H86 Facial Soft Tissue Depth Shorths and Shormaxes for French Adults and the C-Table Data Store

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After attending this presentation, attendees will possess an appreciation for the utility that shorths and shormaxes hold to describe facial tissue depths in craniofacial identification, over and above the long-established arithmetic mean. The *TDStats* R package, specifically written for exploratory analysis of facial soft tissue depths and computation of shorths and shormaxes, will also be demonstrated.

This presentation will impact the forensic science community by providing a structured and systematic framework for face prediction that transcends quantification of the facial soft tissue thickness alone. Such a development is long overdue in the widely recognized subjective domain of facial reconstruction.

Humans show variation in soft tissue thickness at any given landmark of the face. However, it is impossible for smaller values to be, in relative terms, as extreme as the larger ones since soft tissue depths cannot be negative. Consequently, facial soft tissue thicknesses are likely to be positively skewed, especially around the chin and in the cheek regions where measurements can be large. This pulls the mean away from the densest regions of the data and reduces its descriptive value. Irrespectively, means have been used to describe facial soft tissue depth data for well over the past 100 years.

Recently, Stephan, Simpson, and Byrd suggested using shorths (the mean of the densest half of the data) to avoid this pitfall, and supplemented this statistic with another — the shormax (75th percentile between the shorth and the maximum) — to better approximate individuals who fell far into the right tail. This has the added benefit of utilizing the full spread of data in the right tail without invoking subjective groupings of body fatness and provides two point estimates. Using recently published facial soft tissue depth data collected on French adults, this study reports skew, shorths, and shormaxes in a contemporary sample measured with some of the latest technology. Positive skew in excess of 0.7 magnitude was found at 28% percent of 36 landmarks measured for French adults (n [max] = 469), and 31% for of 26 landmarks recorded in the C-Table (pooled data; n [max] = 756). Commonly skewed landmarks were rhinion, alare curvature point, mentolabial sulcus, menton, zygion, gonion, and mid-ramus. Differences between means and shorths at skewed landmarks were typically in the order of 1 to 2mm, while 75%-shormaxes were generally 2-3mm larger than the shorth down the midline, and up to 11mm larger at bilateral landmarks (e.g., gonion). This study confirms that some facial soft tissue depths landmarks, important for face prediction, are skewed and together with the fact that shorths provide identical results to means at normally distributed landmarks, highlights the broad-sweeping utility of shorths and shormaxes as central tendency descriptors for all craniofacial landmarks.

In forensic face prediction, shorths should be employed prior to shormaxes because they most closely approximate the densest half of the distribution. If advertisement of this first face is unsuccessful, then a second face constructed using shormaxes should be undertaken. Such serial utilization of these statistics holds three strategic and key benefits: (1) it avoids cost and time expenditure on construction of rarer face types, unless there is a requirement for it; (2) it doubles media exposure, limiting chance oversight by relevant members of the public; and, (3) if the initial miss was underpinned by underestimation of the soft tissue depths, the second face holds the capacity to rectify the miss.

Whether the shorth/shormax combination generates smaller standard errors of the estimate overall compared to single-point estimates of regression equations is yet to be determined. However, the doubling of the media exposure provided by the dual-point estimates may be an unrivaled advantage (especially when body weight cannot be reliably predicted from hard tissues alone). Whatever the case, shorths and shormaxes provide significant improvements to the universally employed arithmetic mean.

Facial Approximation, Facial Reconstruction, Craniofacial Identification