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REVIEW

A review of forensic art

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Abstract: The term "forensic art" is often utilized in scientific papers, books, and professional organizations, yet it seems to be one of the most controversial, marginalized, and poorly understood forensic fields. Despite there being a long history of the use of artists within law enforcement investigation, the discipline has come under scrutiny and has been criticized for its lack of training and code of practice, the high degree of subjectivity, and the paucity of standards. This paper reviews the current status of forensic art in the context of its history, and suggests best practice for the future if forensic art is to become a viable and respected forensic discipline.

Keywords: depiction, composite, facial, artist, court, witness

Introduction

The word "forensic" derives from the Latin "forensis", meaning "in open court" or "from the forum", and it is thought to have its origin in 44 BC, when a Roman physician, Antistius, was summoned to examine the corpse of Julius Caesar.[1] Antistius presented the details of his examination and the resulting conclusion to the forum, stating that although Caesar had been stabbed a total of 23 times, it was the second stab wound to his chest that actually killed him.[2] This type of evidence to the "forum" or court has become known as forensic evidence, and the *Oxford English Dictionary* now defines forensic as "relating to the application of scientific methods and techniques to the investigation of crime".[3] The current definition clearly excludes art as forensic evidence and makes the term "forensic art" an oxymoron. Art is defined as "the expression or application of human creative skill and imagination, typically in a visual form, producing works to be appreciated primarily for their beauty or emotional power".[3] Most definitions of art include the word "creativity" and the application of creativity to a court of law would seem to be a paradox.

Yet there is a long history of art applied to forensic investigation dating back as far as the 19th century.[4] Traditionally, artists have been utilized in cases that involve human identification, especially related to facial composites (depicting a face from the memory of a witness), facial reconstructions (depicting a face from skeletal or partially decomposed remains), and age progression (depicting the aged face of a missing person). These techniques have been employed to locate offenders, to recognize and identify human remains, and to track down missing people.[5] In this article, these are all referred to as facial depictions.

Artists' sketches have long been employed in forensic investigation. The murder of Isaac Frederick Gould in London in 1881 is one early example where the police employed an artist to draw a caricature-like image of the face of the suspect, Percy Lefroy

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Mapleton, and posted this alongside a description of the missing man on a reward poster, in an attempt to track down and apprehend the suspect.[6] In 1888, Dr F Gordon Brown, one of the doctors who examined the bodies of the victims of Jack the Ripper in London, made annotated illustrations/sketches of the body at the scene in order to record the evidence.[4] In 1911, an artist's impression of Dr Crippin was released by the Metropolitan Police and he was identified as a passenger on board a transatlantic liner.[7] US artists were frequently employed to record the memories of witnesses of crimes in the 1920s. The FBI used a commercial artist to produce a sketch of the Wall Street bomber from the memory of a witness from a nearby blacksmith's shop.[4] The sketch was instrumental in the apprehension and arrest of the offender. Since then, police artists have routinely been employed to interview witnesses and produce composite sketches in order to facilitate recognition and apprehension.[8] The use of forensic artists for facial composite work is more widespread in the USA than in Europe, and the International Association of Identification includes a section for forensic artists with accreditation.[9] It was clear to law enforcement officers that artists could be used for this kind of work, as portrait artists understand faces in a way that enables them to depict a person in a realistic and believable manner, and drawing from the recall of a witness or creating an aged image of a person from a photograph requires skills most commonly observed in artists. In addition, this kind of artwork was utilized as an investigative tool rather than directly for identification and was not expected to be presented in a court of law as evidence.

There has also been a long history of scientists collaborating with artists in order to depict the faces of unidentified bodies. This technique has become known as facial reconstruction/approximation/restoration, and the resulting facial depiction is posted to the public in order to facilitate recognition and generate names from which the body can be identified.[10,11] Early examples of this work include anatomists or anthropologists collaborating with sculptors or artists[12–14] or individuals who demonstrated both art and science skills and knowledge.[10,15] The balance of art and science in this field has been well debated,[4,16–20] but it is clear that elements of both are utilized by practitioners.

Eventually, the scientific community began to look at these techniques in more detail, and inevitably computer technology was applied in order to create less subjective methods that did not rely as heavily on practitioner training and where scientific standards could be utilized. Researchers with psychology and computer science interests created more standardized methods for composite production, starting with the Photofit system in the UK,[21] the Identikit system in the USA,[22] E-FIT system,[23] and EvoFIT.[24] These systems relied on image databases rather than the mind of the artist, produced faces of more consistent quality, and utilized psychology research to produce the most effective recall using a standardized process, such as the cognitive interview.[25–27] As digital technology advanced, the facial images produced became more and more realistic, and research results suggest that the resulting recognition from these images has improved steadily over the last 15 years.[28] In part, these systems have put the forensic artist out of business, as the practitioner does not require extensive training and in theory, ordinary police officers can be employed to carry out this work alongside their usual law enforcement duties.

Computer scientists also turned their attention to facial depiction from human remains to create more reliable and reproducible images, and this has progressed within the digital world through the use of three-dimensional modeling systems,[29] automated systems,[30–33] and haptic interfaces.[34,35] Some of these systems have been tested in blinded studies[36,37] and some have been successfully utilized in forensic investigations and presented as forensic evidence in a court of law.[38] In parallel with the creation of digital systems and automated software, there has been an increase in the publication of scientific standards developed from the clinical imaging data of living subjects[18,39,40] and the development of professional guidelines.[41]

Forensic art as expert evidence

As forensic science progressed in parallel with advances in computer technology, the fields associated with artists came under fire for being subjective, and forensic art became a controversial term.[42,43] The application of art to a court of law is seen by some as unscientific and it became regarded as a pseudoscience. This was in part exacerbated by the lack of training in the forensic art field, the wide range of professional skills demonstrated by practitioners, and the paucity of standards for practice.[42,43] In addition, the forensic art field attracted cranks and charlatans, with some practitioners promoting a public smoke screen, depicting themselves as mind readers or psychics. This may be due to the high profile nature of this work, associated with media interest, leading to some degree of fame for successful practitioners. Even the name used to describe facial depiction from human remains became controversial, with different calls for facial approximation, reconstruction, and restoration, with each proponent attempting to suggest that their process was more scientific and less artistic than the next,[42–45] effectively erasing the role of the artist from any discussion.

However, forensic evidence has been placed under the microscope.[46,47] Within forensic evidence in general, numerous miscarriages of justice, unreliable experts, and high profile disagreements between experts have created an atmosphere of mistrust in the court, and this has led to a number of key reforms and investigations.[48–51] For forensic evidence to be considered admissible in a US court, it must now fulfil a number of important criteria that include the use of accepted standards, peer review and publication of the theory and/or method, known error rates, general acceptance by the wider scientific community, and justifiable conclusions.[52,53] In England and Wales, expert evidence is broadly considered in relation to these criteria,[54] and these criteria do not fit well with artistic practice. Even forensic material that is thought to be investigative rather than evidential may now be expected to follow the same levels of subjectivity, reliability, and justification.[55]

So where does the field of forensic art currently stand and what does the future hold for artists in such a science-orientated field where subjectivity and creativity are not considered to be admirable qualities for forensic evidence?

One would expect the forensic artist to have become a historical curiosity, but while computers are objective, reliable, and reproducible, they are, as yet, not capable of replicating the ingenuity, knowledge, and variability of the artist, and facial images created by artists produce a greater response from the public than computer-generated images.[56] Many computer systems produce floating faces without a head, hair, or neck,[32,57] and these images do not connect with the observer in the same way as a face produced by an artist. In addition, the faces produced by computer systems are definitive and inflexible. Many of the facial depiction systems ultimately require final artistic interpretation in order to present a realistic and effective facial image or to present areas of uncertainty and multiple possibilities. In addition, many of the facial depiction systems are more successful when the practitioner has art skills[58] and when a comprehensive methodology is followed.[31] Finally, forensic artists regularly present admissible evidence in US courts in relation to facial composites, and research suggests that the cognitive interview process is more aligned to artistic skills[56] and artists can leap "uncanny valley" in a way that computers cannot.

The uncanny valley was described more than 40 years ago by Masahiro Mori, a robotics professor at the Tokyo Institute of Technology, and related to people's reactions to fake humans.[59] In particular, he hypothesized that a person's response to a fake human face would abruptly shift from empathy to revulsion as it approached, but failed to attain, a lifelike appearance. This descent into eeriness is known as the "uncanny valley" or "bukimi no tani". Facial images produced by computer systems run the risk of descending into uncanny valley as the level of realism increases, and although this phenomenon is frequently observed in relation to computer graphics/animation,[60–63] and photoediting and robotics,[64,65] it is rarely noted in relation to still facial images/models produced by artists.[62] In fact, quite the opposite is often encountered, and the faces artists produce are more easily accepted as human. The sculptor Duane Hanson makes highly realistic sculptures of people, to play with the confusion of the viewer who often mistakes the sculpture for a real person.[60] "The Jogger" (http://www.saatchigallery.com/artists/artpages/duane_hanson_jogger.htm) depicts a middle-aged man in pain sitting on the floor, and a typical audience will instinctively gather around to offer help. Ron Mueck is another sculptor who plays with realism and scale depicting extremely realistic people in a contrasting scale to the viewers; enormous women in bed taking up most of a room or tiny people standing as if in conversation on a platform (http://www.theatlantic.com/photo/2013/10/the-hyperrealistic-sculptures-of-ron-mueck/100606/). These artists do not struggle to represent a lifelike human and offer a deeper understanding than computer scientists can replicate. Indeed, current pioneering computer science research utilizes artists in order to try and understand, and produce realistic faces. Even researchers who are using DNA analysis to predict facial appearance are utilizing digital artists in the generation of a realistic facial image.[66,67] In addition, it is established that humans can recognize familiar faces even with extreme changes in perspective, proportions, distortions, and lighting,[68] and automated systems are not able to tolerate the same distortions and cannot replicate the recognition levels associated with familiar face recognition.

So how can art be applied to a forensic investigation in the 21st century, compete with forensic science in rigor and admissibility, while retaining the insight of an artist? Some forensic artists are answering this question by following scientific standards and justifiable principles while utilizing artistic skills, their knowledge of faces, and the ability to produce flexible and believable faces to encourage recognition and facilitate identification. Those artists who cannot justify the decisions and processes followed and who fail to take on board scientific innovation or the scientists who cannot produce effective depictions and do not understand faces are falling by the wayside and professional bodies are beginning to appreciate the necessity for training, competency, and rigor within the field.[41]

Best practice for forensic art

There are a number of recent research studies that have changed the way facial depictions should be produced and have created a more effective and justifiable process for use in forensic investigation. In relation to facial composites, the following research results should be considered:

1. Eyewitnesses have better facial recall when the cognitive interview is utilized.[26,27]
2. Where more than one eyewitness produces a composite of the same person, then an average of these composites will be more effective than any single composite[69,70] for recognition.
3. High detail facial images may not be any more effective than low detail facial images.[68,71]
4. Configural relationships in a face can be altered and the face will still be recognizable.[68]
5. Pigmentation cues are as important as shape to face recognition.[68,72]
6. Facial features presented on their own may be enough for recognition, especially eyebrows and eyes.[68,73]
7. Caricatured faces are better recognized than accurate faces.[68,74,75]
8. Facial features are processed holistically[68] and one feature can affect the recognition of another feature in a single facial image.
9. Faces are better recognized when lit from above to simulate daylight.[76,77]
10. Faces are better recognized in three-quarter view[78,79] or a moving view.[80–82]
11. The correct hairstyle can be an extremely powerful cue for recognition.[83–85]
12. Cropped images of faces are more effective than whole head images.[56,86]

There are a number of recent research studies that have changed the way facial depictions from human remains should be produced. Feature prediction methods should be utilized where the method has been verified on different populations and only employed for the relevant ethnic groups. The following research results should be considered:

1. The nose has now been shown to be one of the most accurate features predicted by skeletal assessment. Studies utilizing living computed tomographic data suggest that the following areas of the nose can be predicted with reliability and these have been tested in blind studies:[39]
   - Nasal prominence[87–89]
   - Nostril position[4,39,90]
   - Nasal base angle[87,88]
   - Nasal width regardless of ethnic group[39,87]
   - Nasal tip shape[39,91–93]
   - Nasal profile[39,87]
2. Aspects of the eyes can be predicted from assessment of the orbital bones, brow, and zygomatic bones. Multiple studies concur that the following orbital characteristics can be predicted with reliability:
   - Eyeball prominence[94–96]
   - Eyeball position in the orbit from frontal view[97–99]
   - Mean globe and iris diameters[97]
   - Eyelid fold position[97,100,101]
3. The mouth can be predicted from assessment of the teeth and dental occlusion. The following mouth characteristics can be predicted with reliability:
   - Chelion position/mouth width[42,100,102,103]
   - Fissure height[87,104]
   - Lip occlusion[87,105–107]
4. In forensic scenarios, the amount of known appearance detail will be different for each investigation and some scenes will reveal details such as facial hair, skin color, eye color, hair, or clothing, while others offer no detail other than skeletal appearance. Even where some details are known, there may be possible variation to the appearance (eg, white skin can vary from fair to olive, and long hair can be worn loose or tied up) and these variations may have a great effect upon resemblance and recognition.[18]
5. Incorrect surface detail, such as hairstyle, glasses and facial hair, can have an alarmingly strong negative effect upon recognition levels.[83–85] Blurring of hair style in the final facial depiction may facilitate recognition.[85]
6. Faces are more difficult to recognize without surface detail.[108]
7. Skin color, eye color, and hair color cannot be predicted from visual skeletal assessment.[18] DNA analysis may provide these details. Without this knowledge, the facial depiction images should be produced in black and white to facilitate recognition.
8. Faces are better recognized when lit from above to simulate daylight.[76,77]
9. Faces are better recognized in three-quarter view or a moving view.[78–82]
10. Cropped images of faces are more effective than whole head images.[56,86]
11. High detail facial images may not be any more effective than low detail facial images.[68,71]

Forensic artists have not been accustomed to considering themselves as experts or producing court reports in relation to their work, and where forensic artists routinely

give evidence, it has been as investigative material rather than probative evidence. This is no longer a luxury that can be afforded by the forensic artist community, in light of changes to the expectation of the court in relation to evidential and investigative material. Whether or not the expert/report is utilized in court, it should become routine for all forensic art work to be produced following expert witness guidelines and accompanied by a report to enable the court to understand the material produced. These reports should follow the requirements associated with the law of the country and fulfil all necessary regulations, codes of practice, and legal process. In the UK, the Crown Prosecution Service produced a Guidance Booklet for Experts in 2010,[109] which provides a practical guide to preparing expert evidence.

Forensic artists may be considered as experts in an investigation and, as such, have an overriding duty to assist the court and this will include obligations relating to disclosure. These obligations take precedence over any internal codes of practice or professional standards, and it is important for forensic artists to know that they cannot be excluded from these duties and obligations and a failure to comply may have a negative effect upon the investigation and any conviction, loss of professional reputation, and potential civil action. If forensic art is to be taken seriously as a forensic discipline, artists who work in police investigations should follow the same procedures and regulations as any other forensic expert and be accountable to the court. This means that the methodology utilized to produce each facial depiction needs to be described in full and justified with publication, peer acceptance, and error rates. Any assumptions made by the artist (otherwise interpreted as artistic license) must be highlighted to the court, in order for the court to fully understand and appreciate the depiction produced. Artists should not be afraid to describe their interpretations and analysis. Forensic art is no more "creative" than many other forensic disciplines that involve some element of interpretation, such as forensic anthropology or odontology, where the "most likely" classification is determined through measurements and visual assessment.[110]

However, there are still scientists in this field who cannot understand the role of the artist and who refuse to accept that there is a future for these methods unless they are exclusive to the world of science. It would be preferable for the future if scientists and artists found a way to work together and understand variant approaches to the same challenges. This approach has produced significant steps forward in the field of craniofacial superimposition, where computer scientists, biological anthropologists, and forensic artists have collaborated to produce best practice, evaluation, and practitioner standards.[111–113] If standardized professional practice can be developed for forensic art, then the less able and rigorous practitioners will be encouraged to change practice or leave the profession, and the court can rely on this evidence as rigorous and consistent.

Disclosure

The author reports no conflict of interest in this work.

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