ancients employed slingers in all their engagements” (Epitoma 1.16). Some of history’s most famous armies, including those of Sennacherib, Julius Caesar, and Trajan all included meaningful numbers of well-trained slingers. The earliest literary mention of organized military slingers is Judges 20:16, which mentions seven hundred left-handed Benjamites who could “sling a stone at a hair and not miss.”11 By the time of the Iron Age, the sling had become a weapon commonly used in battle throughout the ancient world, and its use continued into the classical world and beyond. In his war with Rome, Hannibal...
defended Africa with a force that included 870 slingers from the Balearic Islands off the coast of Spain, and he retained a similar force with his own army when campaigning through Europe (Hawkins 1846, 103).

Slings were particularly useful in guerrilla warfare, in skirmishes, in keeping advancing armies at bay, and in showering the enemy’s ranks at the beginning of a battle to expose weaknesses that heavy infantry could exploit (Korfman 1973, 37). Slings could also be employed on an army’s wings with other light troops to protect the flanks of the heavy infantry, or they were used to provide cover for advancing or retreating infantry (Griffiths 1989, 267). For example, the Greek soldier and historian Xenophon tells of leading ten thousand troops in a retreat from the battle of Cunaxa against Persia in 401 BC. His men were unable to move more than a few miles because of the casualties inflicted by pursuing Persian slingers, archers, and cavalry, so Xenophon recruited two hundred Rhodian slingers from his army to provide cover. The slingers enabled the Greeks to escape with few casualties, demonstrating the effectiveness of even a small group of well-trained slingers (Anabasis 3.3–4; Griffiths 1989, 266). Although ancient armies often used slingers, their actual numbers can be difficult to determine because authors typically lumped together slingers, archers, and javelin throwers under the designation “light troops” (Hawkins 1846, 98).

Slings were also common weapons in both siege and naval warfare. For instance, Israel attacked the fortress of Kir Hareseth in Moab during Iron Age II. Second Kings 3:25 describes the siege by simply saying, “Slingers surrounded and attacked it.” Slingstones are common finds in excavations of walled cities and other fortifications, as illustrated by the enormous quantities of brook stones found at Maiden Castle in Britain, noted above. The slingers in the crow’s nests of the Egyptian ships pictured at Medinet Habu offer one example of slingers serving in naval contexts (fig. 4); later Greeks and Romans also used slingers in naval battles (Echols 1950, 299). In one battle between Athens and Syracuse, defenders on one ship rained on their attackers “javelins and arrows and stones without stint” (Thucydides, War 7.70.5). Julius Caesar used slingers on ships to cover his troops in one naval landing, and the people in the harbor at Majorca in the Balearic Islands used their slings to repel invaders in a different attack (Hawkins 1846, 103).

Despite their effectiveness, slingers generally commanded little respect in the ancient world, particularly in Greece. Heavily armored soldiers fighting hand-to-hand were the most honored, and only the rich could afford to equip themselves with the necessary armor and weaponry. By contrast, the simple and cheap sling was viewed as a poor man’s weapon brought from rural areas by herders. As a result, slingers often received less honor even though it took great practice to become an accomplished slinger (Griffiths 1989, 267). The disdain for David expressed by the heavily armored Goliath in 1 Samuel 17:42–44 may reflect this sort of disrespect. Nonetheless, many armies valued slingers and recruited them from regions known for skill using the weapon; the Greeks used slingers from the island of Rhodes and the Romans famously relied on Balearic islanders (Echols 1950, 230).

Despite the common social bias against their users, slings served as an effective weapon and could also function as a tool of terror. Because of the often-small size of their projectiles and the speed at which slingers could launch them, the enemy often could not see the projectiles in flight (Griffiths 1989, 263). This made the projectiles extremely difficult to avoid and could make it appear as though men were falling wounded or dead for no reason, striking fear into those around them. In addition, sling projectiles often made a whirring sound as they flew and lead sling pellets could even be fashioned with holes bored through them to create a shrill whistle, as noted above. The sound could unnerved enemy combatants and was quite useful against elephants and chariot horses who might panic and stampede as a result, trampling those around them. Caesar described using this technique in his African War (chap. 83). Although the enemy commander Scipio had attempted to train his elephants to overcome the fear of whistling slingshot, when Caesar’s slingers fired at them they were “terrified by the whizzing sound of the slings and . . . wheeled round (and) trampled underfoot . . . their own supporting troops.”

Capabilities of Slings

Just how effective were and are ancient and modern slingers when casting their projectiles?—often extremely effective. Numerous authors attest to the general effectiveness of the weapon as well as particular aspects of its use including distance, accuracy, and ability to inflict damage. Greek historian Diodorus Siculus (first century BC) wrote that the celebrated slingers from the Balearic Islands “can hurl far larger stones than any others, and with so great force that the missile might be supposed to be projected from a catapult; and yet so accurate is their aim that they rarely miss their mark” (Hawkins 1846, 99). Much later, Spanish conquistadores
(sixteenth century AD) wrote of opposing Peruvian slingers who slung stones with enough force to kill a horse (Korfmann 1973, 40).

The Range of the Projectiles

How far could the ancients sling effectively? Although ancient writers were often rather general, sometimes they give enough information to estimate ranges and these accord well with more modern information. Vegetius recommended that Roman slingers and archers practice using bundles of twigs and straw set 600 feet (180 meters) away, suggesting a good level of accuracy even at that distance. Similarly, modern slingers in Ibiza on the Balearic Islands can hit targets one meter square from a distance of over 200 meters (Griffiths and Carrick 1994, 1). And slingers in New Guinea can cast stones "about the size of a billiard ball (ca. 5.7 cm) . . . up to 200 yds (180 m) on the level" (Monckton 1921, 38).

Could ancient slingers also have been effective at distances greater than 180 meters? Xenophon’s comments noted earlier claim that Rhodian slingers could reach distances up to 400 meters, which he stated outranged opposing Persian archers (Korfmann 1973, 37). Persian archers apparently used composite bows that could shoot beyond 350 meters, so 400 meters for slingers fits well (Griffiths 1989, 261). The Assyrian reliefs of their attack on Lachish in 701 BC also seem to support a greater range for slingers since the Assyrian slingers are portrayed standing behind their archers. The modern world record for sling distance is 505 meters (www.slinging.org), further adding credibility to Xenophon’s ancient claim of a 400-meter range, although perhaps at such great distances slingers could effectively hit only larger targets such as a massed body of troops. Thus this ancient information suggests that slingers could be quite accurate as much as 180 meters away and could still be effective up to 400 meters away.

What type of sling projectile can be slung the farthest? Modern experimentation with slings using projectiles in a variety of shapes and weights (Skov 2013, 51–52, 74–77) suggests that biconical lead pellets weighing 40 grams achieve the best distance, given its aerodynamic advantages because of the lift created by a spinning biconical shape. Stones projectiles weighing 85–160 grams produced the poorest results in the tests, perhaps showing why ancient militaries largely transitioned from larger stones to smaller, molded biconical lead projectiles.

The Accuracy of Slings

In addition to the effective range of 180–400 meters noted above, comments from ancient authors and modern information suggest an even higher degree of accuracy at closer range. The Roman historian Livy (first century BC/AD) claimed that Achaean slingers were the best and would “wound not merely the heads of their enemies but any part of the face at which they might have aimed" (History 38:29), calling to mind David’s successful first cast to Goliath’s forehead. The slingers of Corfinium in ancient Italy could reportedly even hit and kill a bird in flight (Griffiths 1989, 264). Diodorus wrote that the Balaeric’s developed their famed skill in sling shooting by training their children to hit bread set on a stick when they wished to eat (Korfmann 1973, 40). Modern slingers in New Guinea reportedly can hit a stick at fifty paces (ca. 38 meters) (Wheeler 1943, 49). A modern ethnographic study notes that Arabian slingers hunt game at 27–45 meters (Skov 2013, 46), also demonstrating extremely high accuracy at about 40 meters.

How does this effective range of sling shooting compare with that of other ancient projectile weapons? The simplest projectile weapon is a hand-thrown stone (fig. 8). Vegetius recommended that “all (Roman) soldiers (be) trained in . . . throwing stones, a pound in weight” (Epitoma 2.23). A person can throw such a stone up to 113 kilometers per hour (70 mph) (Skov 2013, 65) with an effective maximum range of 26–31 meters (Griffiths 1992, 8). Javelins had a similar range. Tests for Napoleon with javelins produced a maximum effective range of 20 meters (Gardiner 1907, 258).

Modern experiments with replicas of Roman javelins also suggest a maximum effective distance of 20 meters (Griffiths and Sim 1993, 6) but warriors in the South Pacific reportedly are accurate up to 30 or 40 meters (Skov 2013, 106). Since the heavily clad Goliath wielded a javelin, his effective range for attacking may have been 20 meters or perhaps more, but David would easily have outranged him with his sling and apparently could have stayed out of range if closing to about 40 meters where he could have been highly accurate.

How does the effective range of the bow compare to the sling? One survey of ancient texts giving distances for bowshots suggests that archers (a) could be quite accurate up to 50 or 60 meters, (b) had an effective range of at least 160–175 meters, and (c) could shoot for distance up to 500 meters (fig. 13; McLeod 1965, 8). These distances are similar to the capabilities of a sling. Bows have the advantage of requiring less training for effective use than do slings, the latter of which typically demand extensive practice to achieve
The Speed and Lethal Force of the Projectiles

The sling uses centrifugal force combined with skill to launch a missile at great speeds despite needing only minimal physical strength. The sling’s speed and distance vary with the shape and weight of the projectile as well as the skill of the slinger, but even a moderately skilled slinger can launch a projectile at speeds of up to 182 kilometers per hour (113 miles per hour) and inflict great damage.

Ancient authors often described the damage done by slingers. Homer’s epic poem, the Iliad, is largely legendary but gives what must be a realistic description of various facets of Greek warfare. In the Iliad, 66 percent of the sling wounds are lethal (compared to 42% arrow, 80% spear, and 100% sword) (Skov 2013, 80). Vegetius wrote that slings were more deadly than bows against leather armor because the projectile did not have to penetrate to inflict fatal injury (Epitoma 1.16). Celcus, the best-known Roman medical author (first century BC/AD), gave extensive instructions in his De Medicina for removing lead and stone sling pellets from soldiers’ bodies. He wrote that wounds from slings were more dangerous and difficult to treat than wounds from arrows. “Better to be wounded by a sharp weapon than a blunt one” (5.26). Sling wounds can cause internal and external bleeding, extensive bruising, broken bones, and often led to death, partly because of the difficulty of treating the resulting internal injuries such as damaged organs, punctured lungs, or brain trauma.

Modern research and military accounts concur. One researcher wrote that “effectively designed sling projectiles can be expected to fracture a wide range of human bone, including at long range. Dense lead projectiles can be expected to penetrate exposed human skin at all ranges, and biconical clay projectiles could penetrate skin at close range” (Skov 2013, 100). An early nineteenth-century AD military account from the Marquesas Islands in French Polynesia includes some of these very effects when describing the fighting between European soldiers and native forces that included skilled slingers:

We entered the bushes and were at every instant assailed by spears and stones. We could hear the snapping of the slings, the whistling of the stones . . . but we could not perceive from whom they came. From the thicket . . . we were assailed with a shower of stones, when Lieutenant Downes received a blow which shattered the bone of his left leg, and he fell . . . one of the (allied soldiers) had his jaw broke with a stone . . . . Three of the men remaining with me were knocked down with stones. The wounded entreated me to permit the others to carry them to the beach. (York and York 2011, 49)

Similarly, the biblical account of David defeating Goliath describes the bone-breaking force of David’s cast by noting that his stone “sank into (Goliath’s) forehead” (1 Sam 17:49).

Conclusion

This survey of slinging methods, ammunitions, practices, and capabilities shows that in well-trained hands, the sling is a formidable weapon capable of inflicting a significant amount of damage. Ancient writers such as Livy, Vegetius, Caesar, and Xenophon tell us that many of history’s greatest military leaders knew this and took advantage of it. Because of their simple design and ammunition, slings were a convenient tool and weapon used by people throughout the ancient world; and, rather than merely serving as a useful implement for shepherds or hunters, their range, accuracy, and ability to inflict damage made them an excellent option in ancient warfare.

The information collected here also adds clarity and credibility to the biblical story of a shepherd boy skilled with a sling who defeated a powerful and highly trained Philistine soldier. Goliath wore scale armor and carried weapons that apparently had a maximum range of approximately 20–
30 meters, and he expressed disdain for his unarmored, simply armed foe as his type of warrior often did. David bore a simple sling, likely made of wool from the sheep he herded, and he used rounded stones from the nearby streambed for his ammunition, as slingers often did. But David's sling provided him the advantage of staying out of range of his opponent's weapons but still hit Goliath's exposed forehead from perhaps 40 meters away with enough force to penetrate his skull so he could kill him and win the battle for Israel and for Israel's God.

Endnotes

1 Ancient authors noted that the renowned slingers from the Balearic Islands off the coast of Spain carried slings of three lengths: short slings for close range (like attacking a besieged city), medium slings, and long slings for the greatest range (Griffiths and Carrick 1994, 5–6; Hawkins 1846, 98).

2 One sometimes sees modern military use of slings when Palestinian Arabs, some armed with slings, combat Israeli troops, as reported not infrequently in the news media. For an example of modern herdsmen using slings, see Vega and Craig 2009, 1265. For hunting, see Skov 2013, 46. For current use of slings for sport, see www.slinging.org. Slinging is also the national sport of Majorca—the largest of the Balearic Islands, which long produced some of the world's best slingers. The first modern international slinging competition took place in Majorca in 2011 (Skov 2013, 49).

3 York and York 2011, 76. The oldest known sling from North America comes from Lovelock Cave, NV and dates to ca. 1200 BC (York and York 96, 122).

4 Two authors from the classical period also mention another use for the sling. Greek and Roman historians Polybius and Livy also describe a cestros—a type of dart perhaps 15 cm long launched from a sling—but this information may not be credible (Griffiths 1989, 260).

5 For a similar analysis, see Griffiths and Carrick (1994, 9), who discuss the subject after reenactors tried using slings from the rampart of a recreated Roman fort. Griffiths and Carrick suggest that whirling a sling horizontally overhead would better suit such a setting—like the Egyptian slingers in the crow's nests shown in fig. 4.

6 For example, the records of the major excavation of Masada (1963–1965) did not include any brook stones used as sling ammunition but later excavations at the site did find brook stones cast by both sides (Stiebel 1997, 305n30; 2005, 101). Brook stones collected in large quantities can indicate they were intended as sling ammunition, such as the 50,000 brook stones found at Iron Age Maiden Castle in England (Wheeler 1943, 49, 115, plate 104). One hoard of 22,260 lay beside the eastern gate, apparently for use when defending the gate.

7 According to the object database of the excavation. Many of these slingstones were broken, likely from impact when used. Most of the complete stones were 5–7 cm in diameter and weighed ca. 250–350 grams, with a maximum of 8.6 cm and 623 grams.

8 Tufnell 1953, pt. 1, 396. Although sling (and ballista) stones are normally made from local stone, Tufnell also notes, “the (sling stone manufacturing) industry was not necessarily a local one. Indeed, the absence of flint near vicinity suggests that such stone was imported” (p. 396; cf. pt. 2, 40:5). A later excavation at Lachish also recorded finding slingstones made of flint (Ussishkin 1978, 54; 1983, 141).

9 This is especially true for Early Roman excavations, given the frequent use of small-caliber ballista by the Romans. For helpful discussions of the similarity of sling- and ballista stones, see Stiebel 2003, 218; 2007, 188–89; 2015, 438–41; 2013a, 299. For weights of Roman ballista stones, see Holley 1994, 355–59.

10 Bosman 1995, 99–103. For an ancient account that mentions casting lead ammunition during battle, see Caesar’s Bellum Africum, ch. 20.

11 Cf. the unnumbered Benjaminites who came to David at Ziklag, who could fire the bow or sling with either hand (1 Chr 12:2).

12 Researcher Skov used a golfing simulator to measure the speeds of his sling- ing tests and exceeded 161 km per hour (100 mph) (2013, app. D) despite considering himself “in the lower half of serious sling users” (2013, 55).

References


