

Thoughts on categorising bloodstain patterns

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1. Background

During the 3rd European Academy of Forensic Science Meeting in Istanbul, Turkey, a meeting was held on Thursday, 25 September 2003, to discuss the possibility of establishing one or two Expert Working Groups within the European Network of Forensic Science Institutes (ENFSI), to address bloodstain pattern analysis (BPA) and/or body fluids. With respect to BPA, a key issue such a working group would address is developing one international, standard categorisation (or classification or nomenclature or taxonomy) of bloodstain patterns. Such a categorisation would:

- Provide additional rigour to the BPA process, to ensure the admissibility of the testimony of expert witnesses;
- Ensure that forensic reports produced by one BPA expert can be reviewed and assessed by another BPA expert, even from another country;
- Ensure that the labels for the categories of bloodstain patterns do not have cultural or linguistic biases, that is, ensuring that these labels are neutral and can be translated accurately, unambiguously and meaningfully into many languages and cultural contexts;
- Ensure that BPA training procedures can be standardised across jurisdictions;
- Ensure that BPA experts have qualifications that will be recognised across jurisdictions; and
- Enable crime scene investigators who are not BPA experts to know when BPA will provide useful results at a particular crime scene.

These requirements are needed urgently in Europe, where there is much cooperation across national borders and migration of professionals. However, they are also critical for developing countries that can only afford to support small teams (if any at all) of BPA experts trained in other countries, or who would use the services of BPA experts from other countries.

2. Issues to consider

The following are a few thoughts on categorising bloodstains: they are taken from the viewpoint of categorising information (taxonomy) and standards, based on experience within the International Organization for Standardization (ISO) and developing South African standards for categorising geographical information. They do not reflect any deep knowledge of blood, bloodstains and/or bloodstain patterns. Hopefully, they are not too naive!

Unfortunately, it is far too common to categorise things for the wrong reasons, and it would be a pity to repeat this mistake for bloodstain patterns. Typical mistakes are:

- **Using a quantitative measure to differentiate categories:** unless there are obvious breaks in the range of numeric values, these categories could appear to have artificial boundaries that could be attacked in court. There could also be occasions where a bloodstain lies exactly on the boundary between two categories, and hence uncertainty over where it should be placed.
- **Overloading a category:** this is very common, and occurs when one category is used to convey several different meanings (often independent), which could cause confusion or which could render the category invalid when one has better knowledge. In this context, an example could be a category based on both the cause of the bloodstain pattern *and* on its geometry. A bloodstain pattern category should be based on only the most important set of characteristics – probably the cause rather than geometry.
- **Assuming there is only one categorisation:** rather than overloading a category, one should consider whether or not there are two or more perspectives of the same data, and develop a taxonomy for each. For example, with bloodstain patterns one could have one categorisation based on the geometry of the bloodstains and their patterns (if that is useful for the crime scene investigator, for example), and another based on the cause of the bloodstains (for use in court).
- **Categorising the symptoms, not the causes:** it is easiest to start by categorising the effects (symptoms) of one's subject of interest, while it is much more useful to categorise based on the causes. Several different causes (injuries to the victim) might have the same effects (bloodstain patterns), and basing the categories on the causes will to some extent highlight the subtle differences between the causes that produce the similar patterns – hence encouraging the BPA experts and crime scene investigators to focus on these subtleties.
- **Having an unstructured categorisation:** this applies particularly when there are a lot of categories (which probably does not apply to BPA), with the result that users struggle to find the appropriate class. In our experience, the best is a variable-level hierarchy, which is easier for users to navigate (drilling down from the top level categories), and provides the flexibility of being able to have more categories where one needs them, and fewer where one does not.
- **Having a “round number” of categories:** needless to say, this places an artificial limit on the number of categories, or results in superfluous categories being created. Often, this is caused by making the categorisation based on some coding scheme (eg: a single digit giving ten categories), when it should be that the coding scheme is based on the categorisation.
- **Assuming there is a perfect categorisation:** it is very easy to get into “analysis paralysis” trying to develop the perfect standard or taxonomy – and then once it is released into the real world, discover its shortcomings. Hence, one should expect to revise whatever categorisation of bloodstain patterns is developed, especially based on feedback from courts, crime scene investigators and BPA experts in the field. It is best to test the proposed categorisation as quickly as possible in the real world.

3. Categorising bloodstain patterns

Firstly, what is the fundamental driver for categorising bloodstain patterns? We would suggest that it is to allow the bloodstains to be used to recreate the events at a crime scene, in a manner defensible in court. Hence, we would suggest that the categories should be based on the events that cause the bloodstain patterns, rather than on the geometric or other characteristics of the bloodstains and their patterns themselves.

For example, one current method is to categorise certain types of bloodstains by their size: tiny, small, medium and large. These bloodstains are caused by blood projected from the victim after an injury caused by an impact, with the size of the bloodstain being inversely proportional to the force applied by the impact – the tiny bloodstains being caused by high-velocity impacts such as gunshot wounds.

An advantage of this is that the categories used will make immediate sense in the context of the case to the judges and the lawyers, who are unlikely to be BPA experts, removing the need to explain how one can translate a categorisation based on bloodstain shape, size, pattern and location, into the process that caused the bloodstain. Of course, this categorisation will have to be tested in court in each jurisdiction, but once accepted, it should stand in future cases without having to be defended and explained in detail every time.

It might be useful to have a hierarchy of categories, rather than trying to place all on the same level. For example, the first level of categories could be *passive*, *transfer* and *projected*. Such a hierarchy would make it easier for users (not just BPA experts, but also lawyers, judges and others) to understand the categorisation. It would also mean that the BPA could use intermediate (or parent) categories meaningfully, such as when they had not yet done the final categorisation, or in cases where they could not differentiate the BPA to the finest level (eg: when there is a mix of projected bloodstains).

4. The Proposed Expert Working Group

It might be best to separate ENSFI's work on bloodstain pattern analysis from its work on body fluids in general, because the former is based largely on physics and mathematics, and the latter largely on chemistry and biology. Indeed, this was implicit in the discussions at the meeting on Thursday, 25 September 2003, with BPA being aligned to the Scene of Crime Working Group and body fluids to the DNA Working Group.

It might be useful to expand the scope of the BPA Working Group (or Sub-Working Group) to deal with stains and residues left by other body fluids and body parts (eg: skin flakes) scattered or sprayed by impacts, injuries and other trauma. While there might not yet have been much research on these, including them in the scope might encourage research on them.