A42 Application of Enhanced Point Estimators on a Sample of *In Vivo* Computed Tomography (CT) -Derived Facial Soft Tissue Thicknesses

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After attending this presentation, attendees will better understand the level of congruence between the conventional arithmetic mean and the shorth and 75-shormax statistics for facial soft tissue depths.

This presentation will impact the forensic science community by providing the results of further investigation into the conventional use of average facial soft tissue depths and the applicability of an alternative statistical technique for measuring central tendency. Additionally, this presentation will provide support for the standardization of best practices in regard to facial soft tissue research.

Facial approximation refers to the process of approximating an antemortem representation of an unidentified individual from his or her skull. This representation is commonly achieved by applying and modeling clay directly to the individual's skull or a skull replica while utilizing the bone morphology as a construction guide. Facial soft tissue depth measurements are a key component in the development of an effective facial approximation. Soft tissue depth research has an extensive and productive history, encompassing more than a century of investigation and employing an expansive array of collection methodologies, analyses, and populations. One common strategy across facial soft tissue depth research is the use of the arithmetic mean as the primary central tendency descriptor. While the arithmetic mean is an informative statistic, some researchers argue that it is not a robust descriptor of central tendency in datasets exhibiting skewed distributions and thus may not reveal the true attributes of a tissue depth dataset. The purpose of this study is to illustrate application of the facial soft tissue depth analysis tool TDStats R to a contemporary American tissue depth dataset and explore the level of congruence between the arithmetic mean, shorth, and 75-shormax statistics.[1,2]

Facial soft tissue depth measurements were collected from cranial Computed Tomography (CT) scans of 388 living American adults.[2] The scans included males (n=198) and females (n=190) from four self-identified ancestry groups ranging in age from 18 years to 62 years (mean: 31, median: 30). Although ages and weights varied considerably, no individuals were eliminated from the study. Two experienced researchers independently collected 14 midsagittal and 11 bilateral soft tissue depths for each CT scan. Summary statistics, including the shorth and 75-shormax, were calculated for the 25 tissue depths using TDStats R.[1] Differences between arithmetic mean and shorth values for the 25 tissue depths ranged from 0.1mm to 2.3mm (average 0.6mm), with no difference exceeding one Standard Deviation (SD) of the mean. In addition, differences between the arithmetic mean and 75-shormax values for the tissue depths were approximately one SD of the arithmetic mean for many tissue depth points, and none exceeded two SD. Differences between the arithmetic mean and 75-shormax mean tended to be greatest for the midfacial region.

These findings suggest that the mean and shorth values of the study sample are congruent within ±1 SD. The results also indicate that 75-shormax values include ±1 to 2 SD of the mean. Although no practical difference between the arithmetic mean, shorth, and 75-shormax statistics was observed in this tissue depth dataset, the statistics may still prove beneficial for analysis of tissue depth datasets. Although shorth values may better represent skewed distributions, they will regress to the arithmetic mean when applied to normally distributed data.

Reference(s):

1. Stephan C.N., Simpson E.K., Byrd J.E. Facial soft tissue depth statistics and enhanced point estimators for craniofacial identification: the debut of the shorth and 75-shormax. *J Forensic Sci* 2013;58:1439-1457.
2. Parks C.L., Richard A.H., Monson K.L. Preliminary assessment of facial soft tissue thickness utilizing three-dimensional computed tomography models of living individuals. *Forensic Sci Int* 2014;237:146.e1-146.e10.

Facial Approximation, Facial Reconstruction, Tissue Depths

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