H77 Radiography as a Tool for Contemporary Anthropological Research

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After attending this presentation, attendees will gain knowledge of: the role of radiography in forensic anthropology, the potential contribution of radiography as a tool for deriving quantitative measurements in the research setting, problems associated with this application, and potential areas of death investigation that may be improved through research using radiography for quantitative analysis.

This presentation will impact the forensic community by enabling better standards for human identification and by showing that anthropological methods are founded in science, there is a need to validate all methods.

This study assessed whether radiographs can be used to generate accurate and reliable morphometric data, or whether they introduce too much error. This presentation is an effort to uncover research that relates to this topic, and to determine whether radiographs are a valid tool (accurate and reliable) for anthropometric analyses of contemporary populations.

This research will help substantiate the use of radiography to facilitate the generation of population-specific standards for the biological profile that may be used to facilitate forensic death investigations and investigations into war crimes. Radiographs have been used extensively as a means for generating osteological data because of their many advantages, including cost effectiveness and simplicity. In anthropology, radiography has recently and less conventionally been used as a tool to generate samples of contemporary people for developing new quantitative standards. Advantages of this application include: non-invasiveness, the potential for longitudinal research, and the accessibility of skeletal data in fleshed remains. During death investigations, the methods of the investigators invariably fall under scrutiny, and must be shown to be accurate, reliable and appropriate for what is being analyzed. Therefore, it is necessary that the standards used to build the biological profile are based on samples that are representative of the populations being analyzed. This research will ultimately aid in the development of new and more reliable methods that will contribute to making positive identifications and will withstand scrutiny during trial.

This study derived linear measurements (maximum length, midshaft width, and diameter of the head) from ten femurs, ten humeri, nine ulnae and nine radii (total n=38). The sample was generated from dry bones belonging to USF's anthropology department. The bone measurements were then compared to their corresponding radiographs. The bones were filmed in antero-posterior view, except for the ulnae, which were filmed in medio-lateral view. Specific measurements were selected based on landmark visibility on the radiograph, their ability to be combined into one sample, and their utility in anthropological investigation. Measurements were taken blindly by both authors so that inter-observer error could be identified. Magnification error was accounted for, and problems associated with accounting for the three- dimensional shape of the bone were identified. The samples were combined and Mann-Whitney tests were performed to determine if there were significant differences between the dry bone and the radiograph measurements. These measurements were plotted against each other to see whether or not there was a clear relationship. The distances were then correlated using a Spearman's correlation test. Finally, the differences between the radiograph and the dry bone measurements were computed for all distances and descriptive statistics were calculated for overall assessment of accuracy and precision.

The Mann-Whitney found all three distances to be highly insignificant (p=0.499, 0.884, 1), indicating that the dry bone and radiograph measurements were similar. The plots indicated a fairly clear relationship between measurements, although less so for the width of the head. Spearman's correlations showed all measurements to be significantly correlated (p=0.01; r=0.999, 0.974, 0.98), indicating that the radiograph measurements were accurate. Descriptive statistics of the differences showed that on average the measurements were fairly accurate, but not within the ±2mm range that is preferable for anthropometric analyses.

Despite the lack of accuracy, the results are promising. It is anticipated that the results may improve as this study progresses. This study will be furthered by: quantifying inter- and intra-observer error, analyzing each bone separately, and analyzing whether certain portions of the bone or types of measurements yield more accurate results (as these are affected by difficulties in accounting for magnification error). More accurate ways to account for magnification error and distortion are needed for this methodology. An elaboration of this problem will be provided in the presentation.

Radiography, Metric Analysis, Osteometry

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