A47 Virtual Skeletal Analysis (ViSA) — One Possible Future for Osteometrics

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After attending this presentation, attendees will better understand what has already been achieved in moving from physical osteometrics and qualitative anthropological assessments to virtual, digital, and quantitative analysis. Furthermore, the current and future opportunities and possibilities in this field will be outlined to enable attendees to develop their own research in this area.

This presentation will impact the forensic science community by detailing the processes involved in ViSA and the considerable range of low and high equipment, software, and methodologies involved. This will show that digital bone analysis can be performed with very few and affordable facilities and that the real challenge is the development of entirely new methodologies and in not acquiring complex hardware and software.

Osteometry and its use in establishing biological profiles has long been researched and practiced by anthropologists. Traditionally, it is done on physical, dry bones or bone regions using calipers and osteometric boards. Landmarks on bones are identified by the anthropologist and used to measure and record the various distances that can be used to determine, or at least estimate, age, sex, stature, and ancestry.

Through the development of imaging technology, from digital cameras to Computed Tomography (CT) scanners, a new way of doing osteometrics has been developed. There are two main processes involved: scanning and data analysis. The scanning or data creation can be accomplished in various ways, such as photogrammetry, laser or light scanning, and CT scanning. Different methods have different advantages and disadvantages.

The raw data then needs to be processed to create a 3D representation of an actual bone or bone region. Various software packages are being used for this and much is currently being done manually; however, research is being carried out to establish reliable automated processes to make this aspect far more efficient. The virtual bone model can then be analyzed and this is currently being done with either software that was written for a different purpose, such as Geographic Information Systems software or software that is written specifically for research projects. Some researchers carry out their osteometric measurements manually on the virtual bone while others attempt to develop software that detects bones, bone regions, and landmarks automatically or semi-automatically and then perform the osteometric measurement equally automatically.

While the idea of not using an actual, physical bone and not measuring it with an equally real tool will no doubt irritate some anthropologists and evoke considerable opposition, there are a number of advantages to be considered, some of which are: (1) scanned bone data files can be stored permanently with far less logistical effort compared with real skeletal remains; (2) virtual bone models can be produced from the living or from decedents who are fully fleshed; (3) population-specific data could be produced for any region on Earth from living populations; (4) analysis of virtual bones can easily be shared with other scientists, without the need to travel long distances; (5) sample sizes for research projects could be increased considerably by sharing resources between institutions; (6) some virtual data can show the inside of bones, not only the outside; (7) automatic osteometric measurements would be more accurate and far more repeatable with no inter- or intra-observer error; and, (8) automated systems could produce far more measurements that can be taken virtually rather than physically.

The full potential of ViSA will only be revealed when anthropologists start thinking outside the box and outside of the current, restricted ways in which osteometrics are performed. There is far more information in the bones that can only be unlocked digitally.

Virtual Skeletal Analysis, Osteometrics, 3D Bones

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