Review-report on Joanna Heuchert Doctoral thesis "Radiomorphometric indices of the mandible in the assessment of bone mineral density in historical populations"

Vilnius, January 07, 2026

Reading the printed version, provided to me in advance, enabled me to make the following statements.

The aim of the study – to evaluate the feasibility of utilizing mandibular radiomorphometric indices for assessing bone mineral density in historical populations - is testing of the research hypothesis that those indices of the mandible may be associated with skeletal mineral status. To fulfill this aim, five specific research questions were formulated: are there sex differences in radiomorphometric and femoral bone mineral density values; do these values change with age of and individual; are there relationships between mandibular radiomorphometric indices and femoral mineral density; is prevalence of dental pathologies associated with reduced bone mineral density; and are there differences in above listed indices between medieval and early modern samples that could reflect changes in living conditions – are sound and scientifically valid. They do logically complement each other and provide a rough frame for the study.

A long (26 pages) but concentrated Introduction is a very comprehensive overview of research context, review of bone biology and metabolism, bone loss with definitions of osteoporosis and osteopenia, their clinical and epidemiological relevance, risk factors of bone development and regulation, bone loss (genetic, environmental, life style), medical conditions, bone quality assessment methods and techniques, relationship between oral health and bone mineral density, approaches to archaeological bone loss assessment with methodological constraints, finally - biocultural contexts of bone loss in past populations (environmental, nutrition, physical activity, cultural practices as factors), demographic patterns. The introduction is summarized in a well-organized subchapter on knowledge gaps, thereby justifying the study's aims, working hypothesis, and research questions.

The materials (two studied samples: medieval Milicz and early modern Wroclaw) are described in the context of comprehensive archaeological contexts and robust selection criteria. Methods (technique of panoramic radiography, determination of mandibular radiometric indices, femoral densitometry, and oral health examination are presented clearly and are sufficient for testing hypotheses. Statistical methods chosen are adequate.

Results: very detailed and thorough descriptive statistics on the demographic structure, radiomorphometric indices, bone mineral density, and oral health are followed by an analysis strictly organized according to the research questions formulated in the Introduction.

Discussion extensively summarizes findings question-by-question, following the general logic of the thesis: there are sex differences, although patterns vary between the two skeletal samples; a significant effect of an individual's age-at-death; and significant associations between mandibular radiometric indices and femoral bone density, although variable correlations. Unexpected associations, or their absence, with oral health conditions underscore the need for specific population studies rather than relying on general biological patterns. The author also provides interesting insights into the

studied radiomorphometric and bone density indices and possible changes in life conditions between the two samples. In general, the discussion is very thorough and detailed, with extensive literature data included. Methodological limitations are thoroughly discussed - this is one more strength of the thesis. Conclusions summarize answers to research questions and the final evaluation of the research hypothesis.

Summing up, the aim of the study was reached, the results are reliable, making the conclusions sound, and providing implications for future work directions.

References: 300 positions - the list is very impressive; they indicate extreme thoroughness in literature search and analysis.

One already published and one submitted paper in high-ranking international journals directly related to the thesis, along with a set of oral and poster presentations at international conferences, serve as additional proof of study validation.

Summary statement

Summing up, Joanna Heuchert's thesis „Radiomorphometric indices of the mandible in the assessment of bone mineral density in historical populations" is a consistent scholarly work based on independent research, which makes an original contribution to knowledge. With this thesis J.Heuchert proves that she has the ambition to develop knowledge of research methodologies and discipline; demonstrates a good understanding of a field of study; has demonstrated the ability to produce data under supervision; demonstrated critical analysis, evaluation and synthesis of new and complex ideas; is able to explain the outcome of research (and value thereof) to research colleagues; has developed integrated language, communication and environment skills, especially in an international context; is demonstrating the ability to conceive, design, implement and adapt a substantial program of research with integrity; has made a contribution through original research that extends the frontier of knowledge by developing a substantial body of work – i.e. has obtained qualifications required for Recognized researcher (doctor of science) as indicated in Euraxess Rescriptors.

The doctoral dissertation meets the conditions specified in Article 187, paragraphs 1-4 of the Law on Higher Education and Science (i.e., Journal of Laws 2024, item 1571, asamended).

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