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## A41 The Perceived Accuracy of 3D Facial Reconstructions

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After attending this presentation, attendees will be aware of the implications of possible identification from 3D facial reconstructions.

This presentation will impact the forensic science community by showing that leads generated by 3D facial reconstructions should be viewed with caution and are generally unreliable.

Often 3D facial reconstructions are a final effort to lead to the identification of skeletal or decomposed remains of an individual, when all other methods have failed to provide leads to identification. Generally, 3D facial reconstructions are considered to be inaccurate because their accuracy relies on the connection between the reconstruction and a living individual. This study tested the accuracy of 3D facial reconstructions in three ways: (1) by assessing the perceived accuracy of a facial reconstruction when compared to a known individual; (2) assessing the consistency of reconstructions created using the same protocol; and, (3) assessing the consistency of the raters.

For this study, 11 different participants each created one facial reconstruction from a cast of the same known individual. Each of the participants completed the reconstructions following the same protocol. After the reconstructions were completed, photographs were taken of each reconstruction. The experiment was evaluated in two parts: (1) a likeness rating of each reconstruction against an array of seven individuals of similar age, race, and sex as the known individual; and, (2) biometric comparison of the reconstructions to the known individual. For the likeness ratings, each rater was asked to rate each of the reconstructions against the array of photographs and provide a score from one (the reconstruction looks nothing like the person) to ten (the reconstruction is of that person). After these ratings were completed, the raters were informed of which photograph was the known individual and asked to rate the reconstructions again, but against only the known individual. Five standard biometrics measurements were taken: forehead to tip of the nose, tip of the nose to the chin, distance between middle of the eyes, width of the mouth, and total length of the face.

The ratings data was analyzed using a Kendall's coefficient of concordance. This allowed a determination of inter-rater agreement for each of the reconstructions. All reconstructions except one showed statistical significance ( $p < 0.05$ ), indicating that there is agreement between the scores assigned to each reconstruction from the different raters. For one reconstruction, there was no agreement among the raters. Inter-rater reliability for the photograph of the known individual, while the individual remained unknown to the raters, was tested. None of the reconstructions returned statistically significant results against the known, with significance levels of  $p \geq 0.993$ . The ratings acquired after the known individual was revealed to the raters showed similar inconsistencies in the ratings, with significance levels of  $p \geq 0.990$ . Subsequently, the biometric measurements were analyzed using a one-sample *t*-test. Only one of the measurements, the width of the mouth, was not statistically different ( $p = 0.406$ ) from the measurement of the known individual. The other four measurements showed statistical significance ( $p < 0.05$ ), indicating that those measurements are statistically different from the known individual's measurements.

The results address two main issues with facial reconstructions. The first is that without an accurate initial outline of the face, any evaluation of the accuracy of the reconstruction cannot be considered to be a true indication of its accuracy. The second issue is how individuals perceive a face cannot truly be tested if the initial face (i.e., the reconstruction) is too inaccurate to be recognized as the individual it is intended to be. Since facial reconstructions rely on individuals recognizing a face they are familiar with, the fact that none of the raters knew the individual they were supposed to be identifying may have hindered their recognition of the reconstructions as that person. Further research should focus on the accuracy of the initial outline of the face to increase accuracy of overall facial reconstructions.

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### Facial Reconstruction, Accuracy, Perceived Accuracy