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SPIRAL DECORATED SHAWLS IN LATE IRON AGE FINLAND – AN INTERPLAY OF LOST AND RECONSTRUCTED MATERIALITY

Abstract

Spiral decorated shawls in Late Iron Age Finland (c.AD 800–1200) were elaborate and special garments with strong connections to identity. In prior research, richly decorated shawls from female graves have been reconstructed for ancient costumes. In this study, we trace the sensorial properties of shawls using microarchaeological methods, experimental archaeology and reconstructions. Examples from female graves, male graves and a child's grave are included for examining the similarities and differences between spiral decoration techniques. In a broader context, we discuss the use and meanings of shawls in both life and death.

Keywords: textile archaeology, sensory archaeology, ancient clothing, reconstructions

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INTRODUCTION

Clothing is important for the study of identity: it shows to others who we are and what we represent. At the same time, it is intimately connected to our sensing bodies, warming and protecting or sometimes irritating them, being sometimes too tight or too itchy. Clothing was needed for practical reasons, but it was also a display of wealth and skill. Archaeological textile finds do not just tell the story of practical clothing adapted to a cold Northern climate: the remains are of finely made and elaborate garments.

In the area of present-day Finland, Late Iron Age (c. AD 800–1200) cloth culture consisted of several layers of clothing, such as

long-sleeved dresses, peplos-type rectangular garments attached with different types of pins and brooches, and aprons tied to the waist with colourful bands (Lehtosalo-Hilander 1984: 54, 58–59). Burial finds suggest that the outermost garment was in several cases a rectangular garment that could be called either a cloak, a mantle or a shawl (Lehtosalo-Hilander 1984: 51–57; Kirjavainen & Riikonen 2007: 135–136; Hirviluoto 1973). The evidence of garments is usually restricted to the textile fragments connected to a metal object or decoration, as metal oxidation and corrosion may preserve the organic materials near them. Therefore, interpretation on the way a rectangular garment was worn can be made based on the placement of brooches and the direction of the fabric's warp: a

garment is interpreted as a peplos if it was worn attached from both shoulders, with the warp of the fabric being transverse to the body. Cloaks or shawls are not as clearly definable, as they were sometimes dressed on the deceased but more often used to cover or wrap the body, and the use of brooches probably differed in life and in the grave setting (Appelgren-Kivalo 1907: 29, 44–45; Hirviluoto 1973; Asplund & Riikonen 2007: 26). In this study, we use the term 'spiral decorated shawl' to refer to a rectangular wool outer garment decorated with ornaments made of small spiral tubes drawn with copper alloy wire.

The structures and appearance of Finnish Late Iron Age female clothing are well understood, since, due to the more extensive quantity of copper alloy jewellery, more textile fragments have survived in female than in male graves (Lehtosalo-Hilander 1984: 5). The most elaborate items from Late Iron Age clothing are the spiral decorated shawls found in female graves from the 11th to 13th centuries. The first well-preserved remains of spiral decorated shawls were found in *Perniö Yliskylä* cemetery and published by Hjalmar Appelgren-Kivalo in 1907. Examples of similar decoration styles have been found in female graves from several Late Iron Age cemeteries in South-West Finland, including *Masku Humikkala*, *Raisio Ihala*, *Köyliö Köyliönsaari C*, *Eura Luistari* and *Turku Kirkkomäki* (Pälsi 1928: 76; Hirviluoto 1973; Cleve 1978: 199; Lehtosalo-Hilander 1982: 160; Asplund & Riikonen 2007: 26–27).

The study of clothing from grave finds in Finland has long been entangled with the practice of making ancient costumes and reconstructions (Lehtosalo-Hilander 1984; Riikonen 2003; Lipkin 2023). The beautiful decorative details of the Perniö Yliskylä finds (Fig. 1) were re-materialised in the Ancient Perniö Costume published in 1925 and exhibited in the Finnish National Museum for 90 years (Lehtosalo-Hilander 2001: 35; Sahramaa & Wright 2021: 141). Although the quality of the surviving textiles from male and child graves is generally poor, shawl remains have also been identified in some male burials (Appelgren-Kivalo 1907: 55–56; Lehtosalo-Hilander 1982: 165–172; 2000a: 193–207; 2001: 77–81; Riikonen 2006) and child burials (Lehtosalo-Hilander 2000a:

221–226; Asplund & Riikonen 2007: 26; Wright et al. 2024). A strong gender bias is nonetheless evident, as female clothing has been studied down to the most minute detail in ancient costume reconstruction projects. Thus, when discussing shawl finds from male graves, interpretations are based both on findings from female graves as well as other sources commonly used in ancient costume studies, including archaeological finds, like the 5th-century graves from *Evebø/Eide* in Norway and *Högom* in Sweden (Mannerling 2017: 156 with references), together with image sources from other areas of Northern Europe, like the Bayeux tapestry (Bayeux Museum 2023).

In this paper, we discuss the possibilities of connecting the recorded technical data on the properties of archaeological textiles, including the weave, thread count, spin angle and dye analysis results, with the sensorial properties characteristic of the original materiality of such textiles, such as the look and the feel of the garment. Susanna Harris (2019: 212) draws attention to 'a sensory disconnect between the archaeological textile artefact and the sensory materials that existed in the past'. In the archaeological literature, researchers have presented multidimensional, colourful and sensuous garments from the past both in tables listing their properties as well as in black and white photographs (Hurcombe 2007: 533; Harris 2019: 211–212). Within sensory archaeology, new perspectives on the past are created by stressing the bodily interaction of human beings with their surroundings (Day 2013: 5). While senses are not universal but culturally specific, we nevertheless experience the world through our senses just as our ancestors did, and this shared corporeality is the starting point for our interpretations of the material world (Day 2013: 6).

Here, evidence of spiral decorated shawls from female, male and child graves will be presented to demonstrate the similarities and differences in material culture based on gender and age. The technical and dye analyses of textiles make it possible to trace the properties of the garments, but reconstructions are needed to make sense of the tactile characteristics of the textile. The reconstructions will offer glimpses of the rhythmic, haptic and visual (Hurcombe 2007: 539) reality of past textile production. In the

making process, the craftsperson's relationship to the materials includes the feel of the wool yarn in their hands, the colour and the surface texture of the fabric building up weft by weft when weaving, how the fabric falls and wraps after removing it from the loom, and even the smell of the dyes and dyeing methods used combined with the wool's own odour. The repetitive and laborious making process creates experience and embodied knowledge that in turn helps researchers understand the materiality and value of the original spiral decorated shawls (Hurcombe 2007: 537).

With reconstructed shawls, it is also possible to study the impact of textiles on bodies, both on living bodies and in a reconstructed grave setting. In our case studies, spiral decorated shawl reconstructions are used to explore the practical constrains and opportunities of different wearing practices. The tests were conducted via historical reenactment events as well as photoshoots to both discuss subjective reflections on the reconstructions and document different wearing practices. With funeral setting reconstructions, the choices concerning the dimensions and placement of decorations on shawls are examined. By providing visual examples of the possible original use of the shawls, the sensorial aspects of spiral decorated shawls and their role in the clothing culture of Late Iron Age Finland can be understood. In previous research, archaeological shawls have not been studied using sensory research. Therefore, this paper will provide fresh approaches to the topic.

Spiral traditions in Finland and the Baltic

The tradition of decorating garments with small copper alloy spirals began in Finland in the 9th century at the latest (Lehtosalo-Hilander 1984: 60–61). Separate spiral tubes have been found in cremation burials, but their connection to clothing can be studied in inhumation graves, where the dead were supposedly buried in their normal or festive clothing (Lehtosalo-Hilander 1984: 2, 62; Riikonen 2005: 37, 45). The placement of decorations and jewellery should therefore also represent the way people dressed during their lifetime, although sometimes, for example, two aprons or shawls have been placed in the same grave (Kirjavainen & Riikonen 2007: 135).

Spiral ornaments were used both in finishing and decorating the textiles. For example, garments woven on a warp-weighted loom were usually started and finished in tablet-woven bands, where the fabric warp yarns served as a weft for the band. The fan-like corner ornaments of aprons were used to hide the warp yarns of the tablet-woven band (Vahter 1928: 68–69; Riikonen 2005: 33). Spirals were used as a decorative element and also as finishing in shawls and female headdresses (Vahter 1928: 66–68; Kirjavainen & Riikonen 2007: 136) as well as in headbands (Riikonen 2023: 81–82; Paschenko 2023) and leg bands (Riikonen 2023: 63).

Besides garment finishes, separately made ornaments applied to the fabric were also used. The earliest examples of such ornaments are those found in early 10th-century male graves at Eura Luistari, constructed of woollen yarn and separate spiral tubes (Lehtosalo-Hilander 1982: 170; Riikonen 2005: 39). From the late 10th or 11th century onwards, ornaments constructed by opening up parts of longer spiral tubes and interlacing them with each other to form the base of the ornament were used to decorate female apron hems (Lehtosalo-Hilander 1982: 161–162; Riikonen 2005: 39–40). Variations on this type of technique were also used in round, star-like and cross-shaped ornaments connected to shawls (Tomanterä 1984: 37; 39–40).

Only a few studies have been done on clothing remains from male graves. According to Lehtosalo-Hilander (2000a: 206), the spiral ornaments from male graves at Eura Luistari were most abundant during the first half of the 10th century, and this fashion continued until the middle of the 11th century. A technical shift seemingly occurred in ornaments found in male graves as well, with straightened spiral tube parts later included in the middle of the ornament, like those found in the 11th-century Luistari grave 670 (Lehtosalo-Hilander 1982: 165; 2000a: 206 and plate 22). While such ornaments are most commonly interpreted as having originated from shawls, Lehtosalo-Hilander (1982: 165) points out that some of the ornaments might also have been placed on other garments, like tunics.

Since the earliest preserved copper alloy spiral finds from the Baltic countries (Rammo & Ratas 2019: 125 with references) precede

Finnish finds by several centuries, the craft of using spiral tubes as a textile decoration technique possibly came from the south (Lehtosalo-Hilander 1984: 60). By the 11th to 12th centuries, several technically different ways of decorating shawls were present in Finland and the Baltic countries. In South-West Finland, spiral ornaments were added directly to the warp ends of the fabric, and separate ornaments were sewn together with woollen yarn. In the finds from the Mikkeli area, in eastern Finland, plant-fibre yarn was used in the threading of spiral decorations, while in Ladoga Karelia the spirals were threaded using horsehair (Vahter 1928: 63; Lehtosalo-Hilander 1984: 61). In the eastern areas, however, spiral decorations were only used on aprons and perhaps veils, not shawl fabrics (Schwindt 1893: 118–119; 121). In the northern parts of Finland, a few spiral decorated tablet-woven bands have been found in the Valmarinniemi cemetery in Keminmaa (Puolakka 2023).

Parallel examples of spiral decorated shawls similar to those from South-West Finland have been found at the cemetery of Siksälä, in Estonia (Matsin 2010; Valk & Laul 2014: 90–91) and in Latvia (Žeiere 2005: 77–78; 2017: 119–123). Most shawls were woven in 2/2 twill with tubular selvages and dyed dark blue, and many similar decorations can be found in both those finds and in the Finnish finds, like tablet-woven bands and threading spirals added directly onto warp yarns (Matsin 2010: 191; Rammo & Matsin 2014: 214; Rammo & Ratas 2019: 136–137). The Latvian shawl finds contain a wide variety of different decoration techniques, including copper alloy decorations woven directly onto the fabric, small yellow glass beads, tin-lead rosettes and colourful fringes and tassels, with the style of decoration varying in different areas and evolving over time (Žeiere 2017).

Shawl decorations in South-West Finland

Different garments found in Late Iron Age graves are recognised by the typical spiral decorations typologically connected to them, in addition to their placement in relation to the remains of the deceased. Archaeologist

Anna-Liisa Hirviluoto has proposed a three-staged typology for spiral decorated shawls based on findings from the Ihala cemetery in Raisio (Hirviluoto 1973: 64–65).

- *Type 1*: Rectangular shawl is finished in a manner where the wool warp yarns of the fabric serve first as wefts of the tablet-woven finishing band, then continue to a spiral-decorated cross-work of braids and end up as wefts of another tablet-woven band, leaving the yarn ends as fringes. Separate ornaments have been applied to the fabric, and the longer edges of the fabric are decorated with separately made spiral bands (Fig. 1b).
- *Type 2*: Otherwise resembling type 1, except that the longer edges of the fabric are decorated with separately made, tablet-woven bands (Fig. 1a).
- *Type 3*: Simpler design, where copper alloy spiral decorations are used only as separately made ornaments applied to the fabric

Hirviluoto (1973: 66) dates type 1 and 2 shawls to the 11th and 12th centuries and the starting point for type 3 shawls broadly to the Viking Age. Later, the earliest spiral decorated shawl remains from male graves at Luistari site in Eura have been dated to the 10th century (Lehtosalo-Hilander 2000a: 196–197).

The more decorated the shawl, the easier it is to define the finds as a shawl. When only separate ornaments or small pieces of fabric are left, there is always the possibility that the ornaments had been sewn to some other kind of garment (Hirviluoto 1973: 65). This challenge concerns especially the type 3 shawls, with no metal bordering on the edges (Hirviluoto 1973: 66). Types 1 and 2 have only been found in graves gendered as female, while type 3 also covers spiral decoration finds from male graves. In the latter graves, brooch or dress pin finds have also been interpreted as proof of a shawl (Lehtosalo-Hilander 2000a: 205–207).

Recently published shawl finds from *Ravattulan Ristimäki* in Kaarina contain both shawls with spiral decorated cross-work in graves 18/2016 and 20/2016 as well as simpler ones in graves 37/2016, 38/2016 and 41/2016 (Riikonen 2023: 74–75). The latter finds fit the Hirviluoto type 3 shawl, as they have copper

alloy spirals only as separate ornaments, but the remains also contain other details: the short edges of the rectangular fabric are hemmed, and a tubular tablet-woven band encircles the whole shawl. According to Jaana Riikonen (2023: 74), the fashion in spiral decorated shawls had possibly shifted from complicated finishes to less time-consuming and skill-demanding practices. In the Häme area, several examples of different shawl decoration traditions have been described by Leena Tomanterä (2003: 37–43). According to her, shawls in Häme were typically decorated by pressing separate copper alloy rings around the tablet-woven edge of a shawl, and separate spiral tube ornaments were placed on the edge so that there was no fabric under them. Tomanterä (2003: 37–38, 41–42) also points out the similarities between the spiral tube ornament finds from Vilunsenharju grave 2 in Tampere and Kirkkailanmäki grave 4 in Hollola and Estonian finds.

Handicraft techniques and ancient costume reconstructions

The first spiral decorated shawl to be reconstructed in Finland was made for the Ancient Perniö costume, based on finds from Perniö Yliskylä grave 6 (Lehtosalo-Hilander 2001: 35). The well-preserved find shows elaborate finishings: the short edges of the fabric are finished with a tablet-woven band, followed

by spiral decoration cross-work using braided warp yarns, and again a tablet-woven band locking the cross-work in place, with the rest of the fabric's warp yarns left as fringes. Here, the warp yarns of the tablet-woven band are used in a rigid twofold corner ornament, linked to separately made spiral lace bands sewn onto the long selvages of the fabric (Fig. 1b.). At Yliskylä grave 1, the pattern of ornaments on the cross-work is different, and the corner ornaments with the warp yarns of the tablet-woven band are just small circles with a cross in the middle (Fig. 1a). Both shawls also have several separately made ornaments applied onto the fabric. From the more decorated shawls, it has been possible to obtain measurements of the fabric. At Yliskylä grave 1, the shawl measurements were 150 x 90 cm, while at Yliskylä grave 6 they were 147 x 94 cm (Appelgren-Kivalo 1907: 29, 44).

Several examples of the Ancient Perniö costume were produced for festive costumes (Lehtosalo-Hilander 2001: 36). Without instructions or detailed knowledge of the original techniques, we can only speculate that complicated details of the costume, like the shawl endings, were probably done by copying the techniques according to each person's handicraft knowledge and sharing tips and patterns with others, in the same tradition as many early national costumes were produced (Valkeapää 2023: 84–90). The Ancient Perniö costume has also been

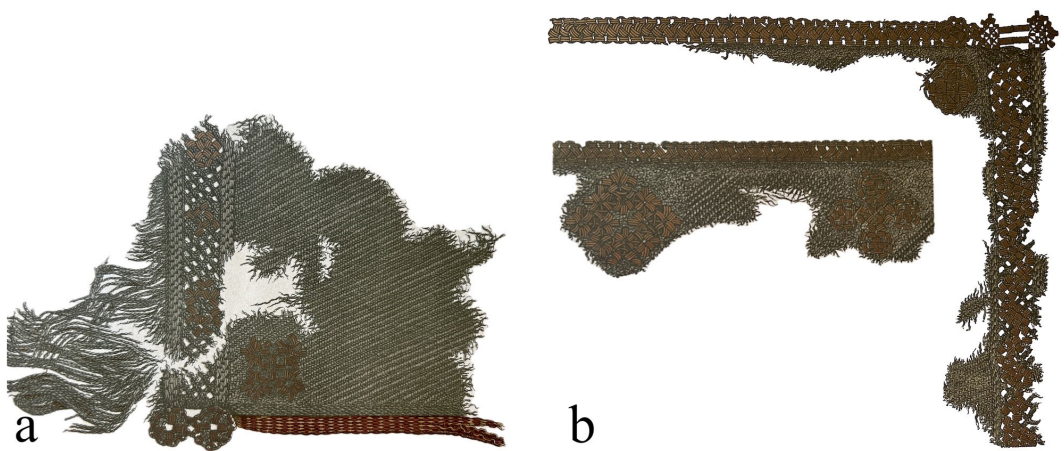


Figure 1. Shawl remains in Perniö Yliskylä a) grave 1 and b) grave 6. Not in scale. Drawings: Jenny Nummelin (Appelgren-Kivalo 1907: Taf. XII:1 and VI:2).

produced at the Helmi Vuorelma workshop, in addition to national costumes. The first set of instructions for making modern reconstructions of the cross-work decoration were included in the description of the Ancient Masku costume, a reconstruction based on the Masku Humikkala grave 32 finds (Tomanterä 1984). The brief set of instructions note that the cross-work part of the decoration should be done as finger-loop braiding with three loops (*kolmipohjukkainen iskunauha* in Finnish). Instructions for making the Ancient Perniö costume were finally published in the year 2000, again suggesting finger-loop braiding for the cross-work decorations (Lehtinen et al. 2000: 20).

Most Finnish ancient costume reconstruction projects have been done for the purpose of wearing the costume on festive occasions. Therefore, their basis has not been so much experimental archaeology or discussing original contexts but creating practical solutions to produce impressive costumes for contemporary use. This practice has developed into a craft tradition in its own right, offering solutions for how to produce details typical of Iron Age weaving, like tubular selvages, when using modern vertical looms (Pasanen & Sahramaa 2021: 209–219). The same adapted techniques have usually been followed when producing textile reconstructions for museum exhibitions.

Table 1. Sites and graves

Shawl burial	Cemetery data	Excavated	Spiral ornaments	Brooches	Other jewellery	Other findings	Human remains
Lieto Ristinpelto							
Grave 86: H50109:8 Female C14 13th c. (Sahramaa et al. 2024: 40)	12th-13th centuries c. 150 burials, 2 with shawl finds	1905, 1949–1950 Cleve 1952; 1974	12 separate ornaments from shawl	-	Round silver sheet pendant	Apron, spiral decorated headband, several other bands, other textiles, fur	Parts of skeleton
Masku Humikkala							
Grave 31 KM 8656:H31:1-26 Female Typologically 12th–13th c.	11th-13th centuries, 56 burials, 15 with shawl finds	1925 Pälsi 1925; 1928	:2, 6, 13, 14, 17, 19, 21, 22 and 24–26 16 separate ornaments, :8, 17, 22 and 24 pieces of cross-work ending	:7 silver penannular brooch 3.0 cm (no textile), :9–10 copper alloy penannular brooches 3.9 cm (peplos)	Two silver rings, glass beads and possibly imitated coin (late 10th c. dirhem, Talvio 2002: 20, 171) from necklace	Apron, headdress, peplos dress, bands, bronze plate knife sheath	Parts of skull
Hollola Kirkkailanmäki							
Grave 4/1978 KM 20450:10–37 Mature female (Salo 2011: 7), c. 165 cm tall C14 13th c. (Moilanen 2021: 136)	11th-14th centuries, c. 140 graves	1935-6, 1978–9, 1987 Hirviluoto 1979	:12, 16, 19, 26 and 31 5 separate ornaments possibly from shawl	:27 and :28 two convex oval brooches (peplos)	Chain arrangements, earspoon, two bracelets, two glass beads	Spiral ornaments possibly from apron, textiles, knife and bronze sheath	Parts of skeleton

Turku Kirkkomäki							
Grave 11 (D/1984) KM 22631:53-136 Male Based on coins 12th c.	11th–12th centuries, 43 burials, 15 with shawl finds	1950, 1962, 1983–84, 1991–92 Katiskoski 1984; Asplund & Riikonen 2007	:62–65, :69–74 nine separate ornaments	:56 silver penannular brooch (no textile), 3.9 cm	Gold foil bead	Belt, two silver coins (11th–12th c. German), textiles, fur, spearhead, unidentified iron pieces	
Grave 16 KM 27025:16001- 16090 Male Typologically 12th c.			:16048, 16054, 16056-58, 16060, 16066-67, 16071-73, 16083-84, 16089-90, 16093 17 separate ornaments	:16045 silver penannular brooch 4.3 cm, :16051-3 copper alloy penannular brooches 3.8 cm, 3.3 cm and 3.1 cm	Silver ring, gold boil bead	Belt, two silver coins (11th–12th c. German), textiles, fur, spearhead, unidentified iron pieces	Teeth
Grave 35: KM 27196:35001- 35079 Child 0.5-3 years old Typologically 12th c.			:35032-34, 35042 and 35060-61 11 separate ornaments, :35002-3, 35035 and 35037-39 pieces of cross-work ending	:35005: silver alloy penannular brooch, 3.8 cm :35029 copper alloy penannular brooch, 2.1 cm	Glass beads and silver coin (Byzantium AD 977–989) from necklace, two sleigh bells	Ceramic pots, iron knife, linden mat, birch bark box	Three teeth
Salo Rikala							
Grave 24/Z: KM 12690:356- 362 Male Typologically 11th–12th	11th–12th centuries, 40 burials, 16 with shawl finds	1950–53, 1976–78 Leppäaho 1955	:357-359 three separate ornaments	-	-	Iron knife, bronze fittings possibly from belt	

MATERIALS AND METHODS

Materials for this study were selected from Late Iron Age inhumation cemeteries in Southern Finland, including three female graves, three male graves and one child's grave, with spiral ornaments interpreted as shawl decorations. All the graves contained preserved textile fragments and had not been

subject to prior detailed analysis. Besides studying objects found in the graves, grave maps and excavation reports were used to understand the structure of the grave and the placement of the different finds. All materials used in this study are part of the Finnish Heritage Agency collections.

Besides spiral decorations, four of the seven graves studied here contained penannular

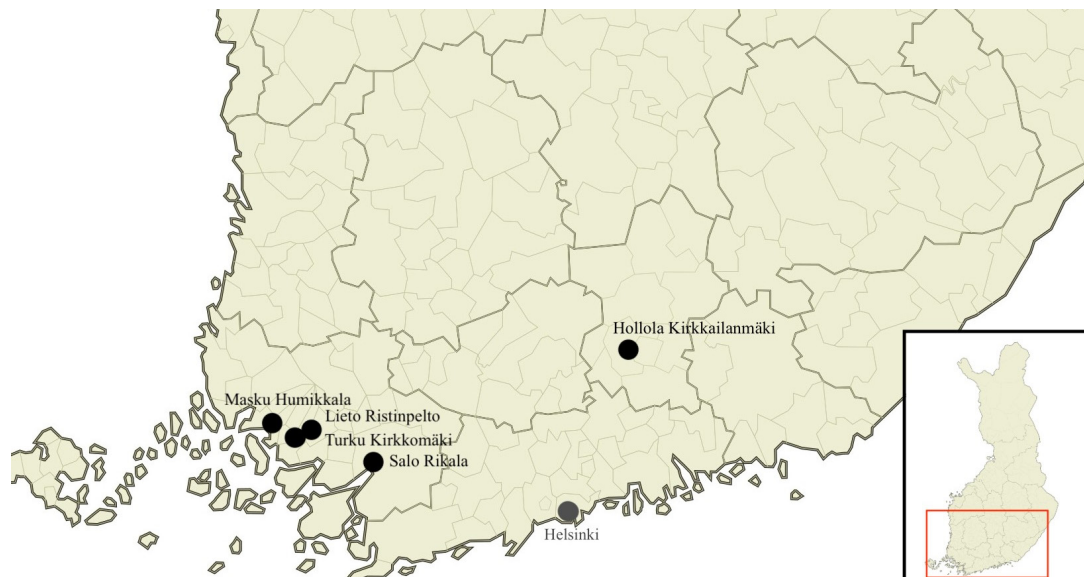


Figure 2. Map of sites. Image: Jenni Sahramaa

brooches, while *Hollola Kirkkailanmäki* grave 4 contained oval convex brooches (KM 20450:27 and 28). Two copper-alloy penannular brooches (KM 8656:H31:9 and :10) placed on the shoulders of the deceased found in Masku Humikkala grave 31 and the Kirkkailanmäki grave 4 brooches can be connected to typical female peplos-type dress. Third, the silver brooch (KM 8656: grave 31:7) found in Humikkala grave 31 contained no textile remains, but it could have been used to attach the shawl from the middle of the breast. Turku Kirkkomäki child grave 35 contained one silver (KM 27196:35005) and one small copper alloy penannular brooch (KM 27196:35029), both placed in the neck area but containing no textile remains. In Turku Kirkkomäki male grave 11, a silver penannular brooch with no textile remains was found at the probable place of the head in the grave. Turku Kirkkomäki grave 16 contained four penannular brooches, with the three copper alloy brooches (KM 27025:16051-16053) having been found at the place of the chest and the silver brooch (KM 27025:16045) found near the left hip of the deceased. All contained small textile remains. No brooches were found in *Lieto Ristinpelto* grave 86 or *Salo* (formerly *Halikko*) *Rikala* grave 24.

Hollola Kirkkailanmäki (also *Kirkkailanmäki* and *Kirkk'ailanmäki*) grave 4, from Päijät-Häme, in Central Finland, is included since interpretation of the spiral tube decorations found there as shawl remains serve as an interesting point of comparison to the better-known South-West Finnish shawls. Moreover, the dress remains from this grave were selected as the basis for a costume reconstruction done for the Lahti Historical Museum. The sites (Fig. 2) and graves are summarised in Table 1.

All the finds from a single grave were first studied visually to recognise the various textiles and other organic remains of clothing. This effort included studying and documenting them with an iPhone 13 Pro 12MP camera system as well as a Leica S6D microscope with Las EZ 3.4.0 software. The findings were compared to excavation reports and grave maps, redrawn using colour codes for different materials and mapping the textile finds.

To characterise the textiles, standard textile analysis included the weave, thread count, twist of the yarn and finishing details (see Walton & Eastwood 1988). Small, 2–5 mm samples of the different yarns were collected together with a conservator and used for fibre and dye analyses. Fibres were scattered from a sample onto glass, mounted in Entellan New rapid™

Table 2. Properties of shawl textiles

Shawls	Textile	Thread count warp/ weft yarns/ cm	Colour	Bands	Shawl on grave
Lieto Ristinpelto 86	Sz/z twill	10/9–10	Visually blue, indigoids and unknown compounds	Starting border, separate tubular tablet woven band sewn to the edge	Covering the deceased
Masku Humikkala 31	Sz/z twill	10/8–9	Visually blue	Finishing border, separate tubular tablet woven band	Over shoulders
Hollola Kirkkailanmäki 4	Sz/z twill	8/8	Visually blue	-	Over shoulders
Turku Kirkkomäki 11	Twill?	-	Visually dark	-	Covering the deceased
Turku Kirkkomäki 16	Sz/z twill	9/9	Visually light, ornament sewing yarn visually blue	Separate tubular tablet-woven band	Wrapped around
Turku Kirkkomäki 35	Sz/z twill	10/8	Visually blue, indigoids and unknown compounds from ornament sewing yarn	Possible tablet woven band	Covering the deceased
Salo Rikala 24	Sz/z twill	9-10/8-9	Visually blue, ornament sewing yarn visually red	-	-

and covered with a cover glass to be studied with a Leica 2500 transmitted light microscope with a Leica MC190HD camera and measured with LAS V4.13.0 software.

Selected samples were analysed using high-performance liquid chromatography and a photo diode array detection system (HPLC-DAD). The method has been described and discussed at length by Vanden Berghe et al. (2009). The previously published results for Lieto Ristinpelto grave 86 and Turku (formerly Kaarina) Kirkkomäki grave 35 (Wright et al. 2023; 2024) are included in Table 2. As the analyses of other dye samples have not yet been completed, they are studied only visually here.

Spiral decoration patterns were drawn from the finds if they were still relatively intact, and excavation photos, microscopic images and in some cases also x-ray images were used to trace their original form. Different ways of sewing an

ornament together were tested in practice, and the results were compared to microscope images of the original. This process followed the experimental study pattern described by Maikki Karisto for the study of tablet-woven bands (Karisto & Riikonen 2018: 6). Spirals were measured based on the photos taken with a Dino-Lite Edge Digital Microscope using DinoXscope 2.4 software for Macintosh. As the original spirals vary in terms of the width of both the wire and the diameter of the spiral tubes, average measures were used in the craft experiments and reconstructions.

RESULTS OF THE MATERIAL ANALYSIS

All the fabric remains interpreted here as shawl parts shared similar characteristics, regardless of whether they originated from female or, presumably, male graves. Fabrics were woven in

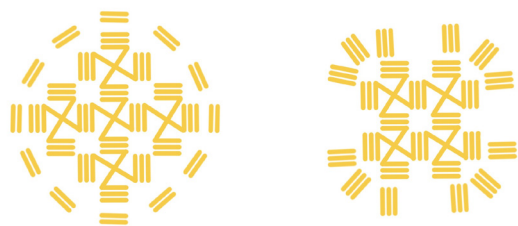


Figure 3. Schematic drawing of two spiral ornament patterns from the Lieto Ristinpelto grave 86 shawl. Image: Jenni Sahramaa

2/2 twill, typical of Finnish Late Iron Age textiles. All warp yarns were first spun with a z-twist, then two-ply in an S-direction for warp, while the weft yarns were of a single-ply z-twist. The most typical thread counts were 8–10 yarns/cm for both warp and weft. The varied construction of soft underwool and more coarse hairs can be observed in the fibre samples. Most samples included some visually blue fibres, while an indigotin-based dye source was confirmed for the Lieto Ristinpelto 86 shawl samples. Results of the textile studies are shown in Table 2.

Two basic techniques had been used for all the separate spiral ornaments analysed in this study, except for Hollola Kirkkailanmäki finds. The body of the ornament was made using long spiral tubes straightened in several parts and placed crosswise so that the straightened parts met (Figure 3). The outer edges were then often finished with a kind of chain made of 2–4 separate round spirals and yarn. The basic patterns consisted of square ornaments, roundels in several sizes, looped squares and different types of crosses (Figure 4). With the Masku Humikkala grave 31 shawl finishing, a technique typical of Late Iron Age spiral decorated shawls can be recognised (Figure 5). Turku Kirkkomäki child grave 35 yielded far fewer shawl remains, but they can be interpreted as evidence of the same pattern (Wright et al. 2024: 87).

RECONSTRUCTIONS

Reconstructions of spiral decorated shawls were used to experiment with different styles of wearing a shawl and dressing the body in the grave. The experiments were done during historical reenactment events as well as separate photoshoot events: four male, five female and one child reenactor (including the authors)

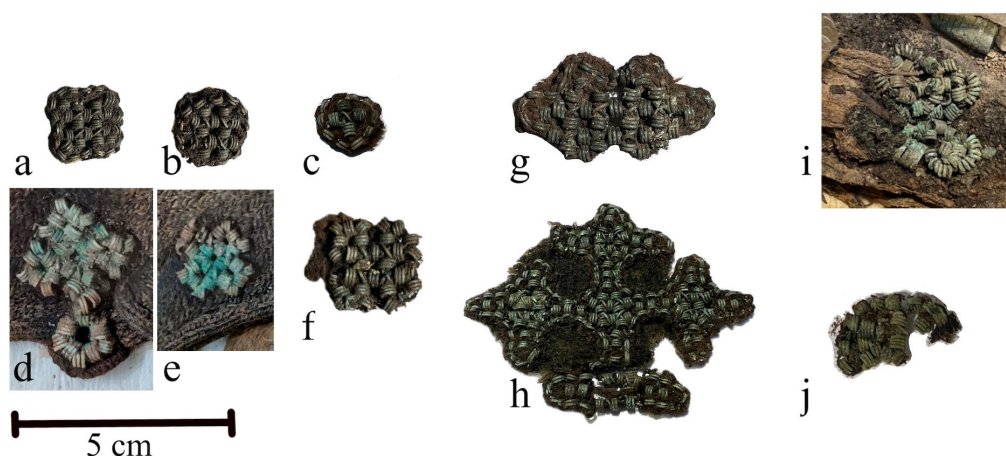


Figure 4. Separately made spiral ornaments a) square ornament and b) roundel from Masku Humikkala grave 31 (KM 8656:H31:25); c) small roundel from Turku Kirkkomäki grave 16 (KM 27025:16090); d) looped square with extra loop and e) looped square from Lieto Ristinpelto grave 86 (H50109:8); f) looped square from Masku Humikkala grave 31 (KM 8656:H31: 22); g) ornament from Turku Kirkkomäki grave 16 (KM 27025:16058); h) cruciform ornament from Salo Rikala grave 24 (KM 12690:357); i) looped square (KM 20450:26) and j) fan-like ornament (KM 20450:16) from Hollola Kirkkailanmäki. Photos: Jenni Sahramaa / Finnish Heritage Agency

took part to the try outs. For the shawls, data concerning reconstruction choices, sensorial properties and wearing practices was gathered in discussions with the participants.

Finds from Lieto Ristinpelto grave 86, Hollola Kirkkailanmäki grave 4 and Turku Kirkkomäki grave 35 were used for the complete shawl reconstructions done by Mervi Pasanen. Commercially available yarns were used, as it would have been far too time consuming to produce sufficient amounts of tight and even hand-spun yarn. All the yarns were wool, specifically spun by Pirtti Spinnery in Finland for weaving ancient costume fabrics.¹ The shawls were woven using modern horizontal looms, but with details typical of Late Iron Age textiles, like tubular selvages and tablet-woven finishing bands. The spiral decorations were made of commercially available bronze wires. The properties of the reconstructed shawls are summarised in Table 3.

Twelve spiral ornaments were found at different locations in grave 86 in Ristinpelto in Lieto. In the first version, ten of them were reconstructed for the shawl, and a round ornament was made for the right lower corner that matched the one found in the left lower

corner. Two ornaments with loops found on the right side of the deceased were left out of the first version – they were possibly placed in the lower long edge of the original shawl. The tablet-woven band finds from Lieto Ristinpelto grave 86 and efforts at reconstructing them have been discussed elsewhere (Sahramaa et al. 2023).

The fan-like spiral decorations found in Hollola Kirkkailanmäki grave 4 (Fig. 4j) were interpreted as belonging to the corners of a shawl in the costume reconstruction made for the Lahti Historical Museum. Despite the fan-like spiral decorations serving as apron markers in South-West Finland, the construction of the Kirkkailanmäki ornaments differed from those finds, and their find places did not suggest that they had been part of an apron. The reconstructed fabric was woven as 2/2 Sz/z twill, similar to the other wool fabrics from the Kirkkailanmäki grave, although few textile remains were found in direct connection with the spiral decorations. The Estonian conservator Jaana Ratas, a specialist in copper alloy spiral reconstructions, made the spiral decorations threaded with horsehair, following their original craft technique.

For a child-sized shawl, a piece of fabric originally woven as part of a large adult apron was used. Since grave 35 in Kirkkomäki in Turku

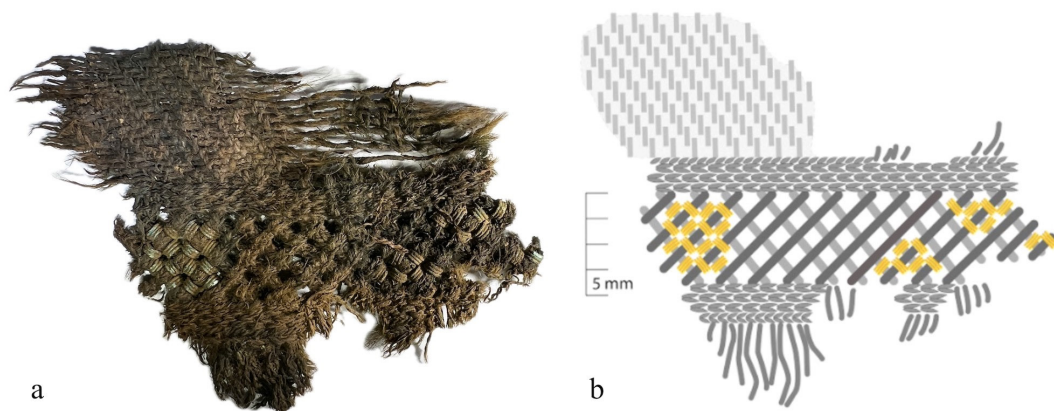


Figure 5. Masku Humikkala 31 shawl finishing: a) Photo: Jenni Sahramaa / Finnish Heritage Agency; b) Drawing: Maikki Karisto.

Table 3. Reconstructions and test shawls.

Shawl	Size	Textile properties	Yarn	Dyes and colour	Spirals	Bands
Lieto Ristinpelto 86	150x90 cm	2/2 twill, 9–10 yarns/cm	Pirtti Sz tex 70x2 for warp, z 140x1 for weft	Woad pigment with natrium dithionite vat, medium blue colour	11 ornaments, 0.7 and 0.8 mm wire, inner diameter 2.5 and 3 mm	Finishing bands, tubular tablet-woven band
Hollola Kirkkailanmäki 4	155x90 cm	2/2 twill, 7 yarns/cm	Ravattula Sz tex 90x2 for warp, z tex 140x1 from Ålandsheep wool for weft	Indigo pigment with natrium dithionite vat, medium blue	4 corner ornaments, 2 appliqued ornaments	Finishing bands
Turku Kirkkomäki 11	200x130 cm	2/2 twill, 9 yarns/cm	Unknown yarn, Sz for warp and z for weft	Undyed white and grey	0.8 mm wire, inner diameter 2.5 mm	-
Turku Kirkkomäki 16	150x100 cm	2/2 twill, 10 yarns/cm	Ravattula Sz tex 90x2 for warp, z tex 140x1 from Ålandsheep wool for weft	Indigo pigment, dark blue	0.8 mm wire, inner diameter 2.5 mm	-
Turku Kirkkomäki 35 / child size shawl	Fabric 97x51 cm, with cross-work and fringes 131 cm	2/2 twill, 10 yarns/cm	Unknown yarn, Sz for warp and z for weft	Dark blue	12 separate ornaments, eight corner ornaments and cross work 0,5 mm wire, inner diameters 1.5 and 3.5 mm	Finishing bands, colourful tablet-woven band

contained few probable shawl remains (Wright et al. 2023: 87), the shawl details were mostly borrowed from adult-sized shawl finds from the Kirkkomäki cemetery, including the tablet-woven band pattern sewn onto the long edge of the fabric (Karisto & Pasanen 2021: 120–121). In the cross-work at the end, eight warp yarns were always braided together, following Maikki Karisto's interpretation of the Masku Humikkala 31 shawl ending (Pasanen & Sahramaa 2021: 246). This braiding technique had proven both simpler and faster than finger-loop braiding in earlier shawl reconstruction projects, and it produced

results similar to the technique observed in the Humikkala 31 find.

Complete reconstructions of shawls from presumably male graves have not yet been possible since the dye analyses are not finished. To experiment with the placements of the shawls and spiral ornaments from Turku Kirkkomäki graves 11 and 16, test fabrics were used. Determining the size of the shawls posed a challenge, as the shawls in male graves are not bordered with spirals. One test shawl was woven using the same warp as some Ravattula Ristimäki shawl reconstructions (Honka-Hallila et al. 2023a:

163), while the same yarns and dimensions were used that are typical of better-preserved female shawls. One test shawl with considerably larger dimensions was made of handwoven wool twill purchased from Tingvatten Museum in Norway. The dimensions of this shawl were chosen based on interpretations that Scandinavian shawls had been quite large during earlier Iron Age periods (Mannering 2017: 156–157).

DISCUSSION

Typology and dimensions

The studied shawls represent two of the typological groups of Hirviluoto. Female grave 31 in Humikkala in Masku and child grave 35 in Kirkkomäki in Turku had type 2 shawls with cross-work decorations at the short edges. Lieto Ristinpelto grave 86 and all the shawl finds from male-gendered graves (Kirkkomäki graves 11 and 16, Rikala grave 24) can be classified as Hirviluoto type 3, only with separately applied spiral ornaments. The spiral ornaments found in Hollola Kirkkailanmäki grave 4 differ both from the South-West Finnish spiral tradition and the finds from the Häme area defined as shawls by Tomanterä (2003). Additionally, it is not possible to confirm that the spirals originate from a shawl. However, comparing their find positions to the way in which a shawl could be placed on the shoulders of a person laying on their back confirmed that the ornaments could have been placed at the corners of a shawl.

The grave map for the Masku Humikkala 31 burial suggests that the individual was approximately 160 cm tall. The cross-work finishings were found approximately 60 cm from the head of the person. Assuming that the deceased person was laying on their back, a shawl length of 160 cm would fit this description. The well-preserved shawl remains from Perniö Yliskylä graves 1 and 6 measured 150 x 90 cm and 147 x 94 cm, respectively, while the Masku Humikkala grave 32 shawl measured 160 x 100 cm without fringes (Tomanterä 1984: 32). The length of the fabric found at Salo Rikala grave 11 was 154 cm (Hirviluoto 1985: 13), while the length of the fabric for the two shawls found in Kirkkomäki grave 27 was 160

cm without fringes (Kirjavainen & Riikonen 2007: 136). For the shawl reconstructions used in the dressing experiments of this study, the dimensions of the adult shawls were in the same range, except for the Kirkkomäki 11 test shawl, which was considerably larger (Table 3). Thus, it was possible to test both the dimensions known from female shawls and the assumption that male shawls could have been larger based on the placement of spiral ornaments found in male graves.

Fabric's appearance

The fabric's appearance depends on five aspects: yarn, binding, thread count, weaving and finishing (Hammarlund 2005: 106). All the textiles interpreted here as shawls shared the same basic characteristics (Table 2). The yarns were made of wool, spun as single-ply in the z-direction for weft, and Sz-ply for warp. The thread counts for all the studied fabrics varied from 8 to 10 yarns/cm in both the warp and weft. In most cases, only very small and decayed pieces of fabric were preserved in connection with the spiral ornaments, and it was not possible to do a thread count in more than one place. Most probably, the original shawls were woven using warp-weighted looms with no reed, which means that the thread count could also have varied within the same textile (Lehtosalo-Hilander 1984: 8; Nørgaard 2011: 28). Nonetheless, this thread count is typical of textile finds from South-West Finland (Lehtosalo-Hilander 1984: 8), although, for example, some Masku Humikkala shawls had more threads per warp (Tomanterä 1982). When it was possible to study larger pieces of textile, they gave a visually balanced impression.

Besides the thread count, the thickness of the yarn also affects the fineness and appearance of the fabric (Hammarlund 2005: 115; Nørgaard 2011: 22). The act of measuring single sample yarns unfortunately yielded several sources of inaccuracy, as the archaeological yarns had often dried out and become flattened. Moreover, to avoid destroying fragile textile structures, sampling was performed in places where the textiles had already been damaged. Therefore, ensuring the visual similarities of

the thread count and that the appearance of the reconstructions matched the originals took priority over measuring the yarn thicknesses.

The reconstructed shawl fabrics were woven with similar thread counts as the originals but using modern horizontal treadle looms. The visual impression given by the original and the reconstructed fabrics, when comparable, was reasonably similar. In this study, it was not possible to reliably differentiate between intentional finishing practices, such as fulling (Hammarlund 2005: 107), and use-wear and damage that had occurred during the time the textiles had spent underground, although some fabrics, like the one found behind the cruciform ornament in grave 24 in Rikala in Salo KM12690: 357 (Fig. 4h), showed slight signs of felting. Since most textiles did not appear to be teased or fulled, reconstructed shawl fabrics were finished only by wetting and stretching them to dry (Pasanen & Sahramaa 2021: 216).

Yarns and wool: Feel of the fabrics

Hand spinning, including the wool preparations, has proven to be the most time-consuming part of fabric production (Vedeler & Hammarlund 2017: 30). Late Iron Age yarns were spun with a hard twist to survive the weaving process (Lehtosalo-Hilander 1984: 48; Andersson Strand & Demant 2023: 11). In most reconstruction projects, however, it has been difficult to find the resources to hire a spinner experienced and skilled enough to produce sufficient amounts of quality yarn (Lehtosalo-Hilander 2001: 6; Vedeler & Hammarlund 2017: 27). Therefore, machine-spun yarn has been used as a compromise; when ordered from smaller wool mills, it has been possible to give the yarns more twist than is generally used in modern yarns (Vedeler & Hammarlund 2017: 27; Kaljus 2019: 152–153; Honka-Hallila et al. 2023b: 95–96). Nevertheless, the yarns bought from Pirtti Spinnery for ancient costume reconstructions still have less twist than the originals.

Moreover, the choice of suitable wool is paramount when imitating the qualities of Late Iron Age yarn (Honka-Hallila et al. 2023b: 93). In previous studies, the closest parallels to the quality of Finnish Iron Age wool have come from Åland sheep (Kirjavainen 2023: 87), or

possibly from the very small population of Jaalasheep (Vajanto 2013: 82). Åland sheep, one of three native Finnish breeds of sheep, have double-coated fleece consisting of long, coarser outer hair and shorter, soft underwool. Several primitive traits have survived in the breed, like its small size, multicoloured wool and even ewes having horns. In contrast, Finnsheep have been bred so that their wool is soft, short, crimp and most often white in colour (Vajanto 2013: 82).

The type of wool used, and the twist of the yarn, are important factors contributing to the feel of the fabric and its behaviour when worn, like how the shawl falls from the shoulders or wraps around the body during use. The feel, in modern fabrics the *handle*, is especially difficult to study since any evaluations of the feel are quite subjective. All the yarns used for the reconstructions in this study were machine spun and mostly made of soft wool. Only the singleply Ravattula yarns used as weft in the Turku Kirkkomäki 16 and Hollola Kirkkailanmäki 4 shawls were spun from Åland sheep wool (Honka-Hallila et al. 2023b: 96). The wool used in other yarns is, according to the Pirtti Spinnery, of Finnish origin, and it might have originated from several different modern sheep breeds besides Finnsheep.

When comparing the different reconstructions during the test wearings, the Lieto Ristinpelto 86 shawl reconstruction, woven completely from Pirtti yarn, feels softer against the skin than the reconstructions that contain Åland sheep wool, even though it has only been used in the weft. Generally, Åland sheep yarn usually feels coarse to modern hands, and the fabric woven from it is thought to be itchy. Tolerance for the feel of coarse fabrics against the skin was supposedly greater in earlier cultures (Harris 2019: 224), and great differences in subjective preferences, habits and experiences are normal also among modern people. Longer fibres and more twist also affect the durability of the fabric, as softer fabrics wear out more easily.

Shades of blue

In general, research on spiral decorated shawls in Finland, Estonia and Latvia has revealed a preference for dark blue fabrics (Lehtosalo-Hilander 1984: 7; Kirjavainen & Riikonen 2007: 135–136;

Matsin 2010; Valk & Laul 2014: 90–91; Vajanto 2016: 57; Žeiere 2017: 119–120, 123). Textile colours, or rather the dyes used, can also be studied through optical microscopy and chemical and spectroscopic dye analyses. Unfortunately, the presence of colourants in visually blue fabrics or fibres could only be confirmed in the Lieto Ristinpelto grave 86 samples, as other dye analyses have not been completed yet (Table 2; Wright et al. 2023).

Specific dye plants can be recognised in the various combinations of chemical dye components, but usually this type of analysis does not extend to dye practices, nor does it confirm the original hue of the colour (Harris 2019: 219). The most common chemical compound found in Late Iron Age textiles in Northern Europe is indigotin, often together with isatin and indirubin. All of them are present both in different indigo plants (*Indigofera sp.*) and in woad (*Isatis tinctoria*), but, since the cultivation and use of woad is well documented in Europe since ancient times and the arrival of tropical indigo via trade thoroughly changed dyeing techniques and economics in the Modern Era (Cardon 2007: 364–365, 374–377), the use of woad is commonly presumed for prehistoric textile finds in Europe. Traded woad balls were supposedly used in Late Iron Age Finland (Peets 1998: 294–297; Vajanto 2016: 57–59; Rammo et al. 2023: 156).

In the Finnish practice of making ancient costume reconstructions, natural blue dyeing has most typically been done with indigo pigment using a sodium dithionite vat (Lehtosalo-Hilander 1984: 52; Honka-Hallila et al. 2023b: 97). This method easily and reliably produces very dark colours at first, with the results lightening in shade at every dipping as the amount of dye becomes reduced in the vat. In contrast, experimental studies of ancient dye practices with different woad vat methods have resulted in a wide range of blue shades as well as some green and pink colours (Hannusas & Raitio 1997; Hartl et al. 2015). This finding is in line with the present authors' experiences with blue dyeing, where neither fresh woad leaves nor commercial woad pigment have resulted in very dark shades, but rather in medium to light blue shades (see Pasanen & Sahramaa 2021: 202–205). Naturally, this result might be due to the lack of knowledge and experience of modern dyers, and experts

have suggested combining several colouring agents or using darker grey, brown or even black wool as a base to achieve darker results (Rammo & Matsin 2014: 338; Rammo et al. 2023: 153). Nevertheless, as previous research on different woad vats has shown, it might be misleading to assume that the results of modern indigo dyeing methods are representative of the colours of original Late Iron Age textiles.

In this study, the naturally light grey yarns used for the Lieto Ristinpelto 86 shawl reconstruction were dyed with woad pigment and those for the Hollola Kirkkailanmäki 4 reconstruction with indigo pigment, both in a sodium dithionite vat. However, the resulting yarns, blue in colour, differ somewhat in hue (Fig. 6). Besides the yarn, pigment and type of vat used, experienced dyers can also make deliberate choices concerning the amount of pigment and number of dips into the vat when aiming for different results. Obtaining a comparable experience when dyeing with woad balls and more primitive types of vats, like the urine vat (Hannusas & Raitio 1997; Cardon 2007: 345–346, 349–351; Vajanto 2010), would require a significant amount of practice.

Spiral decorations

Significantly more spiral ornaments have been recorded from female graves than male graves. For example, at Masku Humikkala and Raisio Ihala sites, only female graves contained spiral decorations from shawls (Lehtinen 1983: 76; Hirviluoto 1973). At Salo Rikala, however, seven male graves contained 1–3 spiral ornaments each, although a later lost fourth ornament is also marked on the original map for grave 24 (Leppäaho 1955: Map 47). Turku Kirkkomäki differs from the other sites in that five male graves with spiral ornaments were recorded (Asplund & Riikonen 2007: 21), while both graves 11 and 16 contained several separate ornaments. Most of the ornaments from South-West Finnish graves followed typical patterns of roundels, looped squares, stars and crosses (Fig. 4a–h).

The spiral ornaments found at Hollola Kirkkailanmäki 4 were constructed using different techniques, as they are threaded with horsehair and not connected to the warp yarns of the fabric or finishing bands. Even though a looped square ornament was also found at Kirkkailanmäki, it was

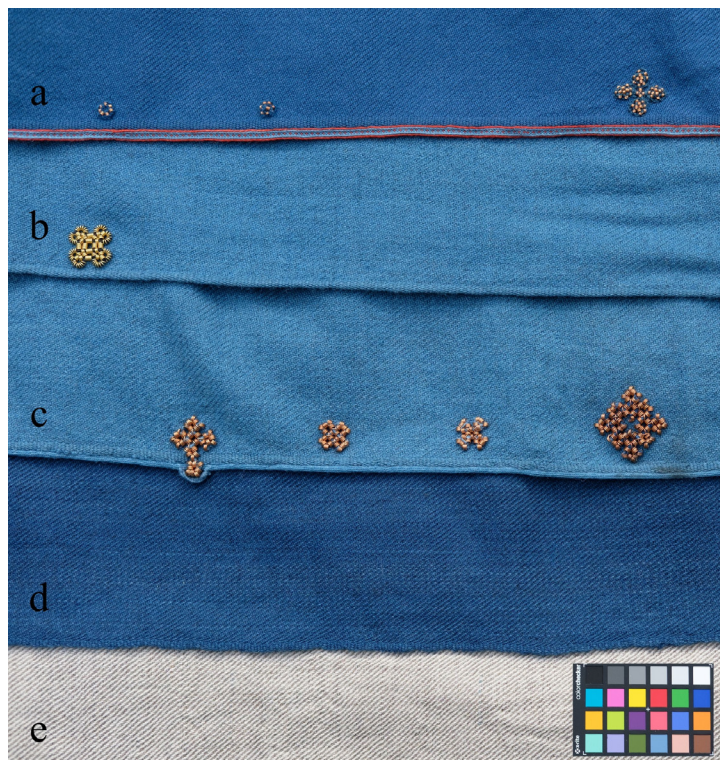


Figure 6. Different shades of blue in shawl reconstructions: a) child size shawl; b) the Hollola Kirkkailanmäki grave 4 shawl dyed with indigo pigment on light grey yarn; c) the Lieto Ristinpelto grave 86 shawl dyed with woad pigment on light grey yarn; d) test shawl woven of Ravatula dress shawl yarns, purchased as predyed with indigo; and e) natural white and grey test shawl. Photo: Riku Pasanen.

constructed without longer spiral tube crossings in the middle, but with longer tubes bent in the corners (KM 20450:26; Fig. 4i). Parallels to the Kirkkailanmäki looped square have been found in Saarenmaa, Estonia (Tomanterä 2003: 42; Mägi 2002: Plate 115 and 99). No direct parallels to the fan-like ornaments with 10–12 spiral beads (KM 20450:12, 16, 19, 31; Fig. 4j) have been found, but a broken ornament (KM 27196:35034) in Turku Kirkkomäki grave 35 had a similar fan-like shape, although it was sewn with wool yarn and not horsehair. In the dress reconstruction, the Kirkkailanmäki fan-like ornaments are placed at the shawl's corners based on the locations where they were found in the grave.

The typical pattern for female shawls is to place separate roundel or small, looped square ornaments next to the corners, a larger ornament in the middle of the upper long edge with possibly smaller ornaments on both sides of it, and a corresponding larger ornament on the lower long edge, again possibly with small ornaments on its sides (Appelgren-Kivalo 1907: taf. V and XI; Hirviluoto 1973: 61–63; Tomanterä 1984: 39–40; see also Riikonen 2023: 74–75). Small

roundels might be placed along the edge as well. The Lieto Ristinpelto 86 shawl has a series of seven ornaments on the upper long edge in a symmetrical pattern, with the outermost looped ornaments (Fig. 4d) having been placed 63 cm apart from each other. Under the ornaments, separate loops were sewn onto the tablet-woven band bordering the shawl, most likely for attaching the shawl during use. Curiously, another pair of similar looped ornaments was found in the grave, suggesting other possible ways of wearing and attaching the shawl, which were not explored in this study. Another possibility is that there were two separate shawls in the grave, and the other pair of looped ornaments belonged to a second shawl.

The Masku Humikkala 31 and Turku Kirkkomäki 35 shawls contain both cross-work endings and separate ornaments. For the Humikkala 31 shawl, separate spiral patterns decorate the cross-work between two tablet-woven bands (Fig. 5), but only one possible corner ornament (KM 8656:H31:26), typically placed at the band ends, was found in the storage box where the finds are placed to resemble the

grave setting. Regarding the child-sized shawl found at Kirkkomäki 35, several small flower-like roundels could be recognised as originating from the shawl endings, showing traces of having been made at the end of a band (Wright et al. 2024: 87).

Since the spiral ornaments found in male graves are scarce and the textiles connected to them mostly in bad condition, it is quite difficult to reliably assess their placement in a garment. Certain similarities with ornament patterns found in female graves suggest their default use as shawl ornaments, but not much can be said about the dimensions of the fabric. Moreover, the likelihood of spiral decorations having originally been placed on different garments, or their displacement in the grave, are also possibilities.

The spiral decorations are subject to visual change during their time in use. The spirals on the original shawls were made using different copper alloys containing copper, zinc, tin and lead, varying slightly in colour. Moreover, different parts of the wire-drawing process affect the colour of the metal, and even though spirals can be polished, the shine disappears through the oxidation process and decorations already sewn onto fabric cannot easily be repolished (Aspö 2022: 21–22). The original spiral ornaments found on the shawls would probably have undergone several stages of spiral colour change if they had been in use for longer time periods. The commercial wire used in most reconstructions is bronze, with the colour varying from reddish to silverish depending on the amount of tin mixed with copper. Other commercially available copper-alloy wires also have zinc, resulting in more yellow or even a slightly greenish shade of colour. All such ornaments also change to darker and duller shades of colour over time.

Sensory and experience-based process of producing a shawl

Re-examination of old finds has yielded new insights and challenged previous interpretations of the handicraft techniques used in making spiral decorated shawls. Conservator and weaving instructor Maikki Karisto analysed a well-preserved shawl ending from Masku Humikkala grave 31. Based on her vast experience in various braiding techniques and reconstruction experiments, Karisto determined that the cross-work on the shawl ending was

not created using finger-loop braiding, as previously believed. Instead, she identified an 8-yarn braiding technique without loop ends as the method used (Pasanen & Sahramaa 2021: 246–247). This technique proved to be more efficient and logical for the cross-work braiding process compared to finger-loop braiding.

Visually, the end results of finger-loop braiding and 8-yarn braiding are nearly indistinguishable, with the primary difference being the process. Such discoveries, although easily overlooked, significantly impact our interpretation of ancient techniques. In experimental archaeology and reconstruction projects, both archaeologists examining the finds and craftsperson(s) doing the actual physical interpretation continually confront questions such as, ‘would they have done it this way?’ and ‘why would they choose this method?’ An impractical or difficult interpretation, such as the use of finger-loop braiding for cross-work end decorations added to a shawl, can lead to either scepticism about the interpretation or an underestimation of the intelligence and capabilities of ancient people.

Despite the 8-yarn braiding technique being simpler and faster, the creation of cross-work decorations still requires considerable time and effort. For instance, producing the tablet-woven finishing bands, braiding the warp yarns, composing the spiral ornaments in the cross-work and tablet-weaving decorative bands onto the long edges of a child-sized shawl (51 cm wide) took even an experienced artisan more than 50 hours. The production of an adult-sized shawl using Late Iron Age methods involves extensive labour: shearing or plucking wool, sorting and preparing it, spinning and plying it with a spindle, setting up a warp, weaving on a warp-weighted loom, acquiring and applying the dye, and finally, tablet-weaving, braiding and sewing (see, e.g. Matsin 2010; Nørgaard 2011; Vedeler & Hammarlund 2017; Pasanen & Sahramaa 2021: 36–41). Additionally, the production of spirals requires drawing copper alloy wire to the appropriate thickness, twisting it into spirals, cutting it to length, and arranging and threading in the ornaments (Leppäaho 1949: 54–66; Matsin 2010: 181; Rammo & Ratas 2019: 127–129). Even with commercially produced yarns and wires, the reconstructions

effectively demonstrate the significant resources, time and skills needed to produce spiral decorated shawls.

Shawls in the grave

Most spiral decorated shawls found in South-West Finland were used as a cover or to wrap the deceased in the grave (Appelgren-Kivalo 1907: 29, 44–45; Hirviluoto 1973; Asplund & Riikonen 2007: 26). In this study, the shawls found at Lieto Ristinpelto 86 and possibly in Turku Kirkkomäki graves 11 and 35 were used to cover the deceased (Katiskoski 1992: 81; on descriptions and maps of Turku Kirkkomäki

graves 16 and 35 pers. comm. Jaana Riikonen). The shawl found in Masku Humikkala grave 31 was dressed to the body as it might have been worn in life, and the same applies to the interpretation of spiral decorations found in Hollola Kirkkailanmäki grave 4 as corners of a shawl (Fig. 7). With respect to Turku Kirkkomäki grave 16, Jaana Riikonen (pers. comm.) suggests that the shawl was placed at the bottom of the coffin and the long sides wrapped to cover the deceased.

The case involving the shawl found in Salo Rikala grave 24 is more complicated, as there are no remains of the deceased left, and it is not possible to determine how items related to the



Figure 7. Hollola Kirkkailanmäki grave 4/1978 a) map of spiral decorations (KM 20450:12, 16, 19, 26 and 31) connected to the shawl (after Lehtosalo-Hilander 1980: 67); b) testing placement of spiral decorations in a grave setting; c–d) reconstructions of spiral ornaments made by Jaana Ratas. Images: Jenni Sahramaa and Riku Pasanen.

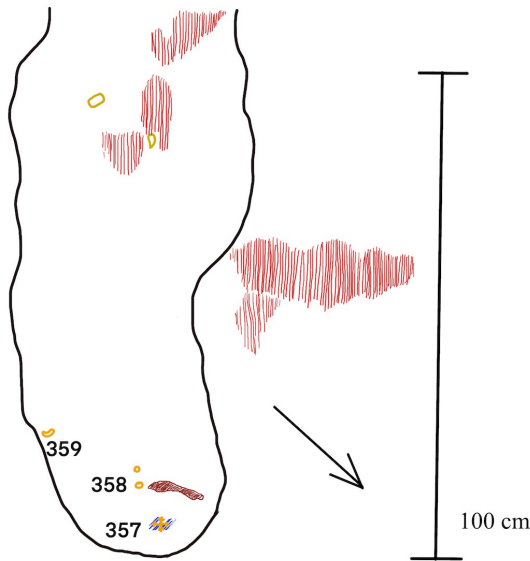


Figure 8. Map of spiral decorations (KM 12690:357–359) in Salo Rikala grave 24. Image: Jenni Sahramaa after Leppäaho 1955 Map 47.

clothing are placed in the grave in relation to the body. At the northeastern end of the grave, a larger cruciform ornament (KM 12690:357; Fig. 4h) and two smaller round ornaments (:358–359) were found together with an iron knife (Fig. 8). After an empty space of approximately 60 cm, copper alloy fittings with some leather remains, possibly from a belt or a sheath, were found; then, the shape of the burial pit was sharply cut, with a total length of approximately 115 cm. Curiously, several patches of red ochre were found at the bottom of the grave. (Leppäaho 1955: 30–31.) Another quite similar cruciform spiral tube decoration (KM 12549:9) was also found at Rikala, but unfortunately the position of this ornament in relation to the deceased could not be observed either (Leppäaho 1955: 5). Both ornaments were nonetheless assumed to have originated from shawl fabrics (Leppäaho 1955: 5; see also Hirviluoto 1992: 96, 102).

To trace the potential placement of spiral ornaments, practical tests with shawl reconstructions were conducted. For Lieto Ristinpelto grave 86 and Hollola Kirkkailanmäki grave 4, the hypotheses regarding the shawl placements and reconstruction dimensions proved plausible. For Turku Kirkkomäki grave 11, most of the small roundel ornaments were found together

with the penannular brooch in the presumed place of the head, at the southwestern end of the grave (Fig. 9a). However, one ornament (KM 22631: 74) was found at the other end, approximately 210 cm away. Thus, tests were conducted in which most decorations were placed at one end of the 200 cm-long piece of fabric (Fig. 9b). The fabric was large enough to cover or wrap the test person in several ways.

For Turku Kirkkomäki grave 16, most ornaments were found in a face-down position in the place of the chest of the deceased, together with other objects and several layers of textiles (Fig. 10a–b). The ornament furthest away, the small roundel (KM 27025:16066), was found near the left knee, where a silver penannular brooch (KM 27025:16045) had also been placed. A test was done by placing a 150 x 100 cm shawl at the bottom of the coffin, right side up, and wrapping it around the body so that the short edges of the rectangular fabric ended on top of the chest (Fig. 10b). Even though the grave contained four penannular brooches, in this interpretation they were not used to attach the shawl fabric as it would have been worn in life, because the ornaments were found face down. In the tests, it was discovered that the length of the test shawl, based on the dimensions of female shawls, was

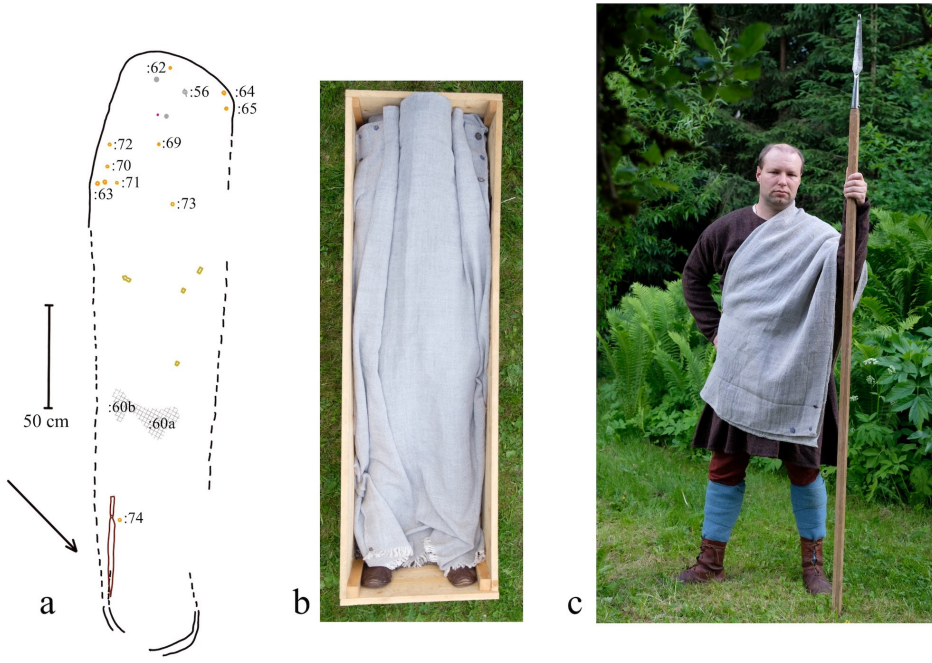


Figure 9. Turku Kirkkomäki grave 11 a) map of spiral decorations (KM 22631:62–65, 69–74; after Katiskoski 1984); b) covering a body with the test shawl; c) wearing the shawl with same placement of spiral decorations. Images: Jenni Sahrmaa and Riku Pasanen.

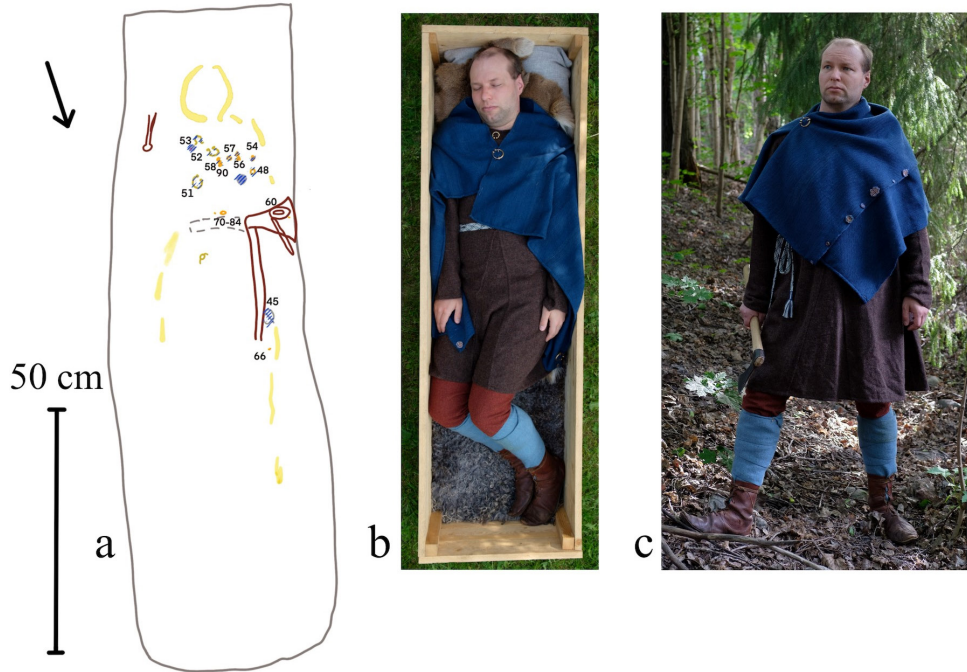


Figure 10. Turku Kirkkomäki grave 16 a) map of spiral decorations (KM 27025:16048, 16054, 16056-58, 16060, 16066-67, 16071-73, 16083-84, 16089-90, 16093; after excavation map provided by J. Riikonen); b) Test shawl placed on the bottom of the coffin and wrapped around the body; c) Wearing the shawl partly folded and placing the brooch on the shoulder. Images: Jenni Sahrmaa and Riku Pasanen.

barely long enough to wrap around the test person's broader shoulders. Most probably the male shawls would have been larger than the ones found in female graves.

Shawls in use

In prior studies, models wearing ancient costume reconstructions are mostly displayed in very static postures (see, e.g. Lehtosalo-Hilander 1984: 42–43; Luoma 2003: 48–61). Shawl reconstructions are worn on the shoulders with no brooch to attach them or else carried on one arm with the brooch attached to the fabric. In several pictures, spiral decorated shawls from Perniö and Masku costumes have been dressed on the head (Lehtosalo-Hilander 1984: 63; Luoma 2003: 56). This choice of display is connected to the idea that spiral decorated shawls found in South-West Finnish graves from the 11th to 13th centuries might have their stylistic models in Eastern Orthodox depictions of Saint Mary (Lehtosalo-Hilander 1984: 63; Riikonen 2018). Models for decorating clothing with metal ornaments have also been sought from the east, suggesting that the fashion had Byzantine origins

(Hirviluoto 1973: 67; Lehtosalo-Hilander 1984: 63).

In Orthodox icons, three golden stars are generally placed on Mary, one on the forehead and one on each shoulder, symbolising her virginity (Riikonen 2018: 56). The shawls found in Lieto Ristinpelto grave 86, Masku Humikkala grave 32 and Perniö Yliskylä graves 1 and 6 include a large ornament in the middle of the long edge, which would have been placed on the forehead. Both the Ristinpelto 86 and Yliskylä 6 shawls, however, contain several ornaments in a row, while the Humikkala 32 and Yliskylä 1 shawls seem to fit the pattern of three ornaments, resembling Mary's stars.

In practical experiments carried out wearing different spiral decorated shawl reconstructions over the head, the style proved possible but not very practical (Fig. 11a). Compared to the long *mafori* worn by Mary in Orthodox icons, the shawl reconstructions are rather wide and short and cannot be wrapped around the head and shoulders in the same way as a long scarf. Softer shawls, like the Ristinpelto 86 reconstruction, could have been wrapped around the head and shoulders quite easily, while stiffer fabrics fell



Figure 11. Lieto Ristinpelto grave 86 shawl reconstruction a) worn on the head; b) worn on the shoulders attached with a cord. Photos: Riku Pasanen.

in a straighter manner. Placing the shawl fabric directly over one's hair creates a situation in which the shawl slips backwards off the head with the slightest movement. Wearing a scarf under the shawl helps somewhat, as wool or linen fabric is less slippery than hair. Even so, if spiral decorated shawls had been worn like this in life, the practice was probably restricted to special occasions, where a person would mostly have stood still.

In Masku Humikkala grave 31, a silver brooch suitable for attaching a shawl was found in the middle of the chest of the deceased, although unfortunately with no textile remains. A brooch in this position has commonly been found in Finnish graves, but in most cases with no direct connection to the shawl fabric, so it is unclear if the brooch had been used to attach the shawl to the person or placed on another fabric, as with the peplos dress (Tomanterä 1982: 162; Hirviluoto 1985: 11–12). Not attaching a shawl in one way or another to a person proved, however, quite impractical in the tests, as just placing a garment on one's shoulders again required that the wearer mostly stands still. The only brooch found in Ravattula Ristimäki grave 41/2016 has been deemed too small to support the reconstructed shawl, while the Ravattula shawl reconstruction is attached to the body with a wool braid (Riikonen 2023: 77). This same solution was tried with the Lieto Ristinpelto 86 shawl, which contained loops for attachment, but no brooch was found in the grave (Fig. 11b).

Most of the fabrics seem to have been quite thin, and we have noticed that in winter use, the shawl reconstructions do not provide much warmth against wind or cold. Also, the number of metal decorations and long fringes in the female shawls place them firmly in the category of festive or ritual clothing rather than outer garments preferred for use against the elements. The studied male shawls, while having far fewer spiral ornaments and no cross-work decorations at the ends, did not differ in terms of the textiles' visual characteristics or the densities of the fabrics used compared to female shawls. Their use might still have been different, though.

Based on the placement of brooches or pins and the placement of spiral ornaments in some 10th-century graves in Eura Luistari cemetery, Lehtosalo-Hilander (2000a: 206–207; 2000b: 248 and image 260; 2001: 81) suggests that the shawls were designed for use as large rectangular

garments, attached from the right shoulder or more often under the armpit at the waist and carried partly folded. Sometimes, the brooch has been found on the left side of the body, possibly indicating a desire to leave the stronger left hand free for left-handed persons (Lehtosalo-Hilander 2000a: 206). Riikonen (2006: 380–381) has sought parallels in contemporary depictions of dress from Central Europe and stresses the importance of symbols of power in clothing. For example, a 10th-century Bavarian manuscript and the Bayeux tapestry show that it was seemingly a common practice to attach a shawl at a person's right shoulder (Riikonen 2006: 381; Bayeux Museum 2023).

Wearing test shawls attached to the right shoulder or at the waist has had interesting consequences for our understanding of the placement of spiral decorations. If the wearer wanted to display the decorations, they then would have needed to place them near the short edge of the garment and at the corners² (Fig. 9c and 10c). Questions of practicality were strongly emphasised in discussions during the tests, perhaps because the male test wearers were historical reenactors involved in martial arts. If the shawl was attached at the shoulder, then folding it either partly or totally in half was strongly preferred by the wearers to allow for undisturbed movement of the arms, at least from the elbow downwards. Folding the top part of the shawl while wearing the brooch on the shoulder also made it possible to use the folded part as a head cover. A third way of attaching a shawl onto the body was also proposed during the tests: wrapping the shawl, partly folded, around the body and under the armpit and then attaching the brooch to the shoulder. This use would have made the shawl similar to a peplos-type dress but attached only from one shoulder. Similar use has been proposed by Lehtosalo-Hilander (2001: 75) for the ancient costume shawl from Mikkeli.

Shawls, rituals and meanings

Changes in spiral decoration styles have been discussed from the viewpoints of fashion and pan-European trends of decorating coloured fabrics with metals, like gold and silver (Lehtosalo-Hilander 1984: 62–63). The combination of dark blue fabrics with shimmering metal decorations

has been striking, but spiral ornaments may also have had magical and symbolic meanings both for the living and as a protection for the deceased on the journey to the afterlife. Jaana Riikonen (2005) has suggested that the spiral decorations on aprons carried meanings connected to fertility and protection. Common assumptions in the archaeological interpretation of burial rituals are that the treatment of the deceased and objects placed in the grave are the result of deliberate choice and reflect beliefs concerning the afterlife (Ekengren 2013; Koski & Moilanen 2020), and that the deceased were buried in their best clothing (Lehtosalo-Hilander 1984: 2; Riikonen 2005: 32).

Using spiral decorated shawls as burial covers might have carried strong meanings during the ritual preparations of the deceased for the grave. Shawls have covered other parts of the clothing as well, and, for example, in Turku Kirkkomäki graves 11 and 35 probably also the face of the deceased. The large cruciform spiral ornament found in Salo Rikala grave 24 (KM 12690:357, Fig. 4h) might have connected the deceased to the new faith, as Hirviluoto (1992: 102, 104) has proposed. Even though discussing the conversion to Christianity at length is beyond the scope of this article, it is worth noting that cruciform spiral ornaments are common finds from the 11th to the early 13th centuries, and they represent a craft technique produced locally.

CONCLUSIONS

Spiral decorated shawls have been expensive and special garments with strong connections to identity. Making them required resources, time and skill, which is especially true for the most elaborate examples of female shawls. The act of producing handwoven shawl reconstructions with different spiral decorations has yielded much contemporary practical craft knowledge about this clothing tradition and provided insights that may reflect the thoughts and experiences of the producers of the original shawls. Producing a reconstruction requires making several decisions and solving practical problems that the fragmentary textile finds do not answer in themselves. Thus, the reconstruction process helps us to understand the properties of the original garment, not just recording what is left.

Earlier research on spiral decorated shawls has concentrated on shawls found in female graves. The three studied male shawls from Turku Kirkkomäki and Salo Rikala as well as the child-sized shawl from Kirkkomäki examined here were produced within the same craft tradition as the female shawls found in the cemeteries. Similarities in spiral decoration techniques and fabric types confirm that spiral decorated shawls were part of the clothing of both genders in the Late Iron Age. Similarities in shawl finds from different cemeteries in South-West Finland have inspired researchers to think they were produced in close collaboration (Hirviluoto 1973: 66) or by specialised craftswomen (Lehtosalo-Hilander 1984: 24). In the future, a closer analysis of more extensive cemetery data might bring us closer to understanding such individuals and perhaps even the families that used the garments: for example, the richly equipped man and child from Kirkkomäki graves 16 and 35 were buried close to each other as well as to the woman in grave 27, who had two spiral decorated shawls buried with her (Asplund & Riikonen 2007: 20, 27).

Sensory archaeology of textiles is closely interwoven with the making of reconstructions and the understanding of textile crafts gained from experimental archaeology. In an ideal world, all archaeological reconstructions could be carried out in close collaboration with a research team consisting of the archaeologist(s) and handicraft specialist(s), with the possibility of checking interpretations and the results of preliminary experiments against details from the original find (Andersson Strand & Demant 2023: 6). Since such collaboration is rarely the case, the possibilities that the reconstructed object reflects the properties of the original depend on the available resources and all the choices made during the reconstruction process.

In this study, we experimented with the placement of spiral ornaments found in male graves in differently sized shawl fabrics. Testing the placements both in funeral setting reconstructions and with different ways of wearing the shawls in life strengthened the interpretation that male shawls were most probably larger in size than female shawls and carried in a different way. Such experiments are also highly valuable in evaluating evidence

for future reconstruction work, and they will be continued before producing more exact reconstructions of spiral decorated shawls found in male graves. Moreover, the reconstructed garments should not only be used as visualisations of archaeological data, but also as a starting point for practical studies of their properties and use. Here, the observations are limited to the subjective perspectives of a few test wearers. Next, a more systematic approach to gathering data from user experiences should be developed, and a broader group of test subjects should be involved in the experiments to evaluate the perspectives discussed in this study.

To conclude, although no reconstruction is ever perfect, the value of a spiral decorated shawl reconstruction project lies in the fact that it can yield important new information about and new perspectives on the original finds. They are whole, tangible objects, and the process of both making and using such garments helps scholars formulate new research questions and connect the detailed handicraft information to larger questions when interpreting Late Iron Age culture. Spiral decorated shawls reflect both local craft culture and personal choices in the making of a garment as well new influences resulting from the large exchange network of raw materials and cultural contacts.

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NOTES

¹ Ravattula yarns are specifically ordered from Pirtti Spinnery by the company Elonvillia, which supplies yarns suitable for the Ravattula costume and other ancient costume projects (Honka-Hallila et al. 2023b: 96–97).

² Special thanks to Jouni Tossavainen for first pointing this out.