

2. ISOLATED HUMAN SKULL VAULTS FROM THE LINEAR POTTERY CULTURE BURIAL SITE AT NIEDERPÖRING (ADMINISTRATIVE DISTRICT DEGGENDORF, BAVARIA, GERMANY)

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ABSTRACT

The skeletal remains of 18 human individuals were recovered in the course of archaeological excavations in a construction area at Niederpöring-“Leitensiedlung” (administrative district Deggendorf, Bavaria, Germany). All inhumations date into the late phase of the Early Neolithic Linear Pottery Culture. A small burial site made up of seven of these burials was located next to the contemporaneous settlement area and is outstanding because of the particularly rich grave goods. In the settlement area itself, three pits with burials were documented. Feature 61 with the remains of nine adult individuals is exceptional in so far as four individuals had been subject to the same ritual. The dead had obviously been deliberately killed, their skulls were opened and skull-cups were manufactured which were finally deposited in the pit

together with other skeletal remains. Carbon and nitrogen stable isotopes were typical for a mixed diet at that time. Apatite ⁸⁷Sr/⁸⁶Sr isotopic ratios revealed several immigrants to the site, especially with regard to feature 61.

2.1 INTRODUCTION

About 20 km upstream from the confluence of the river Isar and the Danube, the Isar runs through a fertile and climatically favourable plain called “Gäuboden” (= “good soil”). Today’s village of Niederpöring (administrative district Deggendorf) is located on the southern bank of the Isar on the edge of a high terrace covered with loess. The gradual expansion of construction sites in recent decades in the area of Niederpöring-“Leitensiedlung” has led to archaeological rescue excavations by the



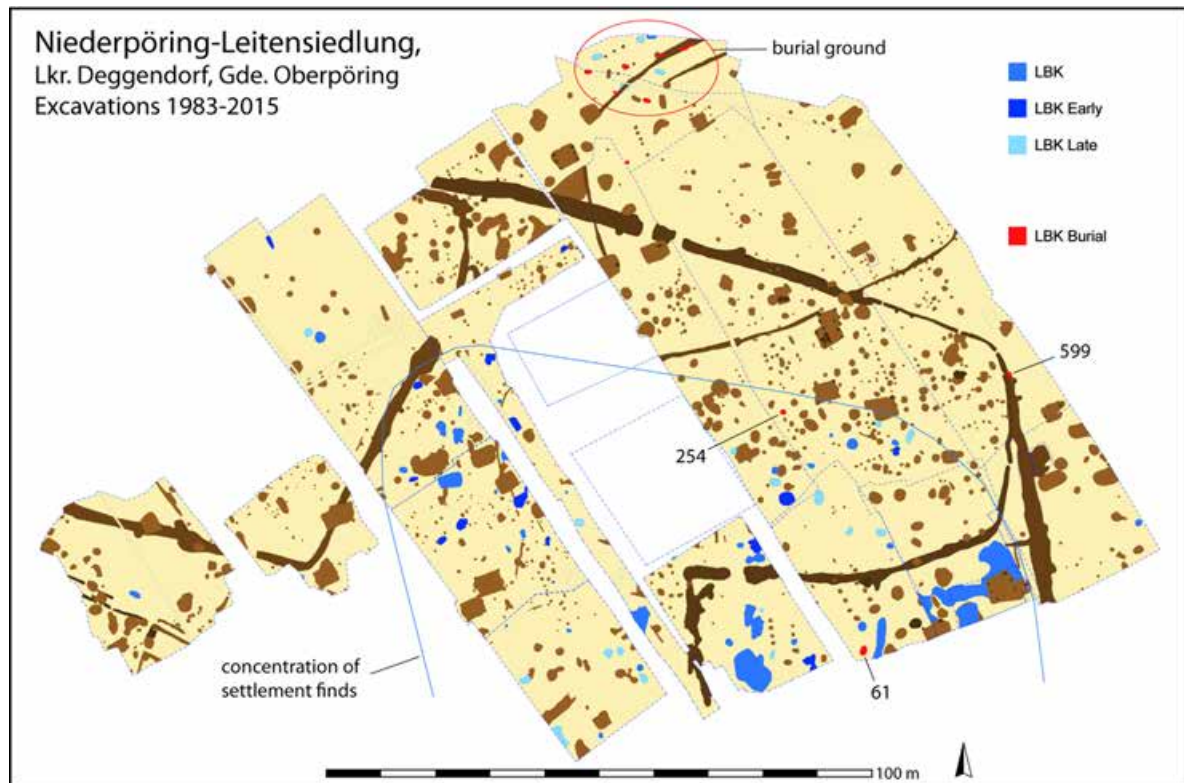


Figure 1: Excavation area Niederpörling-“Leitensiedlung”. Clearly dated settlement features and burials of the LBK are highlighted. Graphics: M. Haberländer, Kreisarchäologie Deggendorf

district archaeology of Deggendorf on a regular base. Among others, extensive and overlapping settlement areas of various Neolithic cultures were recorded (Schmotz, 1997; Pechtl et al., 2018). The oldest finds come from the Early Neolithic Linear Pottery Culture (LBK). A concentration of LBK features was recorded in an area covering about 140 x 70 m, but individual finds are scattered further. At least to the south and the west, the boundaries of the former settlement are not captured by the excavation field (Figure 1). To date, different types of typical settlement pits are documented, and possibly also an enclosure dating to the LBK. However, characteristic house plans have not yet been identified due to strong soil erosion. According to the material culture, a first climax of the settlement dates to phase II of the southern Bavarian chronology of the LBK, which corresponds to the 53rd century BC. A second climax belongs to phase IVb, which probably corresponds to the younger 51st century BC or the time around 5000 BC (chronology after Pechtl, 2019).

In the course of the excavations, skeletal remains of 18 human individuals from the LBK were recovered (Table 1), with some further finds of jet of uncertain date. The seven burials 398, 410, 541, 543, 548, 560 and 561 form a small burial site that has been published previously (Pechtl et al., 2018). Numerous features strongly resemble other burial grounds of that time in Southern Bavaria, therefore, it can be considered a typical representative of this regional group. These include the spatial separation from the settlement (Figure 1), the location to the north of the settlement at the edge of a terrace, the loosely and disordered scattering of the pits, and the creation of special long oval to rectangular burial pits. The inhumations were consistently carried out as east-west oriented inhumations in a crouched position, mostly lying on the left side of the body. Also typical is the low proportion of children, and the high proportion of burials furnished with grave goods. Both the spectrum and location of the grave goods are typical for the region, in particular the type of adornment.

BURIAL	FIND/NUMBER	AGE-AT-DEATH	SEX	REMARKS
254		20-30 years	male	
398*		12-15 years	male?	
410*		14-17 years	male?	pleuritis, several porotic hyperostoses
541*		5-7 years	nd	
543*		40-60 years	female	
548*		50-60 years	female	degenerative joint disease
559		30-40 years	female	
560*		30-50 years	male	
561*		40-60 years	nd	head decorated with snails
61	563	yound adult	nd	isolated skull vault
61	593	adult	nd	several postcranial bone fragments comingled with animal bones
61	637	18-20 years	male	isolated mandible
61	637	40-60 years	male	right os coxae and several cranial and postcranial fragments, animal bones
61	660	20-40 years	male	isolated skull vault
61	661	probably >40 years	male	isolated skull vault and several cranial and postcranial fragments
61	663	18-20 years	female	isolated skull vault
61	665	18-20 years	female	lower skull with mandible and cervical vertebrae 1-6, associates with find number 663
61	716	20-40 years	nd	anterior part of an isolated skull vault
61	984	adult	male	two fragments of the skull and part of a mandible with traces of thermal exposure

Table 1: Baseline osteological data for the skeletal finds from Niederpöring. *: Determined by A. Staskiewicz

Relations to regions located further downstream of the Danube river are evident (Pechtl et al., 2018). Two remarkable features of the burial site at Niederpöring need to be highlighted: First, the grave inventories are unusually rich in grave goods, whereby the graves 398 and 561 belong to the richest known burials of that time in southern Germany and beyond. Above all, the burial 561, probably of an older woman, stands out with a necklace made of bristleworm (*Protula tubularia*) casings and a headdress once decorated with presumably over 400 casings of water snails (*Theodoxus danubialis*). The casings were preserved directly on the skull (Figure 2). This exceptional find is on display in the permanent exhibition of the Museum Quintana in Künzing. Second, four grave-like pits were found in the cemetery area without skeletal remains and typical grave goods, but with deposits of ceramic



Figure 2: Skull of the individual from grave 561 with an in-situ preserved headdress made up of freshwater snail casings (*Theodoxus danubialis*). Photo: J. Pechtl

FEATURE	NUMBER MAMS	14C AGE [YR BP]	+/-	CAL 2-SIGMA	MATERIAL
61	29282	6199	30	5287-5050	bone
254	29285	6150	31	5210-5009	bone
398	29288	6142	31	5208-5002	bone
410	29291	6096	29	5205-496	bone
541	29289	6151	32	5210-5009	bone
543	29292	6182	28	5209-5048	bone
548	29290	6112	29	5206-4946	bone
559	29284	6158	31	5212-5018	bone
560	29293	6194	28	5281-5047	bone
561	29294	6158	29	5212-5022	bone

Table 2: ¹⁴C-dates of the LBK skeletal finds from Niederpörling-“Leitensiedlung”.

vessels, which in turn are missing in the burials. Certainly, these are ritual findings which should somehow be related to the burials. Since no ceramic vessels were used as grave goods, the archaeological fine dating of the burials within the LBK is difficult. The adornment points to the later LBK. This is confirmed by the vessels from the ceramic depositions, which are clearly assigned to the most recent LBK (Phase IVb). If a connection between the graves and the ceramic depositions is assumed, then the burial ground can be dated to the end of the development of the southern Bavarian LBK, thus contemporary to the second climax phase of the neighbouring settlement into the younger 51st century BC. Due to a flattening of the calibration curve, the ¹⁴C dating of all seven burials cannot be used to specify the archaeological datings, but confirm burials took place in the 52nd-51st centuries BC (Table 2). Classified as settlement burials are two as yet unpublished individuals, namely the burial of a younger adult male in feature 254, and the burial of an older adult woman in crouched position in feature 599 (Figure 1). These two unfurnished graves are dated into the younger LBK because of scattered finds of sherds in the grave filling of feature 254 and respective radiocarbon dates (Table 2). Analogies for both burials are known, for example at the neighbouring Otzing site (Pechtl et al., 2017). The remarkable feature 61 was also found in the settlement site. It contained the remains of nine human individuals, including

several isolated skull vaults. In the following, this find is described in more detail from the archaeological point of view by author J.P., followed by a close-up inspection of the isolated skull vaults by authors G.G. and F.S. Finally, the first results of stable isotope analyses are briefly reported. The osteological inspection of the human skeletal finds was performed by Dr. Anja Staskiewicz, Munich, in the year 2016 (Pechtl et al., 2018), and in the frame of an advanced students' course by Leeanne Mundle under supervision of author G.G. in 2018. The skeletal finds had already been washed and partly restored by the cultural heritage institution. Baseline osteological diagnoses of all skeletal finds are listed in Table 1.

2.2 FEATURE 61 AND THE ISOLATED SKULL VAULTS

Feature 61 is a rounded rectangular pit measuring 1.36 m in length and 1.00 m in width, which was preserved to a depth of about 0.40 m (Figure 3). The longitudinal axis is north-south oriented and the pit floor is slightly trough-shaped. In Niederpörling itself, as well as in the neighbouring sites of Otzing and Stephansposching, comparable pits were evidenced that were used both as storage pits and as specially designed grave-pits (Pechtl et al., 2017; Pechtl et al., 2018; Pechtl, 2019). A decision on the primary use of the pit is therefore impossible.

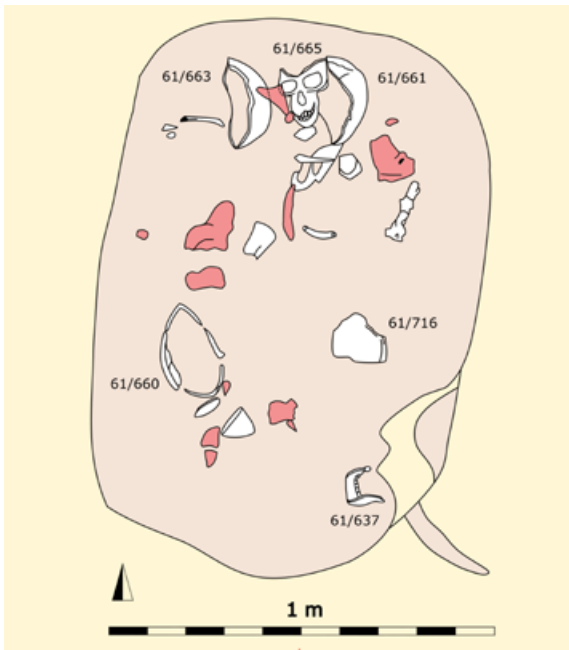


Figure 3: Plana 2-3 of feature 61 from Niederpöring-“Leitensiedlung”. Graphic: M. Haberländer, Kreisarchäologie Deggendorf

The filling material is uniformly dark and humic, and has no stratification due to percolating water. The human bones from a total of 9 individuals are concentrated in the lowest approximately 20 cm of the pit filling. Particularly conspicuous is an assemblage located in the middle of the northern side and only slightly above the pit floor (Figure 4): It consists of an almost upright positioned lower skull in the middle with jaw and cervical vertebrae, the view of which is directed towards the longitudinal axis of the pit (61/665). It is flanked by two upright positioned skull vaults, whose openings face to the west. The skull vault corresponding to the lower skull (61/663) is placed in the west, in the east another detached skull vault (61/661) is leaning against the lower skull. At slightly varying depths, further disarticulated human skeletal remains were found in different parts of the pit. Parts of skulls dominate, including three other skull vaults and two lower jaws. Small remnants of post-cranial skeletal parts as well as some animal bones were found in addition. To what extent the animal bones are related to the human bones remains yet unclear. Pottery sherds were found both in the lower part of the pit filling with human bones and



Figure 4: In situ photo of skull vault no 61/663 on the left and corresponding lower skull (no 61/665) of a young adult female in the middle, and skull vault no 61/661 of an old adult male on the right. Photo: Kreisarchäologie Deggendorf

above. In total, 172 sherds were found with a total weight of 846 g, indicative of a high degree of fragmentation. All were LBK wares, therefore, an undisturbed inventory exists. Mostly single sherds were found, only sometimes a few sherds fitted together. In a single case, numerous and mostly small sherds of a larger undecorated “Kumpf” were evidenced, the majority of which came from the horizon above the skeletal remains. But still, only a small part of the entire vessel is preserved. Additional finds are a small grinding stone, a fragment of probably quartzite, and a quartz pebble. Overall, these artefacts - with the exception of the human bones - resemble normal settlement findings in terms of type spectrum as well as the state of preservation. Hence, a possible explanation of these deposits is that they were ordinary settlement waste. Objects that can be identified as grave goods or remains of ritual acts were not placed in the pit. A ^{14}C date with a very broad confidence interval (5287-5050 BC, Table 2) confirms the dating into the LBK. However, a much closer time span can be deduced from the typology of the ceramics. Most important are the remains of a bowl decorated with a negative pattern left between bands of impressions manufactured in the alternated double-stroke technique (Figure 5). This piece, unique in southern Bavaria, exhibits clear western or northern relationships and is dated to the most recent LBK (Phase IVb) without doubt. Therefore,



Figure 5: Fragment of a decorated vessel of the youngest LBK from feature 61. Photo: J. Pechtl

the feature belongs to the second significant settlement phase in Niederpöding with certainty, and is contemporaneous to the burial ground which is likely to date from the later 51st century BC, or around 5000 BC. The five skull vaults that had all been excavated from feature 61 (no. 61, shaded in Table 1) were subject to a close-up osteological inspection. Without exception, these skull vaults exhibit nearly identical traces of manipulation that are indicative of a systematic modification of the crania after a probably ritualized death of the individuals. In one case, a separated skull vault (no. 61/663) was found next to a lower skull with the upper six cervical vertebrae (no. 61/665) (Figure 4). Cranial vault and lower skull associated to each other and thus belong to the same individual. The postcranial skeleton is missing, and remnants of cut marks especially on the dorsal side of the 2nd, and slighter also on the 3rd and 4th cervical vertebrae indicate that the head had been severed from the body. From find no. 61/716, only the anterior part of the skull vault was preserved (Figure 6). The occiput and the dorsal parts of the parietal bones are missing, the latter exhibit sharp edges indicative of an extensive sharp trauma exerted to the skull around death. No cut-marks could be found but just as in the case of all the other cranial vaults, an impression fracture on the forehead above the frontal sinus was evidenced. It cannot be decided by hindsight whether this trauma was due to interpersonal violence or whether the damage had occurred after the death of the individual in the course of skull manipulation (see below). Few



Figure 6: Endocranial view of the anterior part of skull vault no. 61/716 with fracture lines. Photo: F. Schreil

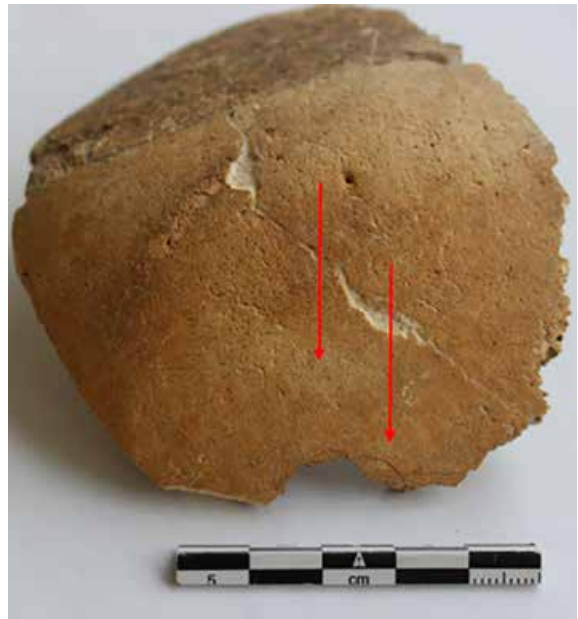


Figure 7: Skull vault 61/563 with impression fracture and cut marks on the frontal bone. Photo: F. Schreil

cranial elements (no. 61/984) had obviously been exposed to fire.

2.3 MODIFICATION OF THE SKULL VAULTS

All detached skull vaults exhibit similar traces of trauma and manipulation: Unhealed impression fractures on the frontal bone, sometimes involving the sinus, indicate a severe perimortem blunt force trauma. Exclusively located on the left side, few to multiple straight cut marks running in parallel to each other are visible on the frontal and parietal bones (Figure 7, 9-11). The edges of the skull



Figure 8: Endocranial view of the skull no. 61/665 with open frontal sinus due to fracturing, and multiple percussion marks with fissuring of the facial skull and brain case. Photo: L. Mundle, G. Grupe



Figure 10a: Skull vault no. 61/661 with impression fractures on the frontal bone.



Figure 11a: Skull vault no. 61/663 with impression fractures on the frontal bone involving the frontal sinus.



Figure 9a: Skull vault no. 61/660 with impression fractures on the frontal bone.



Figure 9b: Skull vault no. 61/660 with parallel cut marks on the left parietal bone. Photos: F. Schreil



Figure 10b: Skull vault no. 61/661 with cut marks on the left frontal bone. Photos: F. Schreil



Figure 11b: Skull vault no. 61/663 with parallel cut marks on the left frontal and parietal bone. Photos: F. Schreil

vaults and also the lower cranium no. 61/665 (Figure 8) are mostly uneven and indicate a forceful separation of the skull vault from the lower cranium by bone fracturing, probably accompanied by carving and cutting (see no. 61/716). Unfortunately, the bone surfaces and especially the fracture lines were frequently moderately to heavily eroded and partly covered by sintered sediment, therefore, details of these procedures are hard to evaluate. Since the ectocranial fracture lines mostly exhibit a longer curvature than the endocranial ones, force upon the skull must have been exerted perimortem (Figure 8). Since the postcranial skeletal elements are not preserved, it is impossible to tell whether the bodies exhibited additional trauma. Therefore, ultimate cause of death of the five individuals remains unknown. However, the fact that all skull vaults show impression fractures on the frontal bone suggests that the blunt force had deliberately been applied to either kill the victims or at least leave them unconscious. The multiple parallel cut marks indicate the removal of soft tissue. Most probably, the scalp had been torn from the skull after some initial incisions. The striking similarity of all these features on the five skull vaults lead to the conclusion that “skull-cups“ had deliberately been manufactured, and that selected individuals had been killed on purpose for doing this. Although the number of skeletons excavated at Niederpörling is small, all these victims from the settlement are at least of young adult age, while in addition to adults, also one child and two juveniles were recovered on the adjacent burial site.

2.4 THE STABLE ISOTOPE ANALYSIS

The bioarchaeological analysis of the skeletal finds from Niederpörling is still ongoing. Reconstruction of palaeodiet had been attempted by analysing stable carbon and nitrogen isotopes in bone collagen (method see Becker & Grupe, 2012). However, collagen was mostly not sufficiently preserved and reliable isotopic ratios could only be obtained for three individuals (nos 541, 560 and 561, all from

the burial site). Variability of the isotopic ratios was particularly small, from -21.5 to -21.0 ‰ for $\delta^{13}\text{C}$, and from 9.0 to 9.5 ‰ for $\delta^{15}\text{N}$. $\delta^{18}\text{O}$ phosphate in bone fragments (ribs, skull fragment in case of no. 541; method see Toncala et al. 2017) was analyzed to determine mobility, and again, the intraindividual variability was quite small at 2.2 ‰ only, from 12.93 ‰ (VSMOW) in the child no. 541 to 15.08 ‰ (VSMOW) in the juvenile no. 398. As the $\delta^{18}\text{O}$ -phosphate intraindividual variability can be as high as 3‰ (Lightfoot & O’Connell 2016), it is likely that all individuals buried at Niederpörling were local to the site or originated in a small catchment area close to the site. Because of the large uncertainties generated by the conversion of $\delta^{18}\text{O}$ phosphate into $\delta^{18}\text{O}$ meteoric water (Pollard et al., 2011), this topic was not evaluated further.

Determining locals from non-local individuals was more successful by measuring $^{87}\text{Sr}/^{86}\text{Sr}$ isotopic ratios in the apatite of enamel from permanent teeth, and bone (method see Toncala et al. 2017). Whenever available, tooth enamel was chosen for analysis because it is not remodeled after mineralization and represents the bioavailable strontium isotopic ratio incorporated during childhood or juvenile ages. In a few cases only, compact or skull bone had to be chosen that integrates the respective isotopic ratio during years until decades prior to death. Therefore, non-local isotopic ratios can only be evidenced in late immigrants to the site where the bone tissue has not yet adjusted to the local isotopic signal. With the exception of two individuals, the double standard error was substantially below the critical value of 0.0055% (Table 3) and the measurement values are therefore acceptable. As usual for the Linear Pottery Culture in Southern Bavaria, the site of Niederpörling is located on loess deposits where bioavailable $^{87}\text{Sr}/^{86}\text{Sr}$ isotopic ratios vary between 0.708 until 0.709 (Grupe et al., 1997). Total variability among the individuals was from 0.70870 in the bone fragments of no. 61/593 until 0.71323 in enamel chips from the charred mandible fragment no. 61/984, a significant difference of 0.00453. Highest and lowest isotopic ratios were therefore measured in the skeletal re-

BURAIL	FIND NUMBER	SAMPLE (TEETH: ENAMEL)	$^{87}\text{Sr}/^{86}\text{Sr}$	2SE [%]
254		1st molar	0.71153	0.0028
398*		1st molar	0.70880	0.0033
410*		1st molar	0.70885	0.0028
541*		deciduous molar	0.70851	0.0061
543*		1st molar	0.71214	0.0035
548*		1st molar	0.70905	0.0028
559		1st molar	0.70871	0.0045
560*		1st molar	0.70892	0.0025
561*		incisor	0.70908	0.0092
61	563	skull bone	0.70898	0.0027
61	593	compact bone	0.70870	0.0022
61	637	1st molar	0.71033	0.0031
61	660	skull bone	0.70876	0.0023
61	661	phalanx	0.70929	0.0024
61	665	incisor	0.71027	0.0019
61	716	skull bone	0.7928	0.0023
61	984	enamel chips	0.71323	0.0016

Table 3: $^{87}\text{Sr}/^{86}\text{Sr}$ isotopic ratios. Shaded values are excluded from the interpretation because of an unacceptable standard error.

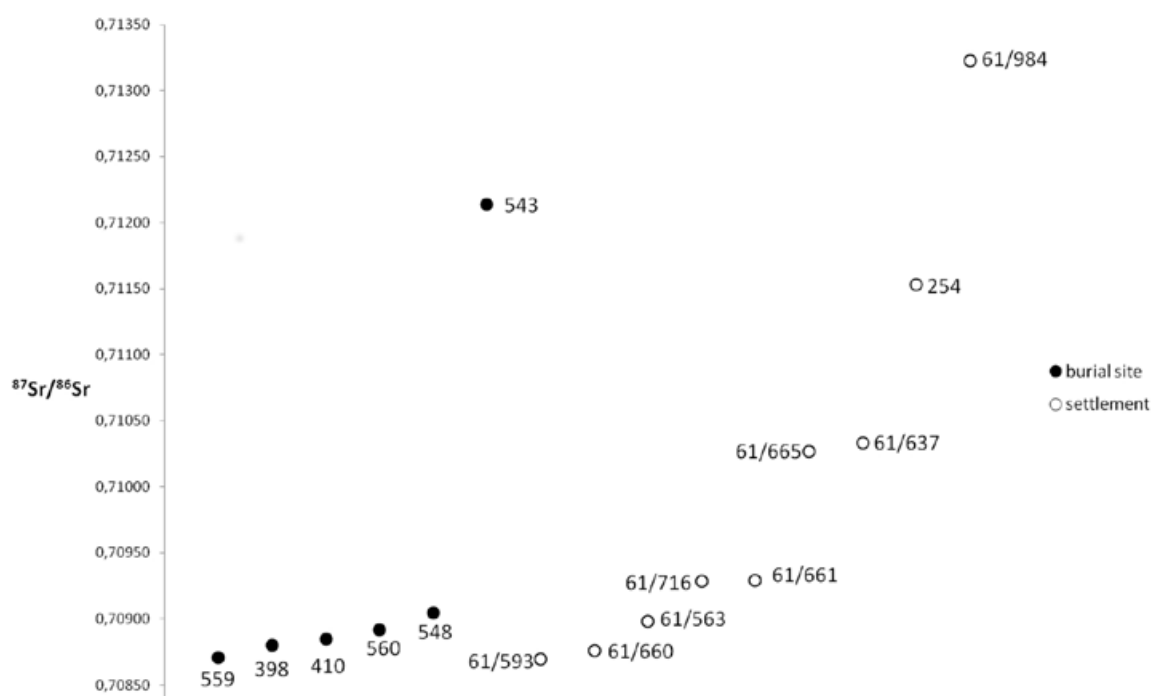


Figure 12: Comparison of $^{87}\text{Sr}/^{86}\text{Sr}$ isotopic ratios of individuals from the burial site and settlement.

mains from feature no. 61. Plotting the $^{87}\text{Sr}/^{86}\text{Sr}$ signatures in ascending order and separately for the skeletons from the settlement and the burial site (Figure 12), a gap was identified around a value of 0.710 by visual inspection of the data. This gap separates those individuals that exhibit the expected local ratio from those with ratios >0.710 . These should be non-locals to the site accordingly and must have originated from regions where the soil is derived from older bedrock (Grube et al., 1997).

The non-local individuals are the old adult female no. 543 from the burial site, and four individuals from the settlement burials. These include the young adult male 254, and three individuals from feature 61, namely the young female 61/665, the young male 61/637, and especially the adult male 61/984 where only charred fragments of the skull and the mandible were recovered.

2.5 DISCUSSION

One can only hypothesize why the skulls of some people at Niederpörling had been manipulated this way, and why they had been deposited together. However, the synthesis of archaeological and osteological data permits the identification of some steps in this process. These include:

1. Massive violence was exerted against the heads of several individuals, mostly against the forehead. The blows had been directed towards the head in a way that the skull vault remained intact: At Niederpörling, only one out of the five skull vaults (no. 61/716) exhibited an unhealed trauma that had severed the right parietal bone from the skull. Interestingly, this skull did not exhibit any of the manipulation traces evidenced on the other skull vaults. The blunt force traumata on the other frontal bones must have been applied with a high force since at least one of them led to a fracture of the frontal sinus (no. 61/663). In the other skull vaults, the sinuses were not preserved and whether these had been fractured as well or removed in the course of further processing could not be determined confidently. Frontal sinus fractures typically necessitate very high forces (Delye et al., 2007; Metzinger & Metzinger, 2009). Today, only 5-12 % of all maxillofacial fractures are accompanied by a fractured frontal sinus. Most of these fractures were due to motor vehicle accidents before seatbelt laws and airbags became mandatory. Today, interpersonal violence is growing in importance as a cause of this type of fracture (Metzinger & Metzinger, 2009). This confirms our hypothesis that the blunt force traumata were deliberately exerted on the victims. Moreover, the exact position of all fractures on the forehead indicates that the victims could no longer defend themselves or repulse the attack, so they must have either been already dead, or at least unconscious or immobilized.
2. The deliberate killing was followed by a treatment of the dead focused on the heads. Both the finds of the lower skull with mandible and cervical vertebra 1-6 in anatomical position (no. 61/665) and the fracture patterns of the skull vaults show that these manipulations were regularly performed on fresh bodies. The heads were separated from the rest of the bodies, with the latter possibly undergoing a different and largely unknown treatment. Only single, disarticulated parts of postcranial skeletons were deposited in feature 61. The treatment of the heads apparently included the scalping as well as the rapid opening of the skull by a series of target-oriented strokes. The products were rather rough skull-cups. Due to the state of preservation, it cannot be determined to what extent the edges of the skull-cups had been smoothed. The uneven fracture lines indicate that at least no greater efforts had been undertaken in this regard. Obviously, these skull-cups received a great deal of sociocultural attention, but whether they were actually "used" in any way is not verifiable. The finds from feature 61 indicate alternative methods for the treatment of the heads as well. The lower jaws

also seem to have played an important role (no. 61/637), and occasionally fire was included in the ritual (no. 61/984).

3. The process was terminated by the deposition of the skeletal remains in pit 61. As the type of filling material and the distribution of the enclosed ceramic finds show, the backfilling of the pit occurred quite rapidly, presumably in the same series of operation. For this, near-surface soil material mixed with common settlement waste was used. During this process, a head of a fresh corpse (no. 61/663+655), which had recently been opened, was carefully placed into the pit, accompanied by a second skull vault (no. 61/661, Figure 4). The other skull vaults and other skeletal remains, however, seem to have been carelessly thrown into the pit or were commingled with the soil (see the upright lower jaw 61/637). In all these latter cases, it is impossible to tell whether the skeletal parts also came from recently deceased persons. Both the skull-cups and the lower jaw could have been kept for some time before being disposed of.

The repetition of similar actions stands for a ritualized behaviour and the joint deposition of the selected skeletal remains of different people in the same pit indicates a meaningful connection. The manipulated body parts from feature 61 thus correspond to the definition of rituals in the course of which the destruction of human bodies and especially of the heads was performed in a very ostentatious way. Whether these had been profane rituals in the form of standardized violent excesses or actions that are embedded in cosmic or religious dimensions in an emic perspective remains to be determined. It should be emphasized, however, that evidence of structurally comparable patterns of action is accumulating for the late LBK. First, there are findings suggesting massacres, such as in Talheim, Halberstadt, Schöneck-Kilianstädten and Asparn, where violence against the head was also particularly frequent (for a summary see Meyer et al., 2018). Second, other deposits of skull-

cups exist. A comparison to the famous Neolithic finds from Herxheim (Landau, Rheinland-Pfalz) is intriguing, although the manipulation traces discovered there are somewhat different (Orschied et al., 2003; Orschied & Haidle, 2006; Bauer, 2019). What holds for both places, however, is the fact that blows had been directed towards the skull. In doing so, people took caution that the skull vault remained intact. Further finds of late LBK skull-cups are known from Eilsleben (Sachsen-Anhalt; Kaufmann, 2002) and from Taborac (Draßburg, Burgenland; Mossler, 1949). Evidence of violence against living and dead people with a focus on the head was thus widespread in the late LBK. Especially the production and the use of skull-cups follow a common ritualized pattern of action. Most common interpretations are derived from ethnographical reports or historical sources and may not be appropriate analogies for Neolithic treatments of the skull, but are mostly in favour of the preparation of drinking cups and/or ritual cannibalism (Bello et al., 2011). As Orschied (2011) pointed out, such interpretations need to be considered with caution, but a ritual or even religious context seems plausible. The skull vaults recovered at Niederpöring may well be considered “skull-cups“ in the wider sense. What makes them remarkable is that they belong to the rare group of finds that provide evidence of skull-cup preparation (Bello et al., 2011).

Reconstruction of palaeodiet was limited because only three individual skeletons from Niederpöring had sufficiently preserved collagen. Previous such studies on Neolithic skeletons from Bavaria (Asam et al., 2006; Hagl et al., 2013; Hofmann et al., 2013) showed that dietary variability in the early Neolithic was restricted compared to the later phases when a dairy economy developed. After conversion of the $\delta^{13}\text{C}$ - and $\delta^{15}\text{N}$ -values of the three individuals in question into the global isotopic signatures of the daily diet (Hagl et al., 2013), they fit well into the early Neolithic food web established for Bavarian sites. In fact, the collagen stable carbon and nitrogen isotopic ratios are nearly identical and not significantly different.

Distinguishing local from non-local individuals at the site by use of $^{87}\text{Sr}/^{86}\text{Sr}$ isotopic ratios however led to a quite interesting result. One out of six individuals from the burial site, but four out of nine individuals from the settlement were certainly non-local, and three out of those were deposited in feature 61 after receiving a special ritualized treatment including the preparation of a skull-cup. In fact, this difference between the two funeral collectives could be even more conspicuous, given the nature of the samples analyzed: While enamel was available from the skeletons excavated at the burial site and in the two settlement burials 254 and 599, bone had to be analyzed from five out of eight individuals from feature 61. Remarkably, all three enamel samples from feature 61 had non-local $^{87}\text{Sr}/^{86}\text{Sr}$ isotopic ratios, while all bone samples appeared to be local. Given the fact that only late immigrants to a site can be identified by bone Sr isotopic ratios, the actual number of non-local individuals could have been even higher. The $^{87}\text{Sr}/^{86}\text{Sr}$ isotopic ratios in the bones of individuals 61/661 and 61/716 only slightly exceed local isotopic signatures (Figure 12) and might therefore still represent a mixed isotope signal.

Whether or not the individuals with strontium isotopic ratios between 0.708 and 0.709 were definitely local to the site can, however, not be told with absolute certainty, because such values are typical for sites on loess soils in Southern Germany and beyond where Neolithic people preferably settled. Therefore, also the seemingly “local” individuals could have originated elsewhere. Those with a $^{87}\text{Sr}/^{86}\text{Sr}$ isotopic ratio >0.710 however are definitely non-local. Assessing the most probable place of origin follows the principle of parsimony, that is, the nearest possible region is the most likely one. To the north and north-west from Niederpörling, $^{87}\text{Sr}/^{86}\text{Sr}$ isotopic ratios >0.710 in local animals occur occasionally but at quite large distances, also, such ratios are common further to the south in the inneralpine regions (Toncala et al., 2017) which is also a considerable distance to the site. Niederpörling is located very close to the Bohemian Forest where the bedrock is characterized by older rock

such as granite or gneiss (Grube et al., 1997) with strontium isotopic ratios that have been measured in the non-local individuals. It is therefore possible that the non-locals originated from regions located to the east and/or north-east from their place of recovery. But also, corresponding $^{87}\text{Sr}/^{86}\text{Sr}$ isotopic ratios are characteristic of some burial fields of the LBK in eastern Austria, Moravia, and Hungary (Bickle & Whittle, 2013). This would also be compatible with the archaeological context that detected relations in Niederpörling to exactly these regions that are located further downstream.

In contrast to the age-at-death of the adults from the burial site, individuals from the settlement and especially those who had been subjected to the manufacture of skull-cups, were young adults in their prime-age. Skull-cups nos. 61/637 and 61/663 belonged to particularly young individuals of 18-20 years of age, and also the skeleton no. 254 was aged young adult. Unfortunately, the age-at-death of the individual with the highest strontium isotopic signatures could not be assessed. With the exception of no. 61/661 which was probably older than 40 years, three others (61/563, 61/660, 61/761) were young adults, only no. 61/593 could not be sorted into the either young or old adult age group.

Taking all evidence together, we conclude that the detached skull vaults from the early Neolithic settlement of Niederpörling were intentionally manufactured skull-cups with the same ritual and skull processing performed in each case. The victims were obviously preferably not local to the site and of young adult age. Therefore, they could have been selected on purpose.

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