

Date: 12/01/2021

Forensic Recovery and Examination (BMPS6009) -

Assignment 2

Bart Nowak (2009619)

Question 1. 'Trace Evidence' relates to the 'traces' of tiny particles' that may be left at crime scenes by criminals.

- i. Explain: What 'tiny particles' make up 'trace evidence'.

The term 'trace evidence' refers to minute particles left at the scene of a crime by the perpetrator. In forensic science, Locard's principle of exchange states that every contact leaves a trace, hence it is possible to relate trace evidence to its source of origin, such as a piece of glass found on a suspect to the broken window present at the crime scene (Bryant and Bryant, 2015). Trace evidence encompasses glass, fibres, paint and soil located within the scene or present on the suspect's clothing for instance. It may also encompass DNA evidence such as blood.

Glass is a mixture of silica, sodium carbonate and calcium compounds, once melted, these components form the base material to which further adulterants are added. The additives added to the mixture determine the physical characteristics of glass such as colour, hardness and heat resistance. In a burglary, a window could have been broken and used as a point of entrance. Glass is typically broken by physical objects travelling at speed, heat, explosion or stress exerted on its surface. Through a process called 'backward fragmentation' small shards of glass are distributed in the opposing direction to the force of impact which causes them to travel backwards. The perpetrator standing within close proximity to the window will subsequently be showered with tiny particles of glass.

Fibres can occur naturally or be of man-made origin, for instance wool or cotton are animal and vegetable fibres respectively. Whereas, synthetic fibres such as nylon are man-made. Fibres from clothing will for a time stick to receptive surfaces such as seats, carpets and garments. Manufacturers use a variety of dye's which define the colour and therefore add class characteristics specific to this line of clothing, other examples include the number of strands in each thread or the way the garment is woven.

Likewise, paint is a combination of chemical compounds and colourants. Paint is applied to walls, doors, frames and objects commonly found in crime scenes. It may possess unique properties such as rust-proofing or fungal resistance. However, the evidential value of paint is defined by the quantity of layers of paint on the surface. For instance, numerous layers of multi colour paint are individualised and are less likely to occur elsewhere unlike a single layer of white paint.

Soil occurs naturally, however it may be unique to the area in which a crime was committed. The uniqueness of soil is affected by the chemicals and waste material contained within it. In relation to forensic investigation, the analysis of soil can prove that an object originates from a very specific location.

Blood is often found at the scenes of violent crimes, however it may be encountered in scenes of volume crimes such as burglary whereby the suspect deposits blood by climbing a broken window and cutting themselves. Biological evidence includes blood, semen or hair recovered from a crime scene. By comparing the blood found at the scene and the suspect the investigator can conclude that at one point in time the suspect was present at the scene, most likely during the commission of an offence.

- ii. Explain: How 'trace evidence' might be recovered from a crime scene, and

In order to prevent cross-contamination the forensic practitioner should wear protective equipment which consists of a DNA mask, overshoes, gloves and a protective garment. Evidence such as glass should be taken from the remaining particles still attached to the frame in order to prove that the glass originates from the window. However, if no particles are found in the frame the forensic practitioner could collect samples from around the frame. Once recovered, the glass must be marked as a 'control' sample'. This is salient as the traces recovered from the suspect will be compared to the samples found at the scene. Glass should then be packaged in a box sealed with tape to prevent the risk of fragments cutting through.

Fibres can be recovered using a pair of sterile tweezers. As previously mentioned, fibres can be found on receptive surfaces such as car seats. In that scenario, the forensic practitioner can recover the samples and place them upon a sheet of A4 paper which is then folded to avoid the risk of losing fibres. Hairs can be recovered using sterile tweezers or tape which is used to lift the hair off a surface. It is then placed in a folded piece of A4 paper or an envelope.

iii. Critically evaluate the effectiveness of 'Trace Evidence'
in criminal investigations.

(25 Marks)

Forensic investigation aims to identify the person culpable for committing an offence by linking together scenes, victims and suspects. The effectiveness of trace evidence is subject to its context and interpretation. There are limitations attached to the different types of trace evidence. According to Locard's theory, every contact leaves a trace. However, forensic evidence continues to erode or break down over time. To illustrate this, the fibres or glass shards present on the suspect may be lost due to the effects of retention of evidence. Therefore, the police must follow the golden hour and fast track action principles to increase the chances of recovering evidence and prevent it from changing further. On the other hand, genetic material such as DNA is prone to

contamination due to the lack of correct handling. Biological evidence also requires correct storage conditions, DNA exposed to heat will degrade quickly so it must be stored in a cool environment. Latent blood found at a scene can be made visible using luminol, a chemical compound which reacts with the iron particles present in blood. Under negative light, the substance will give off a blue illumination. However, this method is not unique to human blood, animal blood could be found at the crime scene and will also be illuminated. Furthermore, the chemical reaction could destroy other evidence. Hence, it is best applied to scenes which have been cleaned.

The value of contact trace evidence is dependent upon the retention properties of a material. Fibres present on clothing or discharge residue present on the suspect's hands can be washed off. Particles of glass attached to the hair, garment or shoe soles of a suspect are likely to fall off over time as the movement of a person increases. The texture of a surface will determine its receptive abilities, for example coarse surfaces are more likely to retain debris compared to smoother surfaces. Finally, the more time a suspect has to flee away from the scene and conceal or lose the trace evidence the less likely it is that traces linking them to the scene will be recovered.

Question 2. Explain the importance of careful scene examination following a terrorist attack.

Terrorist attacks can take place in busy and often vast areas. To preserve the value of forensic evidence a common approach path must be used to ensure that public service workers can access the scene with a minimised risk of contamination. There is a risk that a secondary device will detonate if the terrorists methodology involves using explosive devices. It may be highly likely that the secondary device intends to harm police and ambulance staff, it will therefore be concealed by the terrorist within the presumed cordon of the scene.

When examining post-blast scenes, there is a risk of encountering explosive devices which failed to detonate. The assistance of explosives officers can be used to advise on the remaining dangers related to the incident. Explosive traces can disperse and cover large areas, it may be necessary to swab parts of cars parked nearby to secure the residue. The use of discharge residue from firearms and explosives can aid to identify the terrorist group responsible for the attack. This would likely happen after components of the bomb were found among the debris. Likewise, in a lone-wolf scenario the perpetrator may hide among the civilians. They should be identified promptly, their clothing retrieved and tested for the presence of firearm discharge residue. The value of such evidence is enhanced if the suspect denies ever using a firearm.

Question 3. Explain the purpose of forensic examination in criminal investigations and critically evaluate the effectiveness of forensic work in criminal prosecutions in the United Kingdom

The purpose of forensic investigation is to establish links between the suspect, victim and the crime scene. The links made can either be one way or two way links. To illustrate this, a screwdriver found on the suspect matching the impression left in the window frame at the crime scene is a one way link. An additional link can be made by analysing the traces on their clothing for instance paint flakes. Therefore, mechanical fit proves that the screwdriver was used in the commission of the offence and the paint flakes recovered from the suspect's garment are supporting the premise that they were present in the vicinity from the moment the offence was committed.

Forensic examination can also be used to test the veracity of victim, suspect and witness statements. Therefore, their claims can be corroborated or disproven. The movement of victims and suspects within the crime scene can be interpreted by blood pattern analysis. If more than one drop is present at the scene, a forensic investigator could determine the point of origin of blood which can show the position that the victim

was in when being struck. Also, crime scenes can be linked with other scenes to determine the MO (Modus operandi) of the perpetrators. A prolific burglar in an area can be identified based on their methodology such as the time of day or night when the offences were committed, the points of entry to the property or the type of goods stolen.

Question 4. DNA provides important evidence in criminal prosecutions:

- i. Explain from where dna might be recovered at a crime scene,

Prior to commencing the recovery of evidence, the investigating officer should speak to the victim to identify the sources of possible evidence and narrow down the search. DNA could be recovered from the blood, hair or nail scrapings present at the scene or found on the suspect or victim. Victims of sexual assault are likely to hold the perpetrators DNA for a while at least. It could include semen deposited by the suspect or blood if there has been a struggle. Thus, DNA of a suspect could be recovered from the victim's body. Semen and blood provide the most reliable sources of DNA evidence, both being able to identify individuals with 90% and 87% accuracy respectively.

- ii. Explain how dna samples may be recovered, and

Nail scrapings or skin swabs can contain traces of blood, those should be cut using clippers over a piece of paper and placed in separate bags and labelled. Bodily fluids such as blood should be swabbed and collected into a plastic container, secured and labelled. Samples can be recovered from the clothing worn by the victim which should be recovered immediately, it could contain DNA evidence such as semen or saliva.

iii. Critically evaluate the effectiveness of dna as evidence.

DNA can uniquely identify a person, no two people are known to share the same DNA apart from identical twins which form from one fertilized egg split in two. The value of DNA evidence can be diminished by poor handling as well as the risk of contamination by the officer handling it. Mitochondrial DNA recovered from bone or hair is resistant to outside factors and is more likely to maintain its value over time. However, such evidence can only identify a person's maternal line such as the mother and her siblings. That is because the father's mitochondria does not enter the egg and is left outside. Conversely, males and their paternal lines can be identified using the Y chromosome.

DNA evidence offers many possibilities, matching the control sample from the scene to the DNA recovered from the suspect does not mean that they are guilty. DNA therefore also provides corroborative evidence in addition to the conclusive identification of a person. The suspect could have attended the scene prior to the commission of crime, their DNA was recovered but they have no involvement in the offence. Alternatively, the suspect was present at the scene and played a lesser role in the incident. The final option concludes that the suspect was present at the scene and played exactly the role they are accused of.

(25 Marks)