"*Sanguis Effectum":* A continued investigation of blood effect theory on the reliability of eye witness recall.

Katie-Louise Peacock

University of Cumbria

Abstract

Witness testimony is frequently used as a form of evidence within the criminal justice system, as it possesses a high level of evidentiary power (Dando, Wilcock & Milne, 2008), however it is surrounded by much controversy. Weapon focus has been well-documented to reduce the reliability of witness statements, as the witness' full focus is on the weapon (Loftus, 1966). This results in little attention left to be allocated to details of the crime that do not involve the weapon, such as the victim and the crime scene (Loftus, Loftus & Messo, 1987). Despite an abundance of empirical support, weapon focus theory cannot be generalised to explain low recall rates in non-weapon based crimes. Therefore, it is possible that an alternative explanation for low recall rates can be explained by blood effect theory, which states that blood will act in a similar way to a weapon and draw the witness' full focus. This results in little or no attention left to be attributed to other factors of the crime, such as the perpetrator and crime scene, reducing recall rates and producing unreliable witness testimonies. Peacock (2014) initially investigated blood effect theory and found that blood significantly reduced recall rates. Inspired by Peacock (2014) findings, the current study employed the use of two experimental conditions; control (n=40) and blood (n=40). Participants were required to watch one of two short video clips and then answer one of two versions of the same questionnaire immediately after, which focused on three key sections; victim, perpetrator and crime scene. Initial statistical analysis suggested that there was a significant effect of section and age on recall rates, but there was no difference in recall rates between the control and experimental condition, suggesting that blood did not have an effect on recall rates as first hypothesised. The results of the current study will be explained by specifically focusing on literature pertaining to blood sensitivity, age, stress, shock and surprise and facial recognition.

Key words: Blood Effect Theory, Eye Witness, Witness Statement, Reliability, Recall Rate.

Peacock,K. L. (2017) "Sanguis Effectum": A continued investigation of blood effect theory on the reliability of eye witness recall.. *Journal of Applied Psychology and Social Science, 3* (1), 1-18

Eye witness testimony is a frequently used form of evidence within the criminal justice system (CJS; Wells, 1984). Put simply it is a legal piece of evidence, such as a document, recorded conversation or video (Stolzenberg & Lyon, 2014) that is comprised of full or partial details of a crime, as recalled by either a witness or a victim (Passmore, 2011). Weber, Brewer and Wells (2004) state that you do not need professional status in order to be a witness to a crime, thus all members of the public can be an eye witness and provide a witness statement that will contribute to CJS proceedings. Furthermore, they are not required to have witnessed the full crime or have been specifically in the immediate locality of the crime scene (Passmore, 2011). Wald (2002) states that multiple eye witness statements from individuals who have only witnessed a proportion of the crime are regarded just as highly in evidentiary terms compared to one full statement from a single witness in courts. Although Weber et al. (2004) states that anyone can be an eyewitness, Mueller-Johnson et al. (2007) states that there are certain criteria that must be met in order for the jury to believe the witness is reliable, these are; possession of a reliable memory and the ability to express memories in a coherent and structured manner.

Due to the specificity of the above mentioned criteria, (e.g. Ebner & Johnson, 2011), it is unsurprising that there has long been much controversy pertaining to the reliability of eye witness statements (Schweitzer & Saks, 2007) and consequently, an abundance of research has amassed throughout the years. The first issue that questions the reliability of eye witness testimony is the nature of memory; however, this issue is often frequently overlooked, as many individuals view memory as merely a storage facility rather than the driver of an important bio-cognitive process (Bartol & Bartol, 2004). Consequently, many individuals see memory as being infallible and therefore permanently accurate, which is not the case (Wise, Fishman & Safer, 2009). Furthermore, whilst most individuals are able to produce a reasonably accurate statement, it is highly likely that they will be unable to recall every aspect of the crime and will therefore have gaps in their memory (Kasin et al., 2001). In order to reconstruct a memory, the brain unconsciously retrieves information from the individual's schemas, producing a complete, but sometimes unreliable statement (Devenport, Cutler & Penrod, 1997). A schema is a cognitive framework that enables individuals to sort through their memories and pieces of new information and place them into groups based on similar knowledge, beliefs, expectations and previous experiences of similar events (Ghosh & Gilboa, 2014). When a gap in memory occurs, the individual retrieves information from a relevant schema to complete the memory; however the unconscious incorporation of schematic information poses a problem when examining the reliability of a statement, as it is highly likely that there will be elements of an individual's statement that will not be true and

will therefore not be accurately representative of the most recalled event (Wise et al., 2009).

Knowledge, beliefs and expectations can also manipulate how the eyewitness interprets what they have seen; this is known as eyewitness bias (Garcia-Bajos & Migueles, 2012). An example of eyewitness bias would be due to the type of employment that is held by an eyewitness. For example, if a hairdresser witnessed a crime, they would be more likely to remember the hair colour, cut and length of the perpetrator and victim, compared to an individual who is employed as a bricklayer who may be more likely to remember the area in which the crime was committed (Steblay, 1997). In addition, the witness's knowledge, beliefs and expectations are also known to influence encoding procedures (Sporer, 2001). Encoding is an unconscious process (Meissner & Brigham, 2001) that enables the individual to interpret the witnessed event by assigning it personal meaning (Huggenberg & Sacco, 2008). Although important to an eyewitness statement, encoding can be easily interrupted, through the incorporation of a distracting stimulus, such as a weapon, which results in poor recall and an unreliable witness statement (Green et al., 2007).

Weapon focus theory was developed by Loftus (1996), as a way to explain the low recall rates that occurred whilst weapon based crimes were witnessed. Weapon focus theory states that a witness' sole attention will be drawn to the weapon, leaving little or no attention left to be allocated to other aspects of the crime (Loftus et al., 1987). The theory initiated a change in witness statement taking procedures throughout the police force, as officers are now required to apply scientific interview techniques to minimise eyewitness error caused by a weapon (Wise, Cushman & Safer, 2012). Despite contemporary application to witness statement taking procedures, weapon focus theory has been at the centre of critical debate throughout the years (Ericson, Lampinen & Leding, 2014). Kassin, Elsworth and Smith (1989) found only 56.9% of psychological experts agreed with weapon focus theory; the other 43.1% that did not agree provided no alternative explanation for low recall rates. Although Kassin et al. (1989) study was conducted over 25 years ago, suggesting that the results cannot be applied current social and environmental norms, it was the first study to openly investigate the level of dispute between professionals over weapon focus theory and is therefore identified as an important and key piece of research (Hepburn & Hemingway, 2004). In order to further test the dispute pertaining to weapon focus, Peacock (2014) conducted a study that partially examined the presence of a weapon had on recall rates. Analyses revealed that participants had a lower recall rate in the victim and environment sections within the weapon condition, suggesting that the participant's central focus was drawn to the perpetrator who was in possession of the weapon. This ultimately reduced the amount of attention left to be allocated to the victim and environment (Peacock, 2014); the

findings provided current and empirical support for weapon focus theory.

In 2014, there was a surge in anti-weapons campaigns due to an increase in the number of fatal stabbings, which by default, increased the number of witness statements being taken (Hern, Glazebrook & Beckett, 2005). The increased frequency of fatal stabbings was heavily sensationalised by the media and was dubbed the "knife epidemic"; it received so much media attention that it began to adversely alter the public's perception of the frequency in which weapon based crime occurred. Perception became largely exaggerated compared to the actual statistical frequency in which weapon based crimes occurred (Squires, 2009). Contrary to expectation, the recent sensationalism of weapon based crimes is able to explain low recall rates in eyewitness testimonies when a weapon has not been utilised. In further explanation, as the knife epidemic falsely increased public perception of the frequency of knife crime, it is possible that witnesses were placing weapons in non-weapon crimes. Henkel et al. (2000) reinforces this, by stating that when individuals are bombarded with visual stimuli, their imagined events become confused and are perceived as actual events. Media attention surrounding the knife epidemic has since significantly reduced and it is therefore arguable that the theory cannot be used to explain current low recall rates in weapon based crimes in today's society. From this, there is consequently a need for the development of a theory that is able to explain low recall rates in non-weapon based crimes that is able to remain a viable explanation throughout episodes of media sensationalism.

As a result, blood effect theory was developed and suggests that blood will act in a similar way to a weapon, in that it will draw the witness central focus, ultimately reducing recall rates (Peacock, 2014). The theory stems from Vossbech-Elsebuch and Gerlach's (2012) blood sensitivity theory, which states that there is a positive relationship between the volume of blood and disgust sensitivity, in that the higher the volume of blood, the more disgusted the individual becomes. Applied to the context of a witnessed crime, if there is blood visibly present at a crime scene, it is theorised that a large proportion of the witness's attention will be drawn to the blood as it is disgust inducing, resulting in distraction or an avoidance coping strategy being used. Ultimately, this leads to poor recall rates and an overall unreliable witness statement, as the witness' full focus is on the blood, meaning they did not observe any other factors within the crime. Rozin and Fallon (1987) also suggest that the occurrence of distraction or avoidance occurs when confronted with the sight of blood, as people are inherently programmed to be repulsed by blood, as it is seen as dirty and contaminating. Furthermore, the potential longevity of blood effect theory is exemplified by examining haemo-phobia (phobia of blood), as it is a commonly experienced phobia and equally, one of the only phobias that can elicit a response of fear and disgust simultaneously (Dejong &

Mercklebach, 2003). Page (2003) challenges this statement, by suggesting that it is emotionally impossible for an individual to simultaneously feel both fear and disgust in equal proportions; one emotion is usually felt more strongly than the other. Despite the difference in opinion pertaining to the emotions felt whilst observing blood (e.g. Dejong & Mercklebach, 1998; Page, 2013), blood remains to be a common phobic inducing stimulus for the general public, therefore suggesting that there will be a higher frequency of individuals employing a distraction method or avoidance coping strategy when confronted with blood (Olatunji, 2008).

The current study was inspired by Peacock (2014)'s findings and therefore aimed to further investigate blood effect theory by following a similar procedure. The current study incorporated the use of two experimental conditions; control and blood. Opportunistically recruited participants watched either a control video or an experimental video that contained blood and were asked to recall information relating to the video by completing one of two versions of the same questionnaire. Based on current literature and the findings of Peacock (2014), it is hypothesised that participants will have a lower recall rate in the experimental condition where there is blood present compared to the recall rate in control condition that is free from blood.

Method

Design

A 2 x (3) x 4 mixed design was employed on an opportunistic sample of students at the University of Cumbria. The first variable was manipulated as participants were assigned to either the control or experimental condition. The second variable measured participants correct number of answers in each section of the questionnaire (victim, perpetrator, crime scene) and the third variable measured recall rates between participants age ranges, who fell into either 16-24, 26-34, 36-48 and 49+ category.

Participants

Eighty opportunistically recruited participants aged 16 and above (40 males and 40 females) took part in the current study. Sixteen year olds were recruited for the current study as Webster and Kingston (2014) suggest that as a result of the current economic climate, poverty levels have soared which has resulted in fewer teenagers remaining in education and an increase in criminal behaviour to make ends meet, which also creates teenage witnesses. Opportunistic sampling was employed to ensure adequate sample of population was recruited and allowed for efficient recruitment of participants due to confined time constraints. All participants were asked to complete the demographics section of the questionnaire which

asked them their age and their gender. In both the control and experimental conditions, there was a 50/50 gender split amongst participants.

Materials and Procedure

After participants were randomly assigned to a condition, they were required to watch one of two videos; a control video, that did not incorporate blood and an experimental condition that incorporated blood. Both videos featured the same scenario in order to maintain standardization and featured a young lady being mugged for her bag and mobile phone outside a residential setting, however during the experimental condition the young lady is punched in the face prior to her bag being taken.

After watching the video, participants completed a questionnaire consisting of four sections- the first consisted of demographics- age and gender of participants, the second section contained questions pertaining to the victim within the video such as demographics of the victim and the victims behaviour, the third section focused on the perpetrator and asked similar questions to section two, but included questions such as "did the perpetrator injure the victim?" and the fourth and concluding section of the questionnaire asked questions relating to the crime scene such as "what was the weather like whilst the crime was occurring e.g. sunny/raining". All of the questions within the questionnaire were validated by two Police Officers to ensure that they replicated the questions that would be asked when obtaining witness testimony.

Results

Descriptive statistics including the standard deviation and the mean number of questions answered correctly in each section was calculated across each of the two conditions amongst each age group.

Table One:

Means and (Standard Deviation) Table for the Total Number of Correct Answers in each Section Across Both Experimental Conditions in each Age Category.

Condition	Age group	Perpetrator	Victim	Crime scene
Blood	16-25	9.30 (2.16)	8.20 (.92)	5.50 (.71)
	26- 35	8.91 (1.81)	8.55 (1.75)	4.82 (.75)
	36-48	9.00 (1.90)	8.18 (1.40)	5.64 (1.03)
	49 +	8.38 (1.85)	7.50 (1.60)	3.75 (2.12)
	Total	8.93 (1.89)	8.15 (1.44)	5.00 (1.36)
Control	16- 25	9.42 (1.67)	9.04 (1.04)	5.21 (1.41)
	26- 35	10.00 (1.63)	9.00 (1.15)	5.50 (.58)
	36- 48	9.33 (1.51)	9.00 (.89)	5.67 (.52)
	49 +	7.00 (2.97)	7.00 (2.00)	5.00 (.63)
	Total	9.10 (2.02)	8.73 (1.38)	5.28 (1. 15)
Total	16- 25	9.38 (1.79)	8.79 (1.07)	5.29 (1.24)
	26-35	9.20 (1.78)	8.67 (1.59)	5.00 (. 76)
	36-48	9.12 (1.73)	8.47 (1.28)	5.65 (.86)
	49+	7.79 (2.39)	7.29 (1.73)	4.29 (1.73)
	Total	9.01 (1.95)	8.44 (1.43)	5.14 (1.26)

Factorial Analyses of Variance (ANOVA)

A 2 x (3) x 4 mixed design factorial Analysis of Variance (ANOVA) was conducted to explore which of the two conditions produced the highest recall rates across all three sections, between age groups. There are three main effects within in current the study; the first is section, the second is age and the third is condition. There are also four possible interactions within the current study; section and condition, age and section, age and condition and age, condition and section.

The factorial ANOVA revealed that there was no significant main effect of condition, (F (1, 72) = 1.28, p=.262, eta^2= .02). There was however a significant main effect of age (F (3, 72) = 6.67, p<.001, eta^2 =.22) and a significant main effect of section (F (2, 144) = 133.09, p<.001, eta^2= .65). Additional post hoc comparisons for the significant main effect of section using Bonferroni, revealed that significantly more questions were answered correctly in the

perpetrator section compared to the crime scene section (*MD* = 3.78, *p<.001*). There was also significantly more questions answered correctly in the victim section compared to the crime scene section (*MD* =3.17, *p*<.001) and there was no significant difference in the amount of correctly answered questions between the victim section and perpetrator section (*MD* = .61, *p*=.057).

There was also a significant main effect of age, further post hoc analysis using Tukey revealed that there was no significant difference in the number of correctly recalled questions between 16-25 year olds and 26- 35 year olds (*MD*= .20, *p*= .916) and 36-48 year olds (*MD*= .08, *p*=.994). Similarly, there was no significant difference in the number of correctly recalled questions between 36-48 year olds and 26-35 (*MD*=.12, *p*=.986). However, 49+ year olds answered significantly less questions correctly compared to 36-48 year olds (*MD*= 1.29, *p*<.01), 26-35 year olds (*MD*=1.17, *p*<.05), and 16-25 year olds (*MD*= 1.37, *p*<.001; See appendix ten for output).

Interactions

Examining the main effects of condition, section and age allowed for the analysis of four possible interactions. The 2 x (3) x 4 mixed design factorial ANOVA revealed that there was no significant interaction between section and condition, (*F* (2, 144) =.37, *p*=.694, eta^2 = .01), section and age (*F* (6, 144) =.41, *p*=.874, eta^2 = .02), condition and age (F, (3, 73) =.50, *p*=.681, eta^2 =.02) and also between condition, section and age (*F* (6, 144) =1.46, *p*=.197, eta^2= .06). Below is a line graph highlighting the lack of interactions between the aforementioned variables (see appendix eleven for output). In summary, statistical analysis performed on the current study revealed that condition did not significantly affect recall rates in any of the three sections, therefore suggesting that blood did not reduce recall rates.

Discussion

The current study aimed to further investigate the effect blood had on recall rates; it was hypothesised that the presence of blood would produce lower recall rates in the experimental condition compared to the control condition, across all age groups. Analysis revealed that age and section of the questionnaire significantly impacted recall rates; more specifically, 16-25, 26-35 and 36-48 year olds correctly recalled more answers across both conditions of the current study compared to participants aged 49 and above. Additionally, participants also correctly recalled more answers in the victim and perpetrator sections of the questionnaire compared to the crime scene section. Contrary to the experimental hypothesis, analysis found that there was no overall difference in recall rates between the control and experimental condition, resulting in the rejection of the experimental hypothesis. However, several points

are worth considering in light of these findings. The low recall rates found in participants who were aged between 49 and 60 can be explained by examining literature pertaining to the reliability of older eyewitnesses and also by exploring literature on how the degeneration of neurological processes affect the working memory and therefore recall.

In contrast to the current study's findings, public perception appears to suggest that there is a positive correlation between the age of an eyewitness and the credibility of their testimony (Lull & Bushman, 2015). More specifically, it is believed that the older the eyewitness, the more credible their testimony is expected to be (Lull & Bushman, 2015). This perception can be explained by Binder and Desai (2012), who found that there is a positive correlation between age and semantic memory, in that the older a person is, the more general world knowledge is stored in their semantic memory. Based on the above information, the current studies low recall rates in the 49-60 group could be deemed unexpected, however, Nyberg et al. (2012) reduces the unexpectedness of the results by stating that an individual's subjective memory declines as they age, which is the area of memory concerned with recalling recently retained information. Applied to the current studies results, low recall rates could be explained by the combination of increased semantic memory and decreased subjective memory, as it is possible the older participants are able to remember how to do a task, such as fill in a questionnaire, but may struggle with applying recently retained information (Adams-Price, 1992), such as the information in the video.

The low recall rates can also be explained by examining self-fulfilling prophecy, which is the is a prediction that directly or indirectly causes itself to become true, due to feedback between belief and behaviour (Wurm et al., 2013). To further explain, the current study grouped individuals aged 49 and over with those aged 60 which may inadvertently have caused participants aged 49 to believe that their cognitive ability is equivalent to participants aged 60 and above. This may have reduced confidence in ability, consequently producing low recall rates (Devlin, 2006). It is also possible that low recall rates may have been the result of younger participants in the category subconsciously being more concerned with producing a higher recall rate compared to their 60 year old counterparts, so as not to be associated with being forgetful. It is therefore possible that their full focus was not on the blood, which in turn will have resulted in a lack of distraction or avoidance techniques, thus rendering blood effect theory unnecessary.

Conversely, the current study also revealed that participants aged 16 to 25 produced the highest number of correctly recalled answers compared to those aged 49 and above. Previous research conducted by Yarmey and Kent (1980) further supports the findings of the current

study, by revealing that younger witnesses were more likely to remember a larger volume of information and also correctly recalled significantly more information compared to older eyewitnesses. Coxon and Valentine (1997) suggest that this may be due to the fact that individuals of that age possess stronger visual acuity and stronger cognitive function which significantly contribute to more accurate storage and retrieval of information (Memon et al., 2003). Additionally, young adults aged between 16 and 25 are believed to have better recall rates as they are generally not as affected by threatening behaviour compared to older citizens (Hess et al., 2003). To expand, Rahhal et al. (2001) proposes that younger adults are less influenced by threatening stimuli due to desensitization of blood and injury from violent video games and increased media pressure to play the games, ultimately reducing the impact of threatening stimuli. However, as individuals aged 49 and above have not been subjected to as much media pressure and have not been brought up playing violent video games, they perceive threat more strongly, which reduces the amount of executive control resources, leading to impairment in the working mind and consequent poor recall rates (Hedden & Gabrieli, 2004). Hedden and Gabrieli's (2004) research provides an interesting explanation for the high recall rates amongst 16-25 year olds within the current study, as it is possible desensitization has caused younger participants to not be as adversely affected by the presence of blood in the current study. The reduced impact of blood resulted in the younger participants possessing the ability to distribute their attention equally amongst all aspects of the video, which produced the high recall rates within the experimental condition.

Despite the impact age has on the reliability of an eyewitness, the results of the current study also found that participants remembered more about the victim and the perpetrator and less about the crime scene. There is an abundance of research pertaining to why witnesses remember more information about the victim or perpetrator of a crime, with the majority stating that is due to facial recognition (O'Rule, Slepian & Ambady, 2012). Faces are a uniquely important stimulus that not only allow people to determine information relating to a stranger's demographics, but also information about a stranger's emotional state and the behaviors that are likely to stem from these emotions (Hope et al., 2004). The information gained from the facial recognition of another person is largely applicable when witnessing a crime, as it enables the witness to determine the answers to questions that may be asked relating to the relationship between the suspect and victim (Sauerland, Sagana & Otgaar, 2013). Moreover, witnessing a victim's face in pain may automatically elicit a response of empathy for the individual (Cui et al., 2015) and may cause witnesses to seek the source of pain in order to stop it (Sun et al., 2015).

Despite the current study highlighting significant differences in recall rates between age groups and between sections of the questionnaire, the current study originally hypothesised that blood would reduce recall rates, however, the findings did not support this hypothesis. The unexpected high recall rates in the current study can be explained by examining the theoretical underpinning of blood effect theory. To elaborate, in Peacock (2014) blood effect theory is underpinned by two key theories, Vossbeck-Elsebuch and Gerlachs blood sensitivity theory and Mitchell, Livosky and Mathers (1998) shock and surprise theory. However, the results of the current study have resulted in the underpinning theories to be reviewed and as a result has highlighted the importance of ensuring elements of both theories are adhered to when creating experimental videos to test the theory. The video highlighted the intentions of the perpetrator by showing them sneaking up behind the victim, thus removing the element of shock and surprise (Mitchell et al., 1998). The theory states that shock and surprise causes an individual's attention to be drawn directly to the shocking and/or surprising stimulus, reducing the amount of attention available that can be attributed to factors not associated with the shocking and/or surprising stimuli. However, despite the lack of shock and surprise, it was still expected that the presence of blood would sufficiently draw the focus of the participant and reduce recall rates. However, the lack of shock and surprise may have resulted in participants distributing their attention equally amongst all aspects of the video, minimising the effect the presence of blood had on participants, which in turn produced the unexpected higher recall rates within the experimental condition. The experimental scenario between studies was changed to make the video more realistic and applicable to everyday life, and also to investigate the generalizability of blood effect theory, to see if it was functional within all aspects of criminal offenses in which blood could be present. The importance of having blood as a shocking stimuli is further reinforced through Peacock (2014) findings, as when the element of shock and surprise was utilised through showing the cashier being severely injured after he provided the perpetrator with the money, participants recall rates were lower in the blood condition.

The unexpected high recall rates may be the result of an experimental design flaw that meant the experimental scenario did not adhere closely enough to blood effect theory. To expand further, Vossbeck-Elsebuch and Gerlach's (2012) blood sensitivity theory states that the higher the volume of blood, the lower a person's tolerance level becomes and the more likely they are to become disgusted. This results in the individual becoming distracted or employing an avoidance coping mechanism (Page, 2003), which in turn reduces recall rates (Peacock, 2014). With that in mind, the amount of blood present in the current study can be

seen to be inadequate, as the high recall rates in the experimental condition suggest that the volume of blood was not of a sufficient enough size to elicit a disgust response. The lack of a disgust response did not result in distraction or an avoidance coping strategy being elicited. However, the volume of blood in the experimental video was directly proportional to the crime that had been committed, which exhibits a high level of mundane realism. Mundane realism is the extent in which an experimental study is similar to a similar real life situation outside of the laboratory (Dobbins, Lane & Steiner, 1988). Difonzo, Hantula and Bordia (1998) express the importance of mundane realism in experimental research, by stating that it is indicative of high external validity within the research.

Conclusion

In brief, the aim of the current research was to investigate the effect blood had on recall rates in order to further contribute to the falsification of blood effect theory (Peacock, 2014). The study found that there was an age difference in recall rates, specifically between 16-25 year olds and 49 year olds and above and also that participants produced higher recall rates in the victim and perpetrator section of the questionnaire, compared to the crime scene section. In contradiction to the expected results, the current study found that there was no difference in recall rates between conditions, suggesting that the presence of blood did not reduce rates as hypothesised. Whilst exploring literature to explain each of the study's results, it became evident that the experimental design may have been flawed, in that it did adhere closely enough to blood effect theory. In further explanation, although the experimental scenario was altered to increase mundane realism, the change resulted in an inadequate amount of blood being incorporated into the experimental video. This is theorised to not of been of a sufficient enough amount to draw participants central focus and elicit a disgust response, which should have distracted the individual or caused them to employ and avoidance coping strategy, reducing recall rates in factors not associated with the blood (Peacock, 2014). The experimental design may have also inadvertently encouraged age bias through the incorporation of the "hoodie" stereotype, which was induced through the perpetrator wearing a hooded jacket. The association between a "hoodie" and crime may have caused participants to guess the outcome of the video, which unconsciously diverted participants focus from the blood to the act of crime itself. Despite the unexpected results, the change in the experimental scenario and consequent recall rates has brought to light a potential application of the theory that had not previously been foreseen. Moreover, it is possible that blood effect theory can only be applied to instances in which violent crime has occurred; although not as frequent as a mugging, seemingly non-weapon based violent crimes do still occur, resulting in instances

in which blood effect theory can be frequently utilised as an explanation for the low recall rates.

With the above in mind, future replications of the study may benefit from increasing the amount of blood in the experimental video to ensure the volume is sufficient enough to draw the participant's central focus, allowing blood effect theory to be carried out. Additionally, future replications may also find not adhering to stereotypes to be advantageous, as the participants' central focus should be on the blood and the element of shock and surprise will also be reintroduced to the scenario, which has been proven to be fundamental to blood effect theory. In light of the new application, further research should be conducted that aims to test the application of blood effect theory, by utilising three experimental conditions; a control condition, a condition in which a moderate crime has been committed that does not result in serious injury and a condition in which a violent crime has been committed, that results in serious injury, such as the experimental video from Peacock (2014). The current study was initially conducted as a follow on from Peacock (2014) and although the findings were not as originally hypothesised, the results have revealed a new avenue of application for blood effect theory, in that it may only be applicable to instances in which violent crime has occurred. Whilst blood effect theory would largely benefit from further research, possible future applications of the theory centre on altering witness statement taking procedures so that a reliable statement can be devised irrespective of an attention drawing stimuli being present. However until finite conclusions can be made regarding weapon focus theory, it would be unreliable to extrapolate results to real life applications.

References

Adams-Price, C., (1992) Eyewitness Memory and Again: Predictors of Accuracy in Recall and Person Recognition. *Psychology and Aging.* 7 (4) 602- 608.

Armfield, J., & Mattiske, J., (1996) Vulnerability representation: The role of perceived dangerousness, uncontrollability, unpredictability and disgustingness in spider fear. *Behaviour Research and Therapy*, 34 (11), 899-909.

Barber, S. J., & Mather, M., (2013) Stereotype threat can enhance, as well as impair, older adults' memory. *Psychological Science.* 24 (12) 2522-2529. doi: 10.1177/0956797613497023

Bartol, C. R., & Bartol, A. M., (2004) *Theory, Research and Applications.* Psychology and Law. pp 435-512, 3 Ed, Wadsworth: United Kingdom.

Binder, J. R., Desai, R. H., (2011) The Neurobiology of Semantic Memory. *Trends in Cognitive Science.* 15 (11) 527-536. doi: 10.1016/j.tics.2011.10.001.

Brewer, N., & Wells, G. L., (2006). The confidence-accuracy relationship in eyewitness identification: Effects of line-up instructions, foil similarity and target-absent base rates. *Journal of Experimental Psychology: Applied*, *12*, 11–30. doi:10.1037/1076-898X.12.1.11

British Psychology Society, (BPS, 2009) *Code of Ethics and Conduct,* 1-31. Leicester, UK: British Psychology Society.

Butler, K. M., McDaniel, M. A., Dornburg, C. C., Price, A. ., & Roediger, H. L., (2004) Age differences in veridical and false recall are not inevitable: The role of frontal lobe function. *Psychometric Bulletin and Review*. 11 (5) 921-925.

Dando, C., Wilcock, R., & Milne, R., (2008). The cognitive interview: Inexperienced Police Officers perceptions of their witnesses/victim interviewing practices. *Legal and Criminological Psychology.* 13, 59-70.

Devlin, M., (2006) Inequality and the stereotyping of young people. *Equality.* 1, 7-69.

Difonzo, N., Hantula, D. A., & Bordia, P., (1998). Micro worlds for experimental research. Having your (control and collection) cake and realism to. *Psychonomic Society.* 278-320.

Dobbins, G. H., Lane, I. M., & Steiner, D., (1988). A note on the role of laboratory methodologies in applied behavioural research. *Journal of Organizational Behaviour.* 200-251.

Ebner, N. C., & Johnson, M. K., (2011).What predicts the own age bias in face recognition memory? *Social Cognition.* 29 (1) 97- 109.

Ericson, W. B., Lampinen, J. M., & Leding, J. K., (2014) The weapon focus effect in target present and target absent line-ups: The roles of threat, novelty and timing. *Applied Cognitive Psychology*. 28 (3) 349- 359.

Gabrieli, J. D. E., (1996) Memory systems analyses of mnemonic disorders in aging and age related diseases. *National Academy of Sciences.* 93 (24), 13534- 13540.

Garcia-Bajos, E., & Migueles, M., (2012) Bias of script driven processing on eyewitness memory in young and older adults. *Applied Cognitive Psychology.* 26 (5) 737-745.

Green, E., et al., (2007) The four stages of memory: Perception, Encoding, Storage and Retrieval. *Psychology and the Legal System.* 5, 29-132.

Gurshberg, F. B., & Shimamura, A. P., (1995) Impaired use of organizational strategies in free recall following frontal lobe damage. *Neuropsychologists.* 13 (16) 1365- 1375.

Hedden, T., & Gabrieli, J. D. E., (2004) Insights into the aging mine: a view from cognitive neuroscience. *Nature Reviews Neuroscience.* 5, 87-96. doi: 10.1038/nrn1323.

Henkel, L. A., Franklin, N., & Johnson, M. K., (2000) Cross-modal monitoring confusions between perceived and imagined events. *Journal of Experimental Psychology.* 26 (2) 321- 335

Hepburn, L. M., & Hemingway, D., (2004). Firearm availability and homicide: A review of the literature. *Aggression and Violent Behaviour*, 9, 417–440.

Hern, E., Glazebrook, W., & Beckett, M., (2005) Reducing Knife Crime: We need to ban the sale of long pointed kitchen knives. *National library of medicine.* 330 (75) 1221-1222.

Hess, T. M., Auman, C., Colcombe, S. J., & Rahhal, T. A., (2003) The impact of stereotype threat on age differences in memory performance. *Journals of Gerontology.* 58 (1) 3-11. doi: 10.1093/geronb/58.1.P3.

Hope, L., Gabbert, F., Fisher, R. P., & Jamieson, K., (2014) Protecting and enhancing eyewitness memory: The impact of an initial recall attempt on performance in an investigative interview. *Applied Cognitive Psychology.* 28, 304- 313. doi: 10.1002acp.2984.

Kassin, S.M., Elsworth, P.C., & Smith, V.L., (1989). The general "acceptance" of psychological research on eye witness testimony: A survey of people. *American psychologist.* 44. 1089-1098.

Kasin, S. M., Hosch, H. M., Tubb, A. U., & Memon, A., (2001) General acceptance of eye witness research. *American Psychology.* 56 (5) 405- 416.

Loftus, E. F., Loftus, G., & Messo, J., (1987). Some facts about weapon focus. *Law and Human Behaviour.* 11. 55-58.

Loftus, E.F., (1996). *Eyewitness testimony.* 22-23, New York: Harvard University Press

Lull, R. B., & Bushman, B. J., (2015) Do Sex and Violence Sell? A meta-analytic review of the effects of sexual and violent media and Ad content on memory, attitudes and buying intentions. *Psychological Bulletin.* 141 (5) 1022-1048. doi: 10.1037/bul0000018.

Mauer, M., & Huling, T., (1995) Young black Americans and the criminal justice system. *Psychology and Sociology.* 2, 22-31.

Meissner, C. A., & Brigham, J. C., (2001) Thirty years of investigating the own-race bias in memory for faces: A meta-analytic review. *Psychology, Public Policy, and Law, 7,* 3-35.

Memon, A., Hope, L., & Bull, R., (2003) Exposure duration: Effects on eyewitness accuracy and confidence. *British Journal of Psychology.* 94, 339-354.

Mitchell, K. J., Livosky, M., & Mather, M., (1998). The weapon focus effect revisited: The role of novelty. *Legal and Criminological Psychology*. 3, 287–303.

Mueller-Johnson, K., Toglia, M. P., Sweeney, C. D., & Ceci, S. J., (2007) The perceived credibility of older adults as witnesses and its relation to ageism. *Behavioural Sciences and Law.* 25, 355- 375. doi: 10.1002/bsl.765

Nyberg, L., Louden, M., Rikiland, K., Lindenberger, U., & Backman, L., (2012) Memory, aging and the brain. *Cognitive Science.* 16 (5) 292-305. doi: 10.1016/j.tics.2012.04.005.

Olatunji, B.O., (2008). Expectancy bias for fear and disgust and behavioural avoidance in spider fearful individuals. *Cognitive Therapy and Research.* 32, 460-469.

Page, A. C., (2003). The role of disgust in faintness elicited by blood and injection stimuli. *Journal of Anxiety Disorders*, 17, 45- 58

Passmore, C., (2011) Expert Witness Immunity: end of the road? *Clinical Risk,* 17, 1-5.

Rule, N., Slepian, M. L., & Ambady, N., (2012) A memory advantage for untrustworthy faces. *Cognition.* 125, 207-228. doi: 10.1016/j.cognition.2012.06.017

Peacock, K. L., (2014) "*Sanguis Effectum": An investigation of blood sensitivity and weapon focus on the reliability of eye witness recall*. Unpublished manuscript, Department of Psychology, University of Cumbria, Cumbria, United Kingdom.

Rahhal, T. A., Hasher L., & Colcombe S. J., (2001) Instructional manipulations and age differences in memory: Now you see them, now you don't. *Psychology and Aging* 16:697-706.

Rozin, P., & Fallon, A., (1987). A perspective on disgust. *Psychological Review*, 94, 23-41.

Sauerland, M., Sagana, A., & Otgaar, H., (2013) Theoretical and legal issues related to choice blindness for voices. *Legal and Criminological Psychology*, 18, 371–381. doi: 10.1111/j.2044-8333.2012.02049.

Sporer, S. L., (2001) The cross-race effect: Beyond recognition of faces in the laboratory. *Psychology, Public Policy and Law, 7,* 170–200.

Steblay, N. M., (1997) Social influence in Eyewitness Recall: A Meta-Analytic Review of Line-up Instruction Effects. *Law and Human Behaviour.* 21 (3) 283- 297

Squires, P., (2009) Beyond the Mainstream: The knife crime "epidemic" and British politics. *British Politics.* 4, 127- 157.

Valentine, T., & Coxon, P., (1997) The effects of age of eyewitnesses on the accuracy and suggestibility of their testimony. *Applied Cognitive Psychology.* 11, 415-430.

Vossbeck-Elsebuch, A.N., & Gerlach, A.L., (2012). The relation between disgust-sensitivity, blood-injection-injury fears and vasovagal symptoms in blood donors: Disgust sensitivity cannot explain fainting or blood donation symptoms. *Journal of Behaviour Therapy and Experimental Psychiatry.* 43, 607-61.

Wald, P. M., (2002) Dealing With Witnesses in War Crime Trials. *Psychology and Law.* 32-47.

Weber, N., Brewer, N., & Wells, G. L., (2004). 'Is there a "magical" decision latency that discriminates correct incorrect eyewitness identifications?' *Forensic Psychology and Law*, (pg. 115-124).

Webster, C., & Kingston, S., (2014) Poverty and Crime Review. *Applied Social Research.* 1, (1) 3- 36.

Wells, G. L., (1984). The psychology of line-up identifications. *Journal of Applied Social Psychology,* 14, 89-103.

Wells, G. L., Steblay, N. K., & Dysart, J. E., (2015). Double-bind photo-line-ups using actual eyewitnesses: An experimental test of a sequential versus simultaneous line-up procedure. *Law and Human Behaviour, 39,* 1–14. doi: 10.1037/lhb0000096.

Wise, R. A., Fishman, C. A., & Safer, M. A., (2009) How to analyse the accuracy of eyewitness testimony in a criminal case. *Connecticut Law Review,* 42 (2) 430-515

Wise, R. A., Cushman, B., & Safer, M. A., (2012) Scientific procedures for eyewitness evidence for U.S law enforcement officers. *Journal of Forensic Psychology.* 12 (2) 173-187. DOI: 10.1080/15228932.2012.650145.Wyer, N. A., & Calvini, G., (2011) Don't sit so close to me: Unconsciously elicited affect automatically provokes social avoidance. *Emotion.* 11 (5) 1230-1234. doi: 10.1037/a0023981.

Yarmey, D. A., & Kent, J., (1980) Eyewitness Identification by Elderly and Young Adults. *Law and Human Behaviour.* 4 (4) 259- 420.