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Experimental Approach to the Ergonomics of Textile Production in Bronze-Age Greece

Limitations and Prospects

Introduction

When he introduced the term ergonomics in 1857, Wojciech Jastrzębowski had in mind holistic research on human and non-human (!) work which he perceived as a positive driving force of development leading to general benefits for humanity such as increasing property, skills, perfection and happiness (Jastrzębowski 1857). In this paper, the term 'ergonomics' is defined as a tendency for humans to adjust their working environment to the capacity of the human body and it is used to describe labour required by textile technology and an effective organisation of textile work (see Penrose 2013, 686-695 for the concept of ergonomics in archaeology of contemporary world; for modern definitions of ergonomics see Dempsey, Wogalter, Hancock 2006). But it also refers to Jastrzębowski's original ideas perceiving pleasantness, playfulness, satisfaction, skills and theoretical knowledge as integral components of human work.

It seems that the ergonomics, being so closely related to the human body and to work, is scarcely reflected in archaeological evidence and, therefore, remains largely intangible for textile archaeology and difficult to examine in the academic discourse. However, the precepts of ergonomics may be investigated by tracing all those means which were applied to optimise work and workloads, organise a workplace and design tools in order to make them the most convenient for human use.

This paper presents a short overview of how ergonomics may be approached by integrating archaeological evidence with experimental and experience textile archaeology, taking the textile technology in Bronze-Age Greece as the focal point of reference. It aims to suggest that the ergonomics of textile production constitutes a substantial component of textile technology, especially with regard to the organisation of a workplace, the division of labour, the balance between labour investment and efficiency, and the usability of tools. It also suggests that the results of contemporary experiments may shed some new light on how the textile labour may have been maintained and perceived in the past.

Ergonomics and awareness of it in past societies

It may be suggested that the term ergonomics correlates with other concepts referring to work, practice and skills, such as tacit, non-discursive or embodied knowledge excluding, however, the frequently-acknowledged dichotomy between theoretical knowledge and practice or technology (cf. Ryle 1949, 14-48; Polanyi 1966, 4-52, especially 7; Dobres 2000; Molander 2004; Bender Jørgensen 2007; 2012; Ciszuk 2007; Budden and Sofaer 2009, 203-205, 207-209; Kuijpers 2012). On the contrary, the ergonomic organisation of work and design of tools may be perceived as a manifested combination of both 'mechanical' and theoretical aspects of the argued duality of technology and knowledge.

The origins of ergonomic needs for efficient and convenient tools and for minimising workloads have already been traced back to distant prehistory (cf. Bailey 1983; Lupo and Schmitt 2002; Menin, da Silva and Paschoarelli 2012). But a more conscious improvement in living and working conditions, implying a human-centred basis for the overall design, was argued to have been born in classical Greece (Marmaras, Poulakakis and Papakostopoulos 1999). Since the explicit use of the concept of ergonomics in societies of Bronze-Age Greece cannot be argued, the term 'ergonomic criteria' has been introduced to indicate those aspects of labour which reflect the human need for ergonomic adjustments to the working environment.

Considering the large scale, complexity and highly time-consuming and labour-intensive character of textile production in Bronze-Age Greece, it may be suggested that ergonomic criteria for the organisation of workplaces, the division of labour and the designing of tools were already present at this time. Even if efficiency itself may not have been the prime concern of the earliest textile workers (cf. Barber 1994 for near-idyllic images of the work of early textile workers), the need for minimising labour investment likely existed as well.

Ergonomic criteria for the organisation of textile production in Bronze-Age Greece

Ergonomics of workplaces

Although several textile workshops and dye-works have been identified with certainty in archaeological evidence, such discoveries are as yet quite random. Function, date and (incomplete) state of preservation do not allow, therefore, any generalised overview of the ergonomic criteria applied in the spatial and architectonic design of textile workplaces to be presented.

Various strategies for the organisation of work may, however, be traced in specific buildings and installations, demonstrating a broad range of ergonomic choices and reflecting both specific technical requirements for activities conducted and various modes of the organisation of work. From the Neolithic period onwards, archaeological evidence has allowed us to distinguish between domestic and public contexts of textile production (e.g. Knossos and Phaistos: Evans 1964; 1968; Burke 2010; Militello 2012), complex and specialised dye-work installations (e.g. Chryssi and Pefkas: Apostolakou, Brogan and Betancourt 2012; Betancourt, Apostolakou and Brogan 2012; Brogan, Betnacourt and Apostolakou 2012), specialised and large weaving workshops (e.g. Akrotiri: Tzachili 1990; 2007) and multi-craft workshops where several industries were practiced within one space (e.g. Mochlos: Soles 1997).

Even small-scale remains of textile production, such as the early Bronze-Age settlement at Myrtos Fournou Korifi on Crete, show ergonomic criteria for the organisation of the workplace (Warren 1972). Textile production at Myrtos was carried out at only a few spots recognised thanks to the concentration of textile tools combined with several built-in installations providing heating, dyeing and drying facilities in the close vicinity. Those arrangements allowed consecutive procedural sequences to be executed, such as heating water, preparing fibres and dyes, washing/dyeing, drying, spinning and weaving at the very same spot, showing that thinking about work and workloads from the perspective of ergonomics was already there.

Ergonomic design of textile tools

Recently, the functionality of textile tools and the complex relationship between their forms and the parameters of final products, i.e. yarns and textiles, have been clearly acknowledged (Andersson Strand and Nosch 2015), proving that the forms of tools were designed to meet technical requirements of the products.

Several archaeological experiments in spinning have suggested that the quality of yarn may also result from an individual preference of the spinner for spinning threads of a certain diameter (Grömer 2005; 2010, 93, Abb. 36; Kania 2013; 2015), and this may, in turn, suggest that some personal preferences for specific tools or forms of tools existed as well.

The forms of textile tools in Bronze-Age Greece did not differ a lot from tools found in the neighbouring areas (cf. Barber 1991; Andersson Strand and Nosch 2015). However, certain specific forms were found almost exclusively in quite restricted areas, such as the cuboid and spherical loom weights from central and eastern Crete (Barber 1991; Burke 2010; Cutler 2012; Andersson Strand and Nosch 2015). Other forms, such as discoid loom weights, spread over a large area and, in addition to the already acknowledged factors which may have contributed to their wide distribution (Cutler 2012; Pavúk 2012), the ergonomic design of those loom weights resulting in their universal usability may also be highlighted.

Generally, the long-lasting forms of textile tools, some of which had appeared as early as the Neolithic period and have survived until recently, may suggest the appropriate, if not optimal, tool design and their high expediency for users (cf. Marmaras, Poulakakis and Papakostopoulos 1999, 365).

Division of labour and workloads

It is generally assumed that textile production was highly gendered and performed predominantly by female workers (cf. Barber 1991; 1994; Olsen 2014). Although other studies admit that the complex *chaîne opératoire* of textile manufacturing also required the involvement and work of men, children and the elders (cf. Barber 2007; Breniquet 2010; Costin 2013), the monotonous and safe character of several operational sequences (namely spinning and weaving) which allowed work to be combined with childcare was argued as a general rationale behind engendering the labour (Brown 1970; Barber 1994, especially 29-30).

For most phases of the Bronze Age in Greece, it is difficult to speculate about the division of labour beyond this general assumption, with a notable exception of the Mycenaean administration system which left behind fairly large amount of specific data about the huge scale and meticulous organisation of textile industry controlled by the palaces. Thanks to those records, it is possible to assess the number of textile workers employed in one working group/ workshop contracted or run by the palace, to consider the social position and occupations of textile workers, to estimate expected production deliverables (including specialist products) and even to speculate about the existence of a craft education system (cf. Killen 2007; Burke 2010, 66-103; del Freo, Nosch and Rougemnot 2010; Olsen 2014).

Experimental and historic comparanda imply that large workloads were required to fulfil the contracted or ordered tasks (Andersson and Nosch 2003; Nosch 2012; Olofsson, Andersson Strand and Nosch 2015) and it may be assumed that the efficiency of textile production was of much concern to the Mycenaean palatial administration. However, more specific ergonomic criteria applied to meet such high needs and expectations could not be recognised at present.

Experimental approach to the ergonomics of textile production

The ergonomics of textile production has become a subject of study of experimental archaeology, even if the ergonomics itself was not specifically addressed in the posed research questions. In a result of experimental research on the workloads required at each of the consecutive operational sequences, the highly time-consuming character of textile work has been clearly acknowledged (Andersson and Nosch 2003; Andersson Strand 2010b; Olofsson, Andersson Strand and Nosch 2015, 97-98), thus highlighting the importance of the ergonomic organisation of work. The experimental approach to the functionality of textile tools has demonstrated that the design of those implements, especially their weight, height, diameter and thickness, were subordinated to practical needs for obtaining threads and textiles of various quality (Mårtensson, Andersson Strand and Nosch 2009; Olofsson, Andersson Strand and Nosch 2015). As C. Cheval has demonstrated experimentally, even certain peculiarities of shape which may not be easily explained by using the criteria of usability, such as grooves at the upper edge of some discoid loom weights, may have had their rationale in the manufacturing process (Cheval 2008).

According to E. Andersson Strand, a broad terminological umbrella of 'experimental textile archaeology' entails three main research methods: experimental archaeology as a method, ethnographic studies and experience archaeology (Andersson Strand 2010a). The last term encompasses a general hands-on introduction to technology. Alternatively, experience archaeology is also defined as 'exploratory experimental archaeology' (Miller 2007, 34-35) and 'experiential activities' (Outram 2008, 3-4). Acquiring of hands-on experience in textile technology allows one to perceive the nature of labour in person and raises the awareness of how the non-discursive components of technology, such as hardships, pleasantness and satisfaction from work, may have affected the final effectiveness and productivity. Therefore, experience archaeology may be seen as one of the methods of investigating, or at least penetrating, the ergonomics of textile production.

Experience archaeology and academic discourse

Experience archaeology serves primarily as an effective, if not indispensable, teaching tool in studies on any technology (Clarkson and Shipton 2015). Due to the less formal organisation of hands-on activities, usually lacking for any explicit hypothesis to be tested and being less strictly relevant to any specific archaeological evidence, the research value of experience archaeology seems to be seriously limited. However, the results of experiential activities have still been acknowledged as a possible source of analogies with the past (cf. Miller 2007, 35), especially if the tests are repetitive and documented over a longer period of time, and performed according to previously established principles (Ulanowska 2016 forthcoming). The weaving activities discussed herein were conducted by me with students of the Institute of Archaeology at the University of Warsaw since 2011, as part of regular teaching courses dedicated to textile production and technology in Bronze-Age Greece. Each course is scheduled within the 60 hour time-span, comprising of c. 30 hours of lectures and c. 30 hours of hands-on activities. Until now, 70

Department of Aegean Archaeology, Institute of Archaeology UW
BAND WOVEN ON A LOOM WITH A RIGID HEDDLE - DOCUMENTATION CARD

Name and surname	Band no.	Date

SCHEME OF THREADING

BAND PARAMETERS:		LOOM PARAMETERS:			TIME OF WORK:
Fibres:		Loom width in cm:			Time of designing the pattern in min:
Thread diameter in mm:		Shed height in cm:			
Threads / 1 cm^2:		Loom setting:			Time of warping the loom in min:
WA:	WE:	backstrap	vertical	horizontal	
Weight of band:		Warp setting:			Weaving time in min:
		vertical	horizontal	diagonal	
Fabric dimensions in cm (without finishing):		Warp tension, if possible to determine:			Finishing time in min:
L:	W:	Total in g:	1 thread/g:		
Finishing:		Length of working area in cm:			Total working time in min:

DESCRIPTION OF WORK:

Required level of attention:				General comfort of work:	Satisfaction from work:
warping	high	medium	low	high	high
weaving	high	medium	low	medium	medium
finishing	high	medium	low	low	low

OTHER OBSERVATIONS AND A DESCRIPTION OF WORK:

Picture overleaf

Fig. 1. Documentation card for a band woven on the rigid heddle.

participants altogether have completed the courses, including seven students who decided to attend twice. The comparable number of participants each year, the repetitiveness of the experienced activities, as well as the considerable time investment in practice, have inspired me to monitor students' work and to use those observations as possible comparanda to textile work in the past.

In 2013, in order to make the process of monitoring more scholarly and systematic, a card system of documentation was elaborated (Ulanowska 2014, 153-157; 2016 forthcoming). This system was designed to record these activities which are practiced more than once during each course, i.e. weaving on rigid heddles (tabby bands and tabby bands in warp-floating technique), weaving on tablets and weaving on warp-weighted looms. It comprises of four card layouts respectively, tailored to record the parameters of a fabric and the process of weaving it by an individual weaver (Fig. 1). All cards contain similar components, referring to the weaver and his/her experience (name, date, number of fabrics woven in a recorded technique), the fabric (its structure and parameters), the process of weaving (setting up the loom, working position) and, finally, the work (time of work, subjective comfort of work, satisfaction from work). But, since each card was designed to document a specific weaving technique, it also contains specialist questions about it. The card system is open-ended and more cards and more questions may be included in the documentation in the future,

Over time, the underlying methodological principles were established by formulating the following tenets of performance, inspired by the principles established at the Danish National Research Foundation's Centre for Textile Research for experimental research on the function of textile tools (Andersson Strand 2010a; Olofsson, Andersson Strand and Nosch 2015, 76-77):

- all activities are scheduled according to the *chaîne opératoire* sequences and their temporal organisation as Do It Yourself tasks;
- looms and weaving techniques are selected based on the current knowledge of the Aegean Bronze Age textile implements and weaves;
- all loom weights, spools and spindle-whorls used in experience activities are copies of Bronze-Age implements from archaeological sites in Greece;
- students/actors are always informed of gaps in archaeological evidence, either for operational sequences of weaving, the construction of looms or certain categories of textile tools;
- students/actors are always informed that textile production in Bronze-Age Greece was highly specialised and that there were various modes

Fig. 2a-c. Textile workshop in the Institute of Archaeology, University of Warsaw with ergonomic arrangements of the work place.

of its organisation but the manner in which they proceed has no relevance to those organisational systems;
- students/actors are always informed that the manner in which they proceed is suggested by traditional craft and ethnographic analogies and that there may be more than one manner of execution for each of the tested activities;
- whenever there is a greater number of manners of execution or procedural choices, at least two of them are demonstrated and tested;
- the documentation system covers descriptions and photographs of all operational sequences combined with a card system for documenting pieces of experientially woven textiles and their weaving as the work of an individual;
- students/actors are not skilled craftspeople and their observations on weaving can only be further analysed bearing in mind this important qualification (cf. Ulanowska 2014, 2016 forthcoming).

Bearing in mind the limitations resulting from the said principles, the documented experience of labour will be further discussed with regard to the concept of ergonomics.

Experience of the workplace and the ergonomics of textile tools

Since 2012, all the experience activities have been performed in a 'textile workshop' arranged in a staff office-room in the Institute of Archaeology with an area of c. 30 m^2. Depending on the nature of the performed jobs, the room may comfortably hold up to ten working people, although more students happened to work simultaneously in clearly less comfortable conditions (Fig. 2). The basic arrangement of the room could not have been changed, except for the place where two warp-weighted looms and a big working table were placed. All smaller textile tools and yarns are kept in cardboard boxes in the office cupboards and on the floor.

The ergonomic arrangement of this workplace was, therefore, largely limited but still several unplanned improvements to the workplace were successively made. All of them resulted from the need for optimising the working conditions, even if the work itself was performed occasionally and within the time-span limited to the three hours of a single lesson. Within those adaptive strategies all openings/holes, pegs or hooks in the looms and on the walls were employed to put aside the used tools, such as shuttles, weft bobbins, weaving combs, pins, scissors, in order to free the workers' hands. Accordingly, all tools which turned out to be suspendable were provided with threads or strings which made it possible to hang them out or to hang them on the workers themselves.

The main use of the textile tools employed in experiential activities is adequate to their recognised function in the *chaîne opératoire* of textile technology. Nearly all replicated and tested Bronze-Age Aegean loom weights, such as discoid, cuboid and crescent-shaped forms, as well as tools identified as possible loom weights, such as spools and cylindrical weights with three perforations, were evaluated as suitable if not comfortable tools for weaving. A preference for choosing heavier tools which provide higher tension has been observed among inexperienced weavers who usually perceived the heavier tools as being easier to work with.

It seems, however, that ergonomic thinking about how the workplace and tools may be fully exploited resulted in less obvious techniques of use of the available equipment. The warp-weighted looms also appeared to be practical devices for weaving starting borders and warping, and their cloth-beams were set up for being used in various techniques of band weaving (Fig. 3) with crescents, cylinders with three perforations, large cones and spools employed as expedient weights for vertical tensioning of warps (cf. Ulanowska forthcoming). The highly ergonomic design was especially recognised in the form of spool-shaped objects which may also serve as thread containers and reels providing continuously unwinding thread for knitting the heddles (cf. Siennicka and Ulanowska 2016).

Experience of textile labour and labour division

Weaving and spinning is practised in the classroom in the manner which I have been taught by Anna Grossman, archaeologist and textile practitioner from the Biskupin Archaeological Museum in Poland. But the basic manner of performance has been modified or adjusted, according to scholarly descriptions of weaving techniques (e.g. Hoffmann 1974; Collingwood 1982; Ræder Knudsen 2014), new solutions resulting from our practice and experience (cf. Siennicka, Ulanowska 2016) and consultations with colleagues.

Weaving bands on rigid heddles and tablets is demonstrated and experienced in two working positions: sitting and standing. In sitting position, the tension is provided by the body of the weaver who ties himself/herself to the band loom or by stretching warps between two fixed points. In standing position the warp is set up vertically and gravity-tensioning is provided by a suspended weight or spools. The students are encouraged to practise band weaving in all working positions and then to choose the one they feel the most comfortable with.

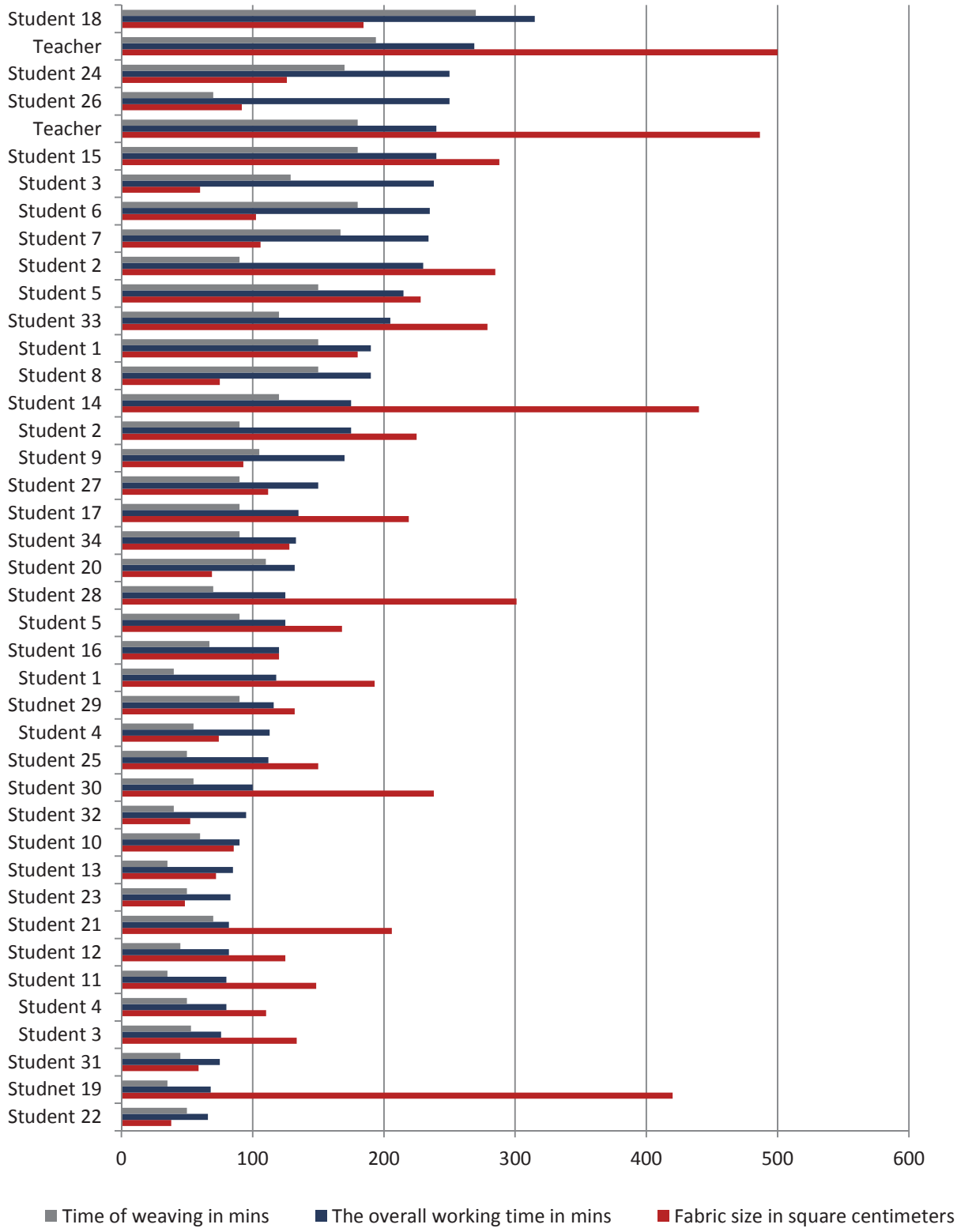

Fig. 3. The comparison of the individual overall working time with the duration of the weaving phase and the size of the obtained fabric (41 respondents altogether).

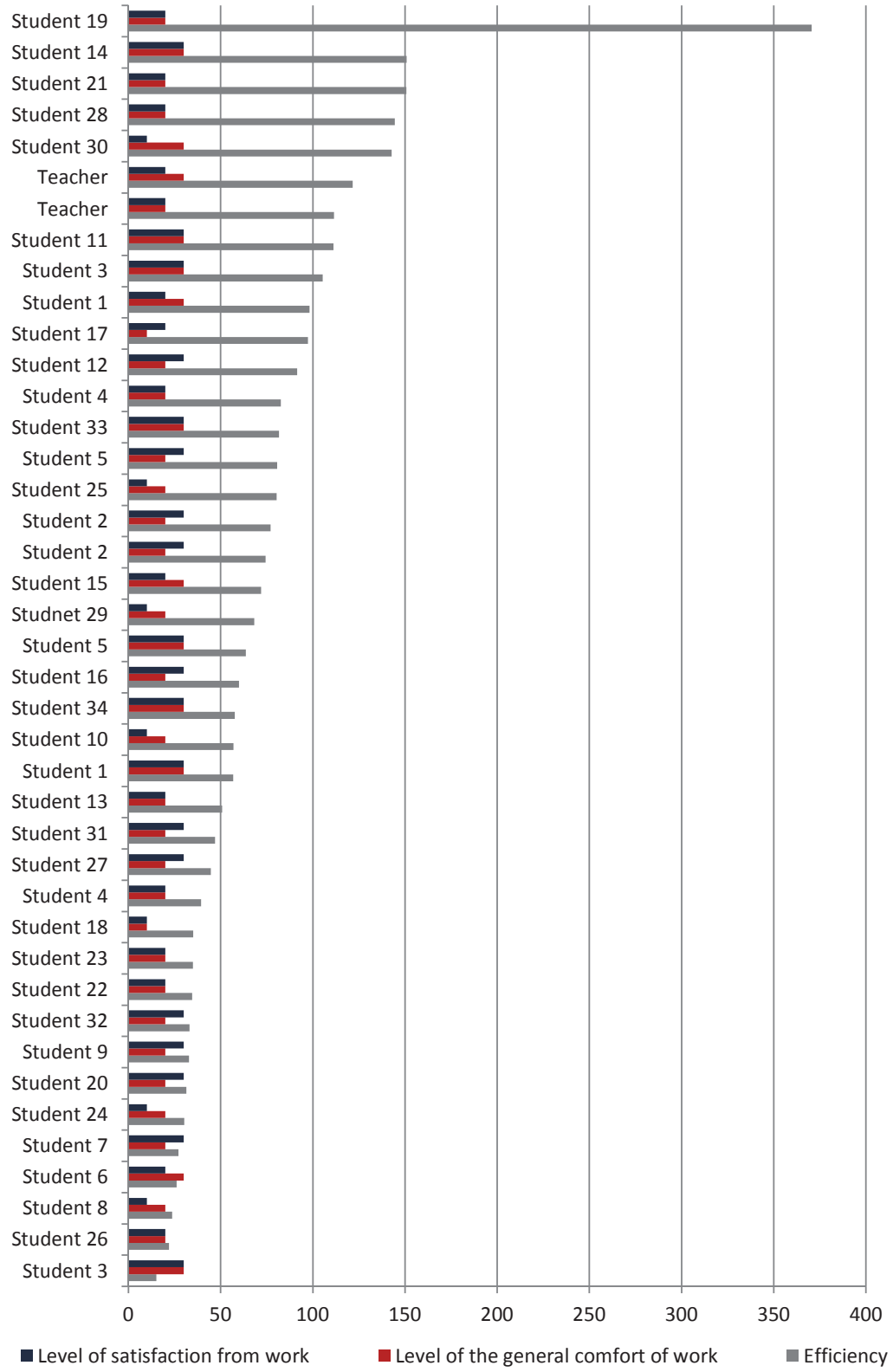

Fig. 4. Individual efficiency of the overall weaving process expressed in terms of the size of a fabric to be obtained within one hour of work, and compared with subjective feelings accompanying the work, such as the comfort of work and satisfaction from work. The level of emotions, recorded as being low, medium and high, were transformed into the numerical values: 10, 20 and 30 respectively.

According to the principles established for the experience tests under discussion, all hands-on activities should be performed as DIY tasks. Throughout the course, the students practise weaving bands on rigid heddles and tablets individually but other activities, such as off-loom weaving with heddling devices, weaving starting borders on rigid heddles or tablets, setting up the warp-weighted loom and weaving on the warp-weighted loom, are usually performed in groups of two to three actors.

Even though all of these tasks may also be executed individually, it seems that cooperation and social interaction make the job easier to learn and perform. In the case of a working group, the efficiency was not taken into consideration or measured but, based on mere observations, it is may be suggested that two weavers working together seem to be optimal for most of the tasks and, possibly, such a group may also add to the overall effectiveness. Therefore, the observed tendency towards collective labour may also reflect the ergonomic strategies in the organisation of work.

Work times, efficiency and emotions accompanying the work

The card system introduced in 2013 has allowed us to record and compare the amount of time spent on the successive sequences of weaving, such as designing, warping, weaving and finishing, and the subjective feelings accompanying the work, such as the comfort of work, the level of attention required and the final satisfaction from the work (Ulanowska 2014 153-157; 2016 forthcoming).

The records analysed herein refer exclusively to the most frequently practised technique and, presumably, the easiest one, i.e. weaving bands on rigid heddles (Fig. 1). So far, 42 cards documenting weaving of simple bands (36 cards) and bands with warp-floats (six cards) have been transferred to an electronic data base in Excel, which made the data easy to search and available for statistical analyses. All the subjective feelings described by the actors by choosing one of three levels of the accompanying emotions, namely low, medium or high, have been translated into numerical values, such as 3, 6 or 9, or 10, 20 or 30 respectively, in order to present them as graphs and compare them with other variables. From among that data, one card was rejected as being incorrect, whereas the other cards, documented the third band (17 cards), the fourth band and subsequent bands woven by an individual weaver (21 cards), which implies that most of the actors, although not skilled, have already acquired some basic knowledge of the tested technique.

As expected, the said lack of skill has a negative impact on the effectiveness of weaving. This may be illustrated by a comparing the overall working time

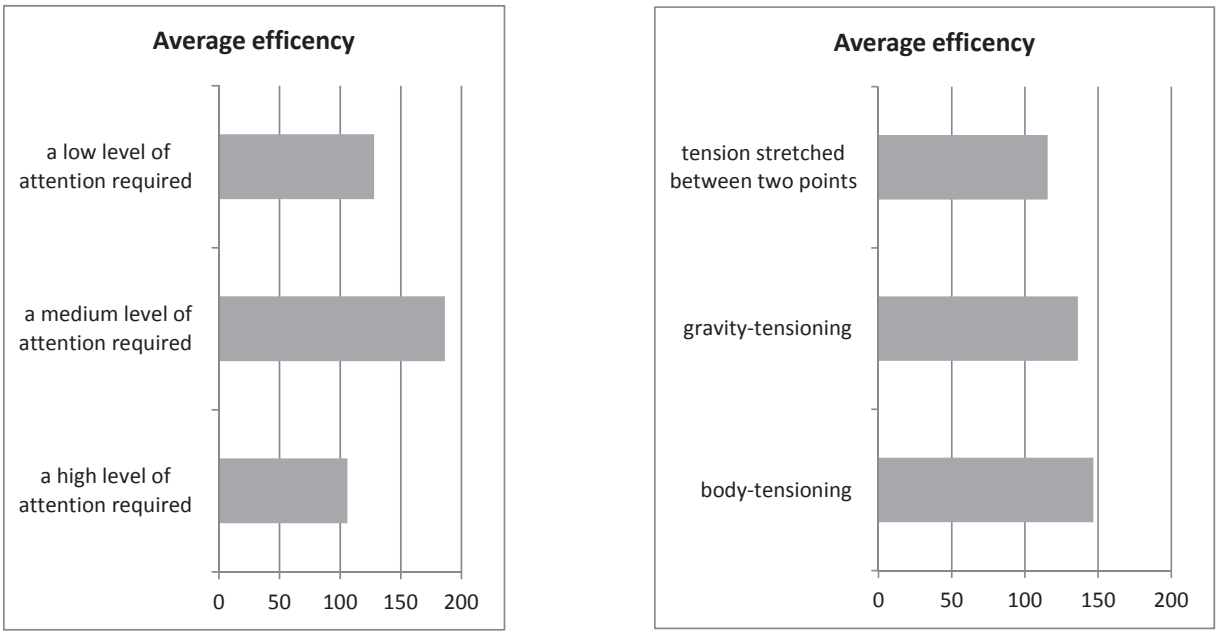

Fig. 5. Comparison of the average efficiency calculated per hour of the weaving phase alone with the high, low, or medium level of attention required (12, 5, 24 respondents respectively), and comparison of the average efficiency of the weaving alone with the manner of tensioning the loom: tension stretched between two points, vertical, body-tensioning (18, 4, 19 respondents respectively).

with a distinguished sequence of weaving alone, and the size of fabric in centimetres (Fig. 3). Although the operational sequence of weaving seems to be the most time-consuming phase which directly affects the overall effectiveness, even if the actors are not skilled, the resultant size of the fabric, in several cases, is not clearly related to the time of work or to the already acquired experience in band weaving. Whereas two less efficient actors documented their fifth (Student 3) and the third band woven on rigid heddle (Student 26), the most efficient ones: Students 19 and 14 documented their third and second band, respectively (Fig. 4). This lack of a clear correlation between the time of work and the size of the fabric obtained may be explained by various levels of individual manual dexterity. However, among the group of actors who attended the course twice or submitted more than one documentation card (Students 1, 2, 3, 4, 5, Teacher), only Student 2 seemed not to improve his/her efficiency while weaving more times (Fig. 4).

The average efficiency was calculated for the size of a fabric to be obtained within one hour of work, and it results in 76.51 cm of textile to be woven per hour, but this seemingly good result needs to be considered with the qualification that all the textiles discussed are narrow widths measuring from one to six cm in width and, therefore, they are relatively fast to weave (Fig. 4). In the analyses considering the efficiency of a single phase of weaving, such as examining the possible impact of the manner in which the loom was tensioned, efficiency was measured per hour of weaving instead of one hour of the overall working time.

The individual efficiency was not related to the reported feelings describing the comfort of work and satisfaction from work and translated into numerical values: 30 to indicate the high level of emotions, 20 medium, and 10 low (Fig. 4). The recorded results may also suggest that for the majority of actors the weaving experience was perceived as both satisfying and comfortable, disregarding the duration of work and the quality of the fabrics obtained. A low level of comfort of work was reported only by two actors (a high level of comfort of work was reported by 13 actors; the medium one by 26 of them). The majority of actors seem to be quite satisfied with the work, describing the level of their satisfaction as being high and medium (19 and 16 respondents respectively), with six being displeased. The satisfaction from work and the comfort of work experienced by the said group of actors who documented weaving of more than one band, suggests that the emotions accompanying the work did not change much with the subsequent weaving trials. It may be observed that the medium level of attention required by the weaving alone may have a positive effect on the average efficiency of the weaving phase, since the highest rate of said efficiency was observed in correlation with the medium level of attention (Fig. 5). Accordingly, the other correlations may suggest that too little and too much attention required by the work may reduce its effectiveness. As regards the manner in which the loom is tensioned, it seems that the body-tensioning may slightly favour the higher rate of the average efficiency of the weaving alone (Fig. 5).

However, it should be clearly stressed that all the efficiencies discussed, as well as the overall effectiveness of work, seem to be primarily related to the level of an individual's manual dexterity for weaving and that the given results may have been different if all actors were more advanced in the craft skills.

Conclusions about the prospects of the experimental approach to ergonomics of textile production

Ergonomics may be seen as an inevitable part of any work and the tendency towards optimising working conditions, minimising workload and using available equipment in full seems to be a natural need of any worker who is allowed to arrange or adjust his/her workplace. The use of various ergonomic criteria in the organisation of textile work, e.g. ergonomic arrangements of workplaces, ergonomic design of tools and division of labour, could be traced in the preserved material evidence of textile production. But the complex emotions accompanying the work, referring to the collectivity of labour, the level of attention it required, its comfort and pleasantness, and, finally, satisfaction from work, remain largely intangible for textile researchers. Since these tacit components of technology must have had a direct impact on the overall productivity, being an important part of every day life, the should also be more clearly addressed in academic discourse.

Experimental approaches to investigating the ergonomics of textile production seem to offer a new method of penetrating the nature of textile work. Especially the acquiring of hands-on experience in textile techniques may be seen as an efficient tool allowing for personal reflections about this work. But in order to use experience archaeology as a research method, the outcomes resulting from the hands-on activities have to be defined, documented and translated into the academic discourse.

The examples discussed of the experience approach to the ergonomics of textile production in Bronze-Age Greece suggest the manner in which an individual experience of modern actors may be compared and verbalised. Specifically, the system of the

documentation demonstrates how the standardised questionnaires may be used to record hands-on experience and hands-on learning. Obviously, the relations or lack of relations between the time of work, its comfort, satisfaction from work and the efficiency cannot be seen as any comparanda to the experience of work performed by the textile workers in the past. But still, these relations do demonstrate how various emotions accompanying the work may have influenced its effectiveness.

The statistic analyses presented here refer only to one technique of weaving. In the future, however, continued documenting of other textile techniques practised with students may allow for comparison between the work and workloads required by various weaving techniques. It would be also interesting to collect and analyse the comparative evidence of textile work performed by modern craftspeople and more experienced hobbyists.

Finally, it may be suggested that the overall concept of ergonomics had to exist in societies of the past and may be used to describe the technical knowledge and skills, the organisation of textile production, its economics and the socio-cultural meaning of textile work as well as the social position of workers, even if some of the aforementioned aspects of work were not consciously perceived and valued as being important by the textile workers in the past.

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