Accuracy of Facial Approximation:

Studies in measurement, prediction, and "recognizability" of human face anatomy

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Abstract

Methods of facial approximation, whilst being controversial, have considerable forensic significance because they are one of the few anthropological techniques that have the consistent potential to obtain specific and purposeful individual identifications from skeletal remains. Fundamental to the accuracy of facial approximation is the knowledge of anatomical facial structures, their relationships and their variabilities. Here, commonly used methods for predicting soft tissue anatomy of major face features (eyes, nose, mouth and eyebrows) from the skull were tested and improved. New guidelines which better predict mouth width are presented (improving accuracy by up to 13mm on average), as are new regression equations that better predict pronasale position (improving accuracy by up to 11mm on average), average exophthalmometry measures which better predict eyeball projection (improving accuracy by about 4mm on average), and new guidelines that better predict superciliare position (improving accuracy by up to 5mm on average). Since all previously untested guidelines tested here could be considerably improved, it seems likely that many other previously untested soft tissue prediction guidelines could also have their accuracy increased in the future.

Enhanced computer graphic techniques were also used to generate standardized average human face anatomies for an Australian sample aged from 18 to 34 years. These average faces were used to remove aspects of subjectivity present in traditional facial approximation methods. By warping average faces to exact face shapes, best-case scenario (α ceiling level) true positive recognition rates were established for two-dimensional facial approximations (≈43%). By warping average faces to fit skulls according to the improved soft tissue prediction guidelines and other commonly used guidelines, and testing facial approximation
recognition by using face pools, it was found that these facial approximations were
recognized well below ceiling rates and were not recognized at rates statistically above that
expected by chance (5%). These findings indicate that further research is needed to
empirically determine other anatomical relationships that can be used for predicting soft tissue
anatomy from the skull before any current facial approximation methods can be expected to
generate faces that can be specifically and "reliably" (i.e., ±43%) recognized as target
individuals.