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Review
of the Doctoral Thesis of M.Sc. Xenia Paula Kyriakou
titled: "Entheseal changes in a reference skeletal collection from Cyprus. Prospects for reconstructing activity patterns in prehistoric and historical societies"

Doctoral dissertation of Ms. MSc. Xenia Paula Kyriakou was written under the supervision of dr hab. Arkadiusz Sołtysiak, prof. UW, and dr Elżbieta Jaskulska in the Faculty of Archaeology, University of Warsaw.

The thesis presented for review is an extensive monograph on pathology, written in English. It has 209 pages, and includes 74 Figures, 53 Tables and Appendices A-D.

The dissertation starts with a Summary in Polish, which requires a language correction because currently it is a simple translation without proper terminology. The main text as stated in the Table of Contents consists of 7 Chapters with numbered subsections, and a list of literature. The reviewed text begins with a Preface that is not included in the Table of Contents, as is the case with the aforementioned Summary in Polish and Appendices A-D, which should be put in this list.

The Preface partly informs us about some scientific problems Ms. Xenia Paula Kyriakou has met during the preparation of the thesis, and in acknowledgements we are able to find about the group of scientists who have encouraged her to make the final success. The layout of the dissertation is logical and subsequently leads us through the undertaken problems.

Chapter 1. The introduction is a scientific overview of the tasks undertaken, and it explains the changes in terminology and interpretation of the skeletal traits used for the reconstruction of daily activities in bioarchaeology. Such reconstructions are possible because visible skeletal changes in the dry bone indicate stress resulting from habitual activities, so they could be considered a direct evidence of human behaviour in ancient communities. Therefore non-pathological entheseal changes (EC) are the most widely used skeletal traits for activity reconstruction in bioarchaeology within the Markers of Occupational Stress (MOS) analysis. The chapter describes the differences between the upper and lower limbs in the study of habitual behaviour that are important to understand the biomechanics of the human body. Furthermore, the anatomy of the skeletal muscle with the anatomy of the enthesis is presented in detail, but the explanation requires an oversimplified statement on p. 20 "[…] *Not all muscles have tendons (e.g., the insertion of the deltoid)*" […]. The term tendon for this muscle is used (see, for example, the article cited in the dissertation: Benjamin, et al. 2002). Special attention is paid to the part called Human Kinetics and Movement. In Chapter 1, Ms. MSc. Xenia Paula Kyriakou also describes types of EC publications (gathered in Appendix A) and their main assumptions, presents methods of EC analyses, and explains the recent loss of interest of MOS analysis, which was the by-product of many methodological issues, which continue to remain. In the description of ES scoring systems, there is a misstep – on p. 37 in the Villotte et al. (2010) method, it is written: "*the authors limited themselves (probably due to skeletal preservation) on aging the skeletons they used in this study solely on epiphyseal fusion*". This statement is misleading because in an article by Villotte et al. (2010) in part Materials and methods, we can read: "Age at death estimation was based on the state of fusion of later-fusing secondary centers of ossification, following Owings Webb and Suchey (1985) and Albert and Maples (1995), on the surface characteristics of the pubic symphyseal face, and on the form of the sacroiliac surface of the os coxae, following Schmitt's methods (Corsini et al., 2005, Schmitt, 2005, Schmitt and Georges, 2008)".

The introductory Chapter, divided into accurate paragraphs, offers a sufficient and appropriate introduction to other parts of the dissertation. The author on p. 38 states "*Based on the discussion presented above, the author of this thesis recommends that EC method-oriented studies should be primarily based on modern skeletal samples with known/confirmed*

demographic information, such as age and sex.", and her studies strictly followed this path according to the presented Research Objectives. As we can see on p. 45: "*The primary objective of this Ph.D. research is to evaluate the effect of, and relationship between, sex, age, and pathology (osteoarthritis, bone forming diseases and trauma) and EC development*" and "*The secondary objective of this thesis is to study the frequency and distribution of EC the between males and females, determine the presence of laterality and whether it is indicative of mechanical stress or not*". The goals presented arise directly from the introduction outlined above, but it seems that they could be more precisely specified, for example, in a kind of working hypothesis.

Chapter 2. The Historical Background tries to deal with information about Greek-Cypriot lifestyle in the 20th century. This chapter consists of the following parts: Geographical and Chronological Setting, Socio-Political Setting, Economy, Subsistence Economy, and Task Specialization. For subsequent analyses, it is important to find out that subsistent strategies of inhabitants were mainly characterised by an agricultural-based economy, and 45% of the population lived in urban centres. Before 1974, the economy consisted of small-scale landowners, with goods produced by small-scale (owner-operated) establishments. We are also informed about the Cyprus "industrial revolution" that took place between 1920 and the end of World War II, as well as a major economic boom during the first half of the 1950s that was a consequence of the high influx of funds from Britain, and about changes in the period between 1975 and 1983, which were formative years for the economy of South Cyprus when the economy was transformed, and a shift from agriculture to tourism served as the main source of income for the island that was accompanied by a redefinition of gender roles in Cyprus. The described economical bases cover the period of working activity of analysed individuals and, therefore, are important for the results of dissertation. According to the data presented, Ms. MSc. Xenia Paula Kyriakou regards that the analysed skeletal sample representing the Greek-Cypriot population could serve as a direct comparison with earlier, bioarchaeological collections.

Chapter 3. The author emphasises the importance of reference osteological collections as a major source of information that contributes to our understanding of modern, historical, and ancient populations. Further on, Ms. MSc. Xenia Paula Kyriakou provides more information on the Cyprus Research Reference Collection (CRRC), which she is co-curated. Part 3.3. contains Sample Description and Characteristics, which represents a direct subset of the general, living, Greek-Cypriot population of the island of Cyprus, and consists of a total of 407 individuals of both sexes. We found that the study utilized a total of 207 males, aged

between 18 and 103 years old (median age = 72 years), who lived between 1880 and 1989, and died between 1967 and 2011, and a total of 200 females, aged between 18 and 101 years old (median age = 73 years), who lived between 1879 and 1992, and died between 1962 and 2011.

Chapter 4. In this chapter, details of the methods of analyses are presented. For the purposes of the study, a total of 27 entheses were chosen for analysis; their list is presented in Table 5. The photographic atlas of the EC scoring system used in the data collection is carefully shown in Appendix C. The EC scoring criteria for this study were an adaptation of the Mariotti et al. (2004, 2007) method. Sufficient standard statistical methods were applied.

Chapter 5. Results are divided into subchapters which consequently present the acquired outcomes. Successively, descriptive statistics of the analysed sample, frequency and distribution of the degree of EC expression in population, male-female differences, and analysis of laterality were presented. Furthermore, the relationship between entheseal changes and the distinguished pathological groups (osteoarthritis, bone forming disease, trauma) was performed, and finally, a multivariate analysis of covariance (MANCOVA) was completed. All figures and tables are signed in accordance with the technique of writing and presenting works, and have been carefully prepared.

Chapter 6. The discussion focuses on a few main tasks: Sex as a Confounding Factor for EC development, Age as a Confounding Factor for EC development, EC Development in the Lower Limb, Pathology as a Confounding Factor for EC development, The Effect of Sex, Age and Pathology on Fibrous and Fibrocartilaginous entheses, Laterality and Handedness, and finally Interpretation of EC in Greek Cypriots and Sex Differences, Laterality and Gender Division of Labour among Greek Cypriots. The distinguished subchapters create a consistent summary of the investigated issues based on the results of statistical analyses. The final results are compatible with ethnographic knowledge and historical evidence from the island of Cyprus that indicate that the household economy was based on agriculture with many activities beginning early in the lives of the individuals.

Chapter 7. The conclusions are a short summary of the results of the thesis with advice for bioarchaeologist "*to limit the extent of their observations to (a) recording only presence and absence of EC, and (b) stay away from elaborate and detailed scoring systems that may create confusion and uncertainty to the observer*".

Bibliographic References. The literature list consists of 303 items, including the latest articles published in 2020 (16) and 2021 (8). Out of reviewer's duty, I present some omissions and mistakes.

There are some deficiencies in the literature, e.g. cited on:

p. 32, 95	Karakostis and Lorenzo (2016)
p. 96	Walker 1995
p. 64	Robb (1994)
p. 111	McGonagle et al., 2008, p. 2694
p. 118	Woo et al. (1981)
p. 130	Larsen (1987)
p. 131	Kennedy (1983)
p. 154	table 27 - Peterson 1998

are not in the bibliographic reference list where they should be added. Judging from the relevant paragraphs, I think the following should be added:

- Karakostis, F. A., & Lorenzo, C. (2016). Morphometric patterns among the 3D surface areas of human hand entheses. American Journal of Physical Anthropology, 160(4), 694-707.
- Walker, P. L. (1995). Problems of preservation and sexism in sexing: some lessons from historical collections for paleodemographers. Grave reflections: portraying the past through cemetery studies, 31-47.
- Robb, J. (1994). Skeletal signs of activity in the Italian Metal Ages: methodological and interpretative notes. Human Evolution, 9(3), 215-229.
- McGonagle D, Wakefield RJ, Tan AL, D'Agostino MA, Toumi H, Hayashi K, Emery P, Benjamin M. Distinct topography of erosion and new bone formation in Achilles tendon enthesitis: implications for understanding the link between inflammation and bone formation in spondylarthritis. Arthritis Rheum. 2008 Sep;58(9):2694-9. doi: 10.1002/art.23755. PMID: 18759270.
- Woo, S. L., Kuei, S. C., Amiel, D., Gomez, M. A., Hayes, W. C., White, F. C., & Akeson, W. H. (1981). The effect of prolonged physical training on the properties of long bone: a study of Wolff's Law. The Journal of bone and joint surgery. American volume, 63(5), 780-787.
- Larsen, C. S. (1987). Bioarchaeological interpretations of subsistence economy and behavior from human skeletal remains. In Advances in archaeological method and theory (pp. 339-445). Academic Press.
- Kennedy, K. A. (1983). Morphological variations in ulnar supinator crests and fossae as identifying markers of occupational stress. Journal of Forensic Science, 28(4), 871-876.
- Peterson, J. (1998). The Natufian hunting conundrum: spears, atlatls, or bows? Musculoskeletal and armature evidence. International Journal of Osteoarchaeology, 8(5), 378-389.

Other errors:

p. 96 the citation “Schlecht, 2012, p.34” refers rather to a dissertation which is not included in Bibliographic References i.e. Schlecht, S. H. (2012). A histomorphometric analysis of muscular insertion regions: understanding enthesis etiology. The Ohio State University, and the cited paragraph is rather on page 18, not on page 34 (but reading from a computer it is page 34)

p. 36 Yonemoto (2015) – probably it should be cited as Yonemoto (2016) (?)

p. 104 Milella et al. (2013) – probably it should be cited as Milella et al. (2015)

p. 110 Villafańe et al. (2014, 2014, 2015) – changes needed

p. 112 Waldron 1998 – probably it should be cited as Waldron 1991

p. 113 Villotte, 2009 – probably it should be cited as Villotte, 2008 (?)

p. 158 Villotte, S., & Knusel, C.J. 2014 – probably it should be cited as Villotte, S., & Knusel, C.J. 2013(?)

There are also some mistakes in the way articles are cited, e.g., more than two authors should be replaced by 'et al.' for example: p. 115 - Lieverse, Bazaliiskii, Goriunova, & Weber, 2009 and Foster, Buckley, Tayles, Spriggs, & Bedford, 2013.

Some minor editorial errors, such as a missing full stop or comma (see p. 20; p. 27; p. 36; p. 41, p. 94), a missing citation (p. 111, 117, 123), a comma instead of a full stop or additional full stops (p. 24; p. 25, table 2) were also noticed. There is also “Appendix x” on p. 126, and spelling errors - p. 115 “sires”, p. 117 “hough”, p. 125 “Wilczack”, p. 164 “female” which should be corrected.

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Scientific issues undertaken by Ms. MSc. Xenia Paula Kyriakou fit the current research problems very well, and the topic taken is an important and valuable contribution supplementing present knowledge. The basic method used in the doctoral dissertation is the detailed analysis of human remains. The adopted research methods and the analyses performed are appropriate and planned logically and consistently, both the scoring system and the analysis, statistical calculation, compilation, and comparison of the results. The completion of these analyses and their detailed interpretation is the greatest achievement of the Author. It should be emphasised that in terms of the scope of the sources and goals analysed, which were outlined in its introduction, the research results achieved, and the interpretations performed, the presented dissertation fulfilled its tasks, and is a proof of the ability to conduct independent

research. Most of the comments indicated are editorial or scientific discussions, which does not detract from the very high substantive evaluation of the reviewed dissertation. I consider the selection of both research and analytical methods to be appropriate. The Author also showed a good knowledge of the literature on the subject. Investigations were conducted on a unique collection, and the acquired results with their multifaceted interpretation deserve special emphasis. It is worth highlighting that during the research, the Author has demonstrated knowledge of many areas of science, and the presented work may constitute a pattern in research planning.

The analyses performed showed how important is not only the correct marking of the pathological changes, but also the knowledge of human anatomy and physiology. The analyses have been adequately elaborated on and well presented. The results presented in the work are of substantial scientific importance, and they significantly expand the existing knowledge on the subject. This work makes a significant contribution to the studies of prehistoric communities.

The reviewed dissertation inspires scientific discussion. The statement on p. 131 "*Kennedy's (1983) early work and many other research publications later, the question remains whether bioarchaeologists will be able to find the Holy Grail of activity reconstruction. The outcome of this thesis leans towards no as an answer*" is a correct result of the conducted studies, but could also be the consequence of choosing a series of individuals to be examined. My own experiences with 20th century individuals, mainly soldiers and casualties of war, that are much younger (20-40 years old), show a considerable decline in general skeletal robusticity compared to archaeological samples. Furthermore, some examples of individuals with identified occupation show that sometimes daily activities were "imprinted" on bones and "history of life" could be reconstructed. The bioarchaeologist almost always deals with only a small number of individuals, who are analysed separately, leading to the reconstruction of the "individual life histories". Archaeological materials usually do not allow for population studies, so our questions are generally whether Individual A morphologically differs from others and what were his daily activities. Therefore, such investigations are more the kind of "case studies" with emphasis on distinct morphological features. As a consequence, in only population approaches we can lose this special individual.

However, the results achieved and the research methods used in the dissertation justify considering it as the basis for awarding the author a doctoral degree. An important advantage of the dissertation is its professional maturity, and starting from the introduction, the thesis

developed with gaining the scientific experiences of its Author. After the necessary corrections, this thesis should be published.

Conclusions

I can conclude that the thesis "*Entheseal changes in a reference skeletal collection from Cyprus. Prospects for reconstructing activity patterns in prehistoric and historical societies*" reviewed by me meets the requirements of a doctoral dissertation per the "Act on academic degrees and academic title, and the degrees and title in arts". Therefore, I am asking the High Scientific Council of the Archaeology Discipline at Uniwersytet Warszawski to accept it and admit Ms. MSc. Xenia Paula Kyriakou to the next stages of the doctoral dissertation.

Anita Szczepanek

Elektronicznie podpisany przez Anita Szczepanek
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